ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY
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IN-DEPTH COUNTRY STUDY - INDIA

by

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INFORMATION NOTE ON ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

At its sixteenth session held in Yangon, Myanmar, in January 1996, the Asia-Pacific Forestry Commission, which has membership open to all governments in the Asia-Pacific region, decided to carry out an outlook study for forestry with horizon year 2010. The study is being coordinated by FAO through its regional office in Bangkok and its Headquarters in Rome, but is being implemented in close partnership with governments, many of which have nominated national focal points.

The scope of the study is to look at the main external and sectoral developments in policies, programmes and institutions that will affect the forestry sector and to assess from this the likely direction of its evolution and to present its likely situation in 2010. The study involves assessment of current status but also of trends from the past and the main forces which are shaping those trends and then builds on this to explore future prospects.

Working papers have been contributed or commissioned on a wide range of topics. They fall under the following categories: country profiles, selected in-depth country or sub-regional studies and thematic studies. Working papers are prepared by individual authors or groups of authors on their own professional responsibility; therefore, the opinions expressed in them do not necessarily reflect the views of their employers, the governments of the Asia-Pacific Forestry Commission or of the Food and Agriculture Organization. In preparing the substantive report to be presented at the next session of the Asia-Pacific Forestry Commission early in 1998, material from these working papers will be an important element but will be blended and interpreted alongside a lot of other material.

Working papers are being produced and issued as they arrive. Some effort at uniformity of presentation is being attempted but the contents are only minimally edited for style or clarity. FAO welcomes from readers any information which they feel would be useful to the study on the subject of any of the working papers or on any other subject that has importance for the Asia-Pacific forestry sector. Such material can be mailed to the contacts given below from whom further copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained:

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VERSES OF WISDOM

"This universe is the creation of the Supreme Power meant for benefit of all His creations. Individual species must, therefore, learn to enjoy its benefits for forming a part of the system in close relation with other species. Let not any one species encroach upon others rights".

Indian Scripture

The best way to pray to God is to love His creation.

Anon

All things near and far,
Hidden to each other Linked are,
That thou cannot pluck a flower,
Without troubling a star,

Francis Thompson

You loose a lot more than trees when you loose a forest.

Anonymous

Varied and Plentiful,
Birds and deer, Hares,
Elephants, lions, tigers, bears,
Buffaloes and gaur
All roam in gay abandon
To the beat of cascading rapids and
Mirthful trumpeting elephants,
Joyfully sing the cuckoos, parakeets,
Koel and pretty geese.

Ram Charit

As long as there is wildlife in the forests, earth will provide shelter to man and his generations.

- Old Sanskrit sayings
(Karanth 1985)

Common persons need wood for fuel. They will continue to cut trees till the forest is destroyed. But, wise person (Muni) thinks about the importance of forests in relation to Nature. He thinks about the balance of natural agencies. He thinks of relationship of Forests and Climate.

- Bhagwad Gita

(Chapter 3, Sloka 29 - Sanskrit verse translated into English).

"A tree is equal to ten sons. The ten gifts of the tree are - Oxygen, Water, Soil, Food, Cloth, Energy, Shelter, Medicine, Fodder and Shade.

And What a son; he wants care and water but for five years, and wants no milk, no nurse."

Upanishads

We invoke the Earth upon which foliage and trees are firmly held, unthreatened, the Earth which is equipped with all good things in a stable environment of harmony.

Atharvaveda

As between the soul and the body, there is a bond, so are the body and its environment linked together.

Kahlil Gibran

INTRODUCTION

This report is at the request of FAO through MOEF to prepare an in-depth study of Forestry situation in India visualising a projected scenario for 2010.

There has been growing awareness of the environmental concerns in which forests play a very vital and critical role in maintaining health and stability of the country, the region and the world. Forestry is among the most difficult of all environmental issues and is certainly linked with India's long range ecological and economic security. But unfortunately there is a lack of acknowledgement of the role of the forest in human life even though everyone knows about it. Environmental challenge is threatening the survival of mankind and the globe. Man's thoughtless action for decades by ruthless exploitation of nature and unfettered consumption of resources has scarred the planet and defiled the environment. There is global realisation of impending crisis to the earth more so the approaching gloom in 21st century. Human intelligence and ingenuity made our earlier generations live in harmony with nature, then why not the present and future generations?

Forests constitute primary and renewable natural resource particularly in developing countries, contributing considerably to national economy, socio-economic developments and rural life support system.

Life styles of Indian people traditionally and philosophically have been environment friendly and conducive to protection and conservation of forests and wildlife. The customs and heritage of nature worship, trees and animal worship, sacred groves, several festivals and folklores related to nature and seasons bear testimony to the fact that paths shown by our religious and social leaders have been all along environment friendly. The sacred groves formed in olden times was a kind of reverence and tribute to nature. Our ancient sages realised the primary and ideal relationship between man and nature. The earlier reverence to nature prevented people from causing any harm to nature being consider as divine and god given ecological symbols. Nature was maintained as it is in inviolate and untouched form. Due to multiple value and use of forest people in the past lived in synergy with nature (forest). India has the wisdom and legacy of veneration and conservation of forests.

India fortunately has a tradition of scientific forest management for over 130 years. Over the years with passage of time the forest scenarios are fast changing. The initial forest policies and thereafter have been quite pragmatic in spite of criticism by cynics and pseudo-environmentalists. The forest polices have been modified from time to time, in keeping with changing times, to address to the ongoing current situations.

Forests in India as well as in Asia Pacific Region at the moment are under tremendous pressure from several sides and are in a crucible of changing situations. Last few years of this millennium and as well as first few years of 21st century will have very many situations that would affect forests to a great extent. The Rio conference 1992 gave forestry a boost in shape of Forest Principles. Agenda 21 while addressing the current pressing problems, aims at preparing the world for the challenges of the next century. It also reflected global consensus and political commitment at the highest level of development and environment co-operation. Since then and even before that Government of India has taken several initiatives in implementation of the forest principles.

Government of India in the Ministry of Environment and Forests are engaged in formulating the National Forest Action Plan (NFAP) which will be a vision document forward looking for next 20-25 years. The exercise is on for last few years and now perhaps in final stages of completion. It envisages protection and conservation of natural forests, eco-fragile areas and wildlife habitats; massive afforestation programme both in Government and private land through peoples participation (including women); regenerating degraded natural forests through J.F.M. which empowers people; improving skills and motivation of forestry personnel through specialised training; increasing forest productivity to meet growing demand by intensive need based research and development programmes and providing adequate financial resources to forestry.

An intensive and detailed study over a fairly long time would actually be needed to arrive at the emerging forestry scenario in first decade and quarter century of the next century on a realistic basis. In a way this paper attempts to project the situation concisely on which NFAP is dealing with at great length. Further the time available for report writing is very little compared to expanse and coverage of the subject matter. Considering all these limitations a very sincere and genuine effort has been made to cover all aspects of forestry situation in India - 2010. Opinions, views and observations expressed herein belong to the author. In retrospect many comments can be made, which is but natural and the present document expresses the best possible that could be done under prevailing limitations of time and other resource constraints. There is always scope of improvement but this is the best at that point of time. In hindsight or as afterthought it can be said something better could have been done but to philosophise the fact of life is “of all the good and bad words the worst are if it would have been”. This paper is based on the informed judgement and assessment of current situations, trends and likely developments, in all probability, to arrive at a realistic forestry scenario in India in 2010 with as far correct as possible. In such a paper repetition of certain matters are unavoidable and inevitable. Having tried to cover the entire gamut of subject matters and issues there might have been some inadvertent gaps or omissions and inaccuracies or discrepancies in figures and statistics in the text for which the author offers sincere apologies. However it is hoped that all such aberrations would be erased with NFAP document which would present a detailed scenario of the future in an elaborate and authentic manner with more clarity.

The topics as per terms of reference have been described in three chapters with specified sub-headings. Chapter 1 deals with the context in which the forestry sector is developing. Chapter 2 narrates the state of forestry in the country and major trends therein. Chapter 3 projects the future prospects. Tables and Annexes have been furnished to illustrate the concerned issues and facilitate understanding. References are placed at the end.

1. CONTEXT IN WHICH THE FORESTRY SECTOR IS DEVELOPING

1.1 Highlights of Social and Economic Situation

Forest is a biological entity in the fascinating web of nature and always in a state of dynamic equilibrium. Forestry sector is an important ingredient in the economic and social fabrics of a country. The importance of this sector is more pronounced in developing countries of tropics. Forest in tropics play very significant role in regulating water cycle and in conserving soils. The demand for forest products and services in tropical countries increased rapidly in the recent past with the growth of population and rural economy. This increasing demand of forest produce and land hunger by the growing population and poverty in tropics are the main causes of deterioration in forest cover. The deterioration is the result of disproportionate withdrawals of forest produce as compared to its carrying capacity and regenerative capacity.

The requirements of timber, pastures. fuelwood and diversion of forest lands for agriculture and various development projects in India have put enormous pressure on forests. The apparent alternative of afforestation on non-forest lands under social forestry and agroforestry activities has not picked up well in many parts of the country to the desirable extent.

India, the seventh largest country, covers about 2% of total global land about 1% forest area and about 0.5% pasture land of the world, but supports about 16% of human and about 15% of cattle population of the world and this population is always in the process of increase. India is one of the 12 mega diversity countries commanding 7% of world biodiversity and supports 16 major forest types varying from alpine pastures in Himalayas to temperate, sub-tropical, tropical forests and mangroves in coastal areas. But nearly half of the country's area are degraded, affected with the problems of soil degradation and erosion.

The population of the country has increased from 360 million in 1947 to about 950 million at present. Cattle population also increased from 250 million to about 450 million during the same period. The per capita forests in India is only 0.08 hectare against the global average of about 1.0 hectare. The average density of population increased from 208 per sq. km. in 1981 to 250 in 1991 and 290 at present. The population density is not uniform. It varies from 653 per sq. km. in Kerala State to 58 in Sikkim and Arunachal Pradesh in north eastern regions. Rate of growth of population in last decade (1981-1991) was 2.3%. But the growth rate of scheduled castes (16.3% of population) and scheduled tribes (8.0% of population) has been 3.0% and 2.6% respectively. Livelihood of more than 90% of these communities directly depend upon forests and obviously put enormous pressure on forests. Rapid increase in population led to unsustainable withdrawals of forest produce resulting in degradation. Tribals have a symbiotic relationship with forests and they are conscious of the contribution of the forests for their sustenance and survival. But in many instances their immediate needs have overtaken the future requirements and broader aspects of conservation of their own posterity.

India has agriculture dominant economy. About 43% of land is under agriculture but the productivity is far below in comparison with developed countries because only one third of cultivated areas in the country is under irrigation. About 23% of land area is forest lands having productivity less than one cubic metre per hectare per year against the potential of

eight to ten cubic metres per hectare per year. The present low productivity is due to growing biotic pressure and inadequate resources for scientific forest management. Nearly 4.6% area are culturable waste and 7.1% fallow land available for tree planting and pasture development.

As per one estimation, more than half (about 53%) of country's lands are under various types of land degradation. The most common form of degradation is from wind and water erosion and salinity. About 146 million ha. area is affected with wind and water erosion and 7 million ha. has become degraded due to excessive salts. 8.5 million ha. is under water logging and about 10 million ha is affected with shifting cultivation.

Nearly 23% (76 million ha.) of country's land has been recorded as forests but only 19.5% (64 million ha.) of total area has forest or tree cover which is much less to the goal of 33% set by the National Forest Policy, 1988. About 65% of forest cover has dense forest with crown density more than 40% and rest 35% are badly degraded. The crown density of dense forests is continuously depleting due to overuse of forest resources by the people and their cattle living in and around the forests those have been depending on forest from the past. Another 6 million hectares recorded forest areas is virtually blank, even bereft of any root stock due to excess biotic pressure.

Forests are not uniformly distributed in India. Some regions have quite considerable forest cover, while others have nothing as forests. Fuelwood is the most important form of household energy in both rural and urban areas (mostly poor people) and represents about 90% of the total demand of wood. Many poor people living in and around the forests depend heavily on fuelwood and fodder for subsistence needs and income from gathered forest produce. In rural areas fuelwood provides 70% of fuel for cooking, 5% comes from commercial fuel, and rest from cow dung and agricultural residues. Only 15% of fuelwood are purchased, 62% are collected from forest and public lands, and the remaining 23% are collected from private lands.

The initiation of rapid development after independence in 1947, led to the establishment of large number of paper and pulp mills, saw mills and plywood industries as well as growing rural and urban housing needs gave a quantum jump to the demand for forest products. India's forests have a growing stock of 4.75 billion cu.m. with an annual increment of around 57.6 million cu.m. Only 12 million cu.m. of timber and 40 million tonnes of fuelwood are being officially extracted from the forest areas leaving, 10 million ha. of good forests, falling under National Parks and Sanctuaries, since no commercial extraction is permitted there. The unrecorded extraction for meeting local needs under the existing rights and concessions is many times more. The current requirements of timber and fuelwood. are 30 million cu.m. and 280 million tonnes respectively. The fuelwood deficit is large but according to estimation about 200 million tonnes of fuelwood are withdrawn from the forests every year. Besides, 280 million tonnes of fodder and countless non-timber forest products are also withdrawn every year.

Out of the current demand of 30 million cu.m. timber, 8.3 million cu.m. is needed for paper, pulp and panel products and 15.4 million cu.m. for saw milling i.e. housing, packaging, furniture etc. Though some of the shortages in timber is being supplemented by liberalising the export policy, the forest industries are still facing raw material shortages and are operating well below their rated capacity.

A large number of India's livestock population, unproportionate to the carrying capacity of forests have been grazing in forests causing serious damage to regeneration and productivity. Since the number of livestock population is not likely to be reduced due to social compulsions, a realistic grazing management alternative has to be evolved. Forests are also the only remaining source for agriculture land, encroachments and shifting cultivation. The over exploitation of forest products to meet the various demands, including unrecorded removals, overgrazing and encroachments have led to the poor productivity and degradation of forests.

While the literacy rate in the country increased from 16.7% in 1951 to 52.1% in 1991, the per capita income increased from Rs.1,127 to RS. 4974 (at 1990-91 price index) during the same period. It shows that India has taken rapid stride in economic development after independence, which consequently increased consumerism and the requirements of forest products for local as well as industrial use. The total value of forest products have never been reflected in calculation of the Gross National Product (GNP). Only recorded commercial sale value (Rs. 76.650 million in 1990-91) has been taken into consideration which contributes only 1.8% to GNP whereas the agricultural sector contributes 31.6% to the GNP taking entire products into account for calculation. Now with the India's new policy provision for conservation of forests and meeting the requirements of tribals and local people as welfare measure and also with increasing unaccounted withdrawals of large quantity of forest products, the contribution of forest products in GNP is not likely to increase in future. According to FAO assessment (1996) India uses fuelwood worth US$ 9,080 million. Given the deteriorating environmental situation, it is essential that current economic theory and practice in India must here-in-after stress the need to increase the contribution of forest to Gross Natural Product rather than the traditional economic Gross National Product.

A holistic view of investment for forest development do not give even a ray of hope of any marked improvement in rehabilitation of forests. More so, the withdrawals from forests are likely to increase at exponential rate with increasing population. It was estimated some time back that different types of monetized and non-monetized forest products worth Rs 300,000 million are withdrawn annually from India’s forests. However, the corresponding investment in forestry development at present is only Rs. 8,000 million annually which is about 2.67% of total estimated withdrawal and less than 1% of total plan outlay of the country.

The National Forest Policy, 1988 marks a watershed in Indian forestry by recognising the role of community in land use of degraded forests mainly in development and protection. Accordingly, a mechanism of Joint Forest Management (JFM) on the benefit sharing basis has been legalised in 1990. Its principal aim is to ensure environmental stability and maintenance of ecological balance through preservation and rehabilitation of forests, while providing for fuelwood, fodder, minor forest produce and small timber needs of the rural and tribal population. The JFM has since been institutionalised by most of the States. The emphasis has been on the formation of Village Forest Committees (VFCs) and empowering them for participatory management of degraded forests on benefit sharing basis sans ownership of forest lands.

With policy preferring conservation on derivation of economic benefit, thrust has been given on massive need-based and timebound plantation activities on waste lands alongside of roads,

railway lines, river, streams and canals, and on all other unutilized lands, under social forestry and agroforestry programmes to meet the demands of people and industries as well.

The practice of supply of forest produce to industries at concessional prices have been ceased. Industries are required to raise the raw material needed, preferably by establishing of a direct relationship between them and the individuals/institutions/communities who can grow the raw material and by supporting the individuals with inputs including credit facility, regular technical advice and finally harvesting and transport services.

1.2 Highlights of Long-term Objectives and Goals

Forests are not only important for providing fuel, fodder, timber and some food to rural people, but also in maintaining the agricultural stability by protecting watersheds and rendering environmental services. The contribution of forests to GNP is meagre as non-monetized withdrawals are not taken into account in GNP. Forest is the foster mother to agriculture and is crucial for maintaining and improving the productivity of agricultural land. Further expansion in agriculture land to feed growing population also destroys some forest. This expansion includes also shifting cultivation areas. Unless the forest ecosystem is maintained, the future of agriculture itself would be at stake. Agriculture, the main source of India's rural economy, contributes more than 30% to GNP, 60% of employment and is primary source of 75% of country's population living in rural areas.

Forests have a significant role in ameliorating climate particularly drought conditions. Substantial area of India, particularly in the States of Andhra Pradesh, Gujarat, Orissa and Rajasthan regularly face drought. Drought prone regions represent 19% of the entire geographical area of the country and affect nearly 12% of the population. Two third of the cropped lands in the country are rainfed. These areas depend entirely on monsoon and the natural hydrological systems. Both climatic condition and sub-soil moisture status are regulated by forest cover in the region. Forests, in rainfed agricultural areas, play important role for the livelihood of local communities.

Large demand of fuelwood, pasture, land for agriculture are the main constraints in the improvement of forests in India. According to India's UNCED submission 70% of rural people and 50% of urban people use fuelwood for cooking purposes. While, commercial fuels make up the difference in urban areas, agricultural waste and cow dung are used in rural areas where fuelwood is scarce. Many industries and kilns in smaller cities still use fuelwood as their primary source of energy. In medium size and smaller cities about 25% of household collect fuelwood free as compared to 76% in rural areas. Most of the rural population are likely to continue to depend on gathered fuelwood. Local people collect fuelwood to meet their domestic needs and for sale to rural elites and to middlemen who transport it to smaller and larger cities nearby.

Gathering fuelwood (headloading) from forest for sale provides one of the biggest employment to the rural people. It is an important source of income to many poor living in and around forests, specially women. According to estimation by the Centre for Science and Environment in 1982, about 3 million people work as headloaders. At present it has exceeded about 5 million. The contribution of Forest does not find place in the employment data at National level.

Role of forests is significant in maintaining ecological balance. An ecosystem consists essentially of living organisms - both flora and fauna - their environment and their interrelationship. Forests, with their phyto- and zoo-mass components and the land supporting them, constitute the most important parts of any ecosystem. The linear retrogression of ecosystems caused by human activities, from historical times, are being mitigated by forests. The major ecological function of forests are to restore and secure the hydrological regime of land, water availability, control run-off, soil fertility and provide much needed oxygen. Forests also patronise the biodiversity and the habitat of wild flora and fauna in the form of National Parks, Sanctuaries and other protected natural areas. In India 4.5% of total land area of country are reserved as protected areas for maintaining biodiversity. Biodiversity includes integration of plants and animals to increase symbiosis with agriculture. Biodiversity is an important source of rebuilding ecological balance and sustainability in agriculture. The protected area network is very essential for a country like India and has an intrinsic link with human welfare. Lush green hills throbbing with wildlife and genetic diversity and myriad's of colours are very much needed for modern man. Destruction of forest with its wilderness rocks the very foundation of human survival.

Forests are the main source of raw material for wood based industries. According to an estimation, about 15% wood harvested from forests are consumed by industries. As per figures of 1991 there are 276 medium and large scale wood based industries. These are paper mills, newsprint, rayon pulp, plywood, and match industries. Besides, there are about 23,000 saw mills including small units. With emphasis on conservation policy and stopping the practice of selling forest raw material at concessional prices to industries, the Government has liberalised the import policy for wood and wood products. The industries are to establish direct relationship with farmers for meeting their requirement of raw material from farm forestry and private plantations. This policy has clear cut intention to develop farm forestry through institutions and industries which has not been favourably taken by the industries as they have to expand their marketing infrastructures for buying raw material from thousands of small producers which is more complex than buying from the government. But then the extension services of industries and institutions have to be strengthened by a suitable mechanism of infrastructure and pricing of forest produce from farm lands and waste lands to reduce the increasing pressure on forests.

The protective and productive role of forests in the national economy entitles them to lay claim to an adequate share of the land. National Forest Policy, 1952, for the first time set the goal to bring 1/3rd of total land area of the country under forest and tree cover and the same was adopted in the Forest Policy, 1988. To achieve this goal, it is imperative to plan for annual plantations of about 3 million ha. degraded forests and scrub areas, all available wastelands and marginal lands and plantation in farm lands under social forestry and suitable agroforestry systems. The National Forest Policy, 1988 lays emphasis on massive need based and time bound programme of afforestation on degraded forests, waste lands, community lands and the lands of individuals including agricultural lands, with particular emphasis on the production of fuelwood and fodder. Policy also provides that the land laws should be so modified wherever necessary so as to facilitate and motivate to undertake tree farming and grow fodder plants, grasses and legumes on their own land. It is essential to develop large scale woodlots for fuelwood, and industrial wood and timber to meet local and national needs with full involvement of all stake holders. Though it is difficult to increase forest cover in the

present scenario of land hunger, it is possible to bring all possible categories of available waste lands under tree cover.

With the realisation that the demand for fuelwood, fodder and non-timber forest produce for local use by communities and tribals was rising rapidly with growing population, it was decided that the old custodial and timber oriented system of forest management needed to be changed. As a result, the new National Policy of 1988 redefined the priorities. The main thrust areas in the Policy are:

- Maintenance of environmental stability through preservation and restoration of ecological balance and protecting the vast genetic resource. Derivation of economic benefit must be subordinated to this principal aim.
- Meeting basic needs of the rural and tribal people, especially of fuelwood, fodder, non-timer forest products and small timber in keeping with the carrying capacity of forests.
- Raising the productivity of forests and achieving the policy goal of having 33% of country's area under tree cover (66% in hill areas).
- Industry to be encouraged to develop its raw material by interacting with the local people and communities for use of the manpower and land through financial and technical inputs as well as buy back arrangements. Monoculture should not be allowed in natural forest areas with rich bio-diversity.
- Ensure people's close involvement in programme of protection, conservation and management of forests.

In pursuance of the policy prescription for creating a massive people's movement with the active involvement of women, the Government of India have issued a detailed guideline to all States and Union Territories in June, 1990 for the people's involvement in development and protection of degraded forests through Joint Forest Management (JFM) by constituting village level institution like Village Forest Committees (VFCs) on benefit sharing basis. Though the concept of Joint Forest Management mechanism was evolved and successfully implemented in early seventies in Arabari (West Bengal) and Sukhomajri (Haryana), it was enshrined in the National Forest Policy for the first time in 1988. Much before this in India traditionally people used to worship trees and forests in shape of religious trees and sacred groves. The benefit from forest was given religious sanction and people guarded those like their own kin. The instances of protecting trees in Rajasthan centuries back and Chipko Andolan in UP of recent past are some examples of peoples (including women) involvement in caring forest. The examples of such silent social revolution has been observed at several places in the country by virtue of the latent knowledge of the people to follow the ecological footprints of their own elders, religious leaders and sages. Climatically forests of India are very resilient and bounce back with vigour by proper by proper protection and management. Traditionally the character of Indian inheritance is ecological sensitivity and symbiotic living with the environment. Equitable sharing of benefits from a resource and avoiding waste are prerequisite for maintaining biotic wealth and biotic diversity.

The policy guidelines provide that the bonafide domestic requirements of forest dependent people for fuelwood, fodder, non-timber forest products and constructional timber should be the first charge on forest produce. The policy document also enjoins that the communities should be strongly motivated to identify themselves with the development and protection of forests from which they derive benefits. However, the problem lies in developing ways and means to identify, and use, the community capacity to bring improvements in the condition of

forests. Also the situation and socio-economic condition in various parts of the country are so diverse that it is impossible to have one uniform policy for community participation. Therefore, the Government of India in their guidelines of 1990, left it to the initiative of the State Governments to device appropriate strategies and modalities for implementation of community participation, depending upon site-specific situations prevailing therein. So far 17 States have passed Government resolutions and implemented Joint Forest Management on 2.0 million hectare degraded forests through 15,000 Village Forest Committees. In fact the coverage is much more than the above figure in the country due to awareness and interest of the rural people in many areas. More areas of degraded forests are likely to be brought under Joint Forest Management by the end of the century. Most of the JFM activities are being funded by Externally Aided Projects.

To achieve the goal set out by the National Forest Policy, 1988, an additional area of about 33 million hectares need to be afforested and 31 million hectares of degraded and open forests would need restocking, presuming there is no further deforestation. To take afforestation at this level, forestry infrastructures including manpower and resources need to be strengthened, expanded and enhanced. As against the need of afforestation illustrated above, present afforestation efforts are not only very low but also shows a declining trend, mainly because of lesser funds earmarked for afforestation. During 1996-97, only 1.30 million hectare afforestation could be undertaken by all sources against the average of 1.50 million hectare in last three years.

1.3 Role of Country in Regional Context

The growth of human population and consequent human activities have pushed forests to the mountains and hills. Mountains form the catchment of most of the rivers and are important source of water, energy and biological diversity. They are the repository of minerals, ores and countless forest products. They are also essential to survival of the local, regional and global ecosystem. In some cases mountains and hills contain very fragile ecosystem transcending national boundaries and having regional and global scope.

Ecological degradation in any country impinges, directly or indirectly on the quality of life in other countries. Conflicts over water rights are common. Many problems of forest depletion arise from disparities in economic and political power both between and within nations. The forest practices of one country may affect the basis for life in a neighbouring community. Forests in a region may be destroyed by the excessive felling because the people living there may not have any alternatives or because timber contractors have more influence than forest dwellers and others who depend on the sustained management of forests. But this degradation affects all without any discretion.

With the fear of fallouts of an ecological disaster which would devastate the rich and the poor alike, environmentalism has now become a major issue in international relations. It is now a major consideration in international policy making agenda. This new sense of urgency and awareness, for the common cause of environmental protection, is leading to unprecedented cooperation in this area. The most formidable obstacles to this mutual cooperation are the vested economic and political interests of most of the countries.

India is one of the countries rich in biodiversity and largest in the region supporting large variety of flora and fauna from high altitude of Himalayas to coastal areas. Whereas the large catchments in India control the conditions of water course in the neighbouring countries and the highlands of Nepal affects the productivity of alluvial plains in India.

The import policy for wood and wood products has also been liberalised with a view to support forest conservation. As such, during 1994-95, nearly US$600 million worth of wood and wood products were imported. There is total ban on export of timber from India. These trade controls affect the price of raw materials and finished goods. The tariffs for forest products have been reduced considerably over the past few years to regulate the price within the reach of consumers. Due to its rich and valued genetic diversity at present India has vast potential for export of value added Non Wood Forest Products (NWFP). But meeting the requirements of rural poor and tribals have been given priority over exports. Government regulates trade for many of the more important NWFPs to protect the interests of tribals and other rural poor.

Population and poverty are the common phenomenon in all the countries of the region affecting the sustainability of natural resources, forests in particular. There is immediate need of taking up conservation measures for water and soil and the easiest way for conserving these is the protection and development of forests. India has taken a lead in the region by conserving and maintaining the extent of its forest cover around 64 million hectares since long by implementing the provisions of policy prescriptions. The most significant is people's involvement including women in the protection and sustainable management of forests.

It has been realised in India that in the present social scenario, the sustainable management of forests can only be possible by taking communities, living in and around forests, along in the joint management of forests type on benefit sharing basis. Though the concept of joint forest management in India is age old, it was given a legal mantle in the National Forest Policy in 1988. India has taken a lead in this concept since then. Many of the States in India have adopted it as a convincing and effective tool in protection of forests as well as in development of permanent resource base for the livelihood of forest dependent communities.

There is immediate need of co-operation among all the countries in the region for the conservation of biodiversity and India has to take initiative and lead. India's National Forest policy marks a watershed in forestry by giving principal thrust on conservation and recognising the role of community in sustainable management of forests. To affect conservation, there is immediate need of increasing productivity of forests by exchanging scientific and technical know-how, for developing improved clones of forest species, and the better management techniques. India's role may be significant in balancing export and import of wood and wood products to encourage the industrial development within the region.

There is a need of exchange of extension technology for raising forest species on private and institutional lands for meeting the requirement of local people and industries. In most of the developed countries like USA, Canada, Sweden, Finland and Germany etc., the major part of the forest estate belongs to the forest based industries. These forests are being managed strictly on scientific lines with high technical inputs for increasing productivity and sustainable use. India being the developing country in the region has the potential of increasing productivity of forests. Keeping in view the success of other developed countries, it is felt that in future India would take a lead in developing strategies of involving local

community and other stake holders fully for rehabilitation of degraded forests and plantation of waste lands with quality clones/planting material of required species. This would not only meet the requirements of local people and industries but also divert the growing pressure from the natural forests and help in conservation of biodiversity of the region.

1.4 Summary of Major Issues

Population and poverty are the two main causes of destructive pressure on forests. The depleting forest cover calls for the urgent possible care in planning a strategy to rehabilitate the forests and meet the genuine human needs. This need has to be distinctly differentiated from greed. The trend in population growth of scheduled castes and scheduled tribes, majority of whom depend on forests for livelihood, reveal that demands of forest produce even for subsistence alone is going to increase in geometric progression. In this scenario of population growth, unless drastic measures are taken to conserve and increase forest cover, the country would be confronted with a disastrous situation.

About 50% of recorded forest areas of the country have already become degraded or open due to disproportionate withdrawals of forest produce. Efforts are being made to improve the situation by intensive afforestation, protection by involving communities, and control through various legislation but the general condition of forest cover is continuously deteriorating. The obvious reason is that the need of forest produce by growing population is beyond the carrying capacity of forests thereby reversing the sustainability. To mitigate the situation alternative wood substitutes have to be depended upon to spare forest for better natural functioning and services.

The government funded afforestation activities have only reached a level of about 1.0 million hectare per year in degraded forest areas and around 0.50 million hectare per year in village commons and private lands under various afforestation schemes. In all the total annual afforestation efforts from all sources fluctuate between 1.0 to 1.3 Mha. It is much below as compared with the need based assessment of 3 and earlier announcement of 5 million hectares annually. The present requirements and growing demand cannot be met with the current level of afforestation and increments. This will not meet even the fuelwood need of the country on sustained basis while growing demand of industrial wood and others will continue to degrade the remaining natural forests.

The results of afforestation efforts on non-forest public lands and village commons under social forestry programmes have also not been up to expectations. The reasons are that the planting sites have some times been encroached or selected for some other use in the name of village development. Generally communities some times also worry about losing control of the areas to the government if planted with trees. Large scale grazing is the other cause of poor success of community land plantations. It has been seen in many instances that good social forestry plantations have been diverted for other developmental works negating the very purpose of plantation. Government efforts to promote tree planting on private and farm lands under agroforestry also do not have the desired impact as the incentives under such programmes could not cater to the expectations of the people.

The other reason for not raising quality and adequate plantation is lack of technical know-how and financial resources. Improving the quality of planting material is one of the most

important factors to increasing productivity of forest plantations on both private and public lands. It is easy to do by using quality seed and nursery management in accordance with technologies which require only minor adaptation to local conditions. The production of quality planting material is costlier than the current planting stock, but the extra investment is worth and economical in the long run. Other management techniques like giving more attention to planting practices and proper site preparation on degraded sites also improve the productivity of plantations.

Better models to rehabilitate degraded forests through protection with intensive plantations with quality material in joint management may be developed at lesser cost. Since the Government does not have the sufficient resources to rehabilitate the vast areas of degraded forests at one time, such models can be useful to protect the areas in the meantime. Forest research needs to be strengthened to support the desired development and provide solutions to field problems. Sociological research needs to be carried out in parallel with identification of technical and economic options for the desired programmes. An effective extension mechanism should be developed and seedlings of fast growing species fetching good return in shortest possible time should be provided to all individuals and institutions interested in raising of trees. In pursuit of higher production the aspect of soil fertility is not to be ignored.

Farm forestry is well established in India but the supply of subsidised seedlings to the people are poor in quality and affect the production adversely. Farm forestry will only be successful in the long run if the farmers use quality seedlings and adopt good technology. There is considerable scope for improving yields and quality of production from farm forestry. At present the yield is not anywhere near what it could be with the improved technology and with quality planting material. In some areas, Wimco and ITC Bhadrachalam have provided better input and their services to the farmers in Haryana, Punjab, Uttar Pradesh and Andhra Pradesh. Kitply has also taken some plantations in self acquired private lands mainly for quick economic returns with higher inputs in N.E. states and M.P. In some cases the improved planting material has enhanced the eucalyptus yield from 7 to 20 cu.m. per ha per year. Superior clones of poplar has shown even a better productivity. Poplar being a plywood raw material has fetched good economic returns to the farmers. Trees can also be extracted at a young age to produce reconstituted wood or fibreboard. The necessary technologies are readily available in India. High production forestry and ago-forestry models for rainfed and marginal areas have yet to be developed and extended. Several companies have come up in private sectors and taking up plantations in private lands with a promise of very high yield per plant. While their efforts are commendable in greening the country, their assurances to the public are misleading.

Some of the government regulations create hindrances in farm forestry practices ultimately making it less popular and profitable. In most of the States in India, farmers and individuals can harvest and transport their wood produce only after going through a long cumbersome process to obtain government permits. Once farmers plant trees in their farms, they should be permitted to harvest and transport their produce freely. Ago-forestry in Haryana and Punjab could become a success because in these States, there is no such regulation. Though some other States have also exempted the species of agroforestry from transit permits, more relaxation in forest legislation is still required to promote the ago-forestry. But the effect of such relaxation is not without a backlash.

Though forests provide many valuable services to society, there is no sufficient financial support to reforestation programmes. Government have limitations in earmarking funds to the need based plantation necessities. While loans at higher interest rates from financial institutions are not viable in forestry activities, external agencies have provided soft loans and aids to some of the States on the basis of area oriented projects. The projections of future requirement indicate that the objectives of the new Forest Policy will not be achieved through the current investment strategies. The alternative seems to be to encourage private individuals and institutions to come forward for plantations on their available lands under suitable agroforestry models and joint forest management on degraded forests. More emphasis is needed on methods of transferring knowledge of successful techniques to private individuals, NGOs and institutions. Planning process should be to promote participatory project planning in consultation with communities to increase local involvement. Farmers and tree growers could also be trained to use better harvesting technologies for small-timber and fuelwood along with planting processes.

Earlier a sizeable portion of funds from poverty alleviation programmes was being allocated for social forestry in rural areas but these have now been ceased. In such circumstances, the community users have themselves to develop a paradigm of sustainable development through creating stakes for people who are presently alienated and have become indifferent to the future of forests. A system needs to be evolved whereby sizeable portion of proceeds from the harvest of forest produce, even if assumed notionally, get ploughed back in kind (labour) or cash for rehabilitation and improvement of forests. In order to mobilize funds for development of forestry sector, as well as to address forestry issues of the country, National Forestry Action Plan (NFAP) is being prepared with assistance from UNDP and FAO. It is expected to be completed shortly.

Raw material to forest based industries were traditionally supplied from government forests under long term leases at prices much below the market value of the raw materials. Government also protected domestic industries from foreign competition by setting some regulations. The result of these past policies are mixed. While industrial development has been stimulated, large transfer of forest produce to private industries at below market price have resulted in degradation in vast forest areas as the proportionate investment could not be made available for forest rehabilitation. Further the value earned from forest in financial terms has been less in proportion to the produce harvested. The pressure to supply industry has often led to the replacement of natural forests by monoculture which in turn has deprived local population from the multiple products of the natural mixed forests. The low material prices have also kept private producers away from the plantation activities for industrial use. Even industries did not create infrastructure to produce raw material as they were getting raw material from government forests at much cheaper rates.

Now the policy of supplying raw material to industries at concessional prices has been changed. The National Forest Policy, 1988 envisages to stop this practice. Industries are required to use alternative raw material and to produce raw material for their requirement with direct nexus with the farmers. At present only those contract of supply at concessional rates are valid which were agreed before the pronouncement of new policy.

Changes were also adopted in 1991-92 in industrial policy to liberalise industrial development by permitting the import of forest raw material without any permit. New regulations give

preference to small scale industries and industries using alternate raw material like bagasse, rice straw, grasses or any other non-woody vegetation and waste paper.

After the new forest policy has come up, industries, institutions and farmers have shown interest in wood production for pulp and other industrial uses. Still industries are hesitant to establish direct nexus with the farmers and individuals perhaps due to cumbersome process of collecting raw material from thousand places. Farmers are growing their own and selling their produce freely. There is no support price for their produce. In the past, prices of farm forestry produce have generally fallen with the increased supply. Some States have fixed the minimum price of wood through the State Forest Corporations, still much more have to be done to promote ago-forestry. An estimate of how much of the industrial wood demand that could realistically be provided from farm forestry over time has not been made. It is time, wood based industries should create infrastructure to promote agroforestry with assured buying back provisions.

The policy of putting ban on fellings from natural forests needs to be reviewed again. This restriction has inflated the import bill and put pressure on wood based industries. Non-working of natural forests will affect the hygiene and health of forests adversely. These forests should be worked silviculturally on the basis of sustainable production with the realistic approach of supply of wood to all with sufficient investment for regeneration and protection. While the reserved forests should be intensively protected with controlled working conducive to natural regeneration, the degraded forests should be immediately taken up for massive plantation and revegetation with quality input and enhanced investment in close collaboration with concerned stake holders so as to provide forest produce to local people and industries maintaining sustainability of forest areas. The degraded forest areas if protected well over a period of time can come to its natural shape and in this regard Indian climate is very supportive.

Sustainable Forest Management (SFM) is a wide ranging comprehensive expression which embraces all aspects of forest management conservation and development. Natural resources have to be conserved and augmented but essential development needs of the society cannot be overlooked. Forest management on sustained basis is a Herculean task which can well be achieved by joint efforts of the State and people. Joint Forest Management (JFM) is a bold step in this direction. Several wood based industries have shown interest to become partners in overall efforts for afforestation. Non-Governmental Organisations (NGO) are also actively helping in the tough task of forest rehabilitation and development of a resource base for millions of rural population. Coordinated efforts of all well meaning agencies with adequate input of research and investment would definitely bring out good results.

Research in forestry has a long tradition in India but for various reasons it has not been given priority in forest management and it has fallen far behind the World development. Indian Council of Forestry Research and Education (ICFRE) in Dehradun and its branches at different regions is the premier institute of research but it undertakes mostly centralised academic research. Some of the States have their own research institutes to focus largely on regional applied problems, while this task in other States is done by silviculturists of forest departments. There is hardly any co-ordination among ICFRE, State institutes and departments and other research organisations including universities. Also, there is no link between users and research organisations and most of the research works are of limited use to field problems. The whole research activities need to be reorganised and strengthened so that

research institutes and organisations take up applied research and the useful findings may easily be transferred to field level.

2. THE STATE OF FORESTRY IN THE COUNTRY AND MAJOR TRENDS

2.1 Forest Resources - Status and Trends

India is endowed with forest resources rich in diverse flora and fauna. The forest types vary from Tropical Rain Forest in north-eastern India, Western Ghats and Andaman and Nicobar Islands to Desert and Thorn Forests in Gujarat and Rajasthan, Rich mangrove Forests in West Bengal, Orissa, Andhra Pradesh and Andaman and Nicobar Islands to Dry Alpine Forests in Western Himalayas. India has approximately 7% of total mangrove forests of the world.

Forest resources of the country can be classified in a number of ways, such as legal classification, functional classification, according to vegetation (forest) types and according density etc.. A brief description of such classification is given as under.

Legal Classification - Recorded Forests are those areas which are legally notified as forests areas and are entered as such in government records (in forest and/or revenue records). Almost entire forest resources in the country are government owned and a negligible forest area is in private hands. Total Recorded Forest Area in the country is 765,210 sq. km, which is 23.28% of total geographical area of the country. Recorded Forests can be broadly classified into three categories Reserved Forests (416,516 sq. km), Protected Forests (223,309 sq. km) and Unclassed Forests (125,385 sq. km). Table I gives state wise details recorded forests. Forest consolidation began along with forest administration by legally classifying forest into different categories. A large part of forest today was notified before independence of India in 1947 and some were notified later on. Whatever classified forest exists today is the result of that thoughtful action otherwise most of it would have been fragmented and lost its character as happened to areas outside. No doubt forest administration began in colonial period but the main emphasis remains unchanged even now since it was conceptualised with a vision.

Table I - Reserved/Protected/Unclassed Forest area of India in 1995 (in sq. km.)

Sl. No.	States/Union Territories (UTs) Forest	Reserved Forest	Protected Forest	Unclassed Forest	Total Area
1	Andhra Pradesh	50,479	12,365	970	63,814
2	Arunachal Pradesh	15,321	8	36,211	51,540
3	Assam	18,242	3,934	8,532	30,708
4	Bihar	5,051	24,168	7	29,226
5	Delhi	42	---	---	42
6	Goa, Daman & Diu	165	---	1,259	1,424
7	Gujarat	13,819	997	4,577	19,393
8	Haryana	247	1,104	322	1,673
9	Himachal Pradesh	1,896	31,473	2,038	35,407
10	Jammu & Kashmir	20,182	---	---	20,182
11	Karnataka	28,611	3,932	6,181	38,724
12	Kerala	11,038	183	---	11,221

13	Madhya Pradesh	82,700	66,678	5,119	154,497
14	Maharashtra	48,373	9,350	6,119	63,842
15	Manipur	4,171	9,520	1,463	15,154
16	Meghalya	981	12	8,503	9,496
17	Mizoram	7,127	3,568	5,240	15,935
18	Nagaland	86	507	8,036	8,629
19	Orissa	27,087	30,080	17	57,184
20	Punjab	1,107	1,750	44	2,901
21	Rajasthan	11,585	16,837	3,278	31,700
22	Sikkim	285	104	2,261	2,650
23	Tamil Nadu	19,486	2,528	614	22,628
24	Tripura	509	2,196	3,588	6,293
25	Uttar Pradesh	36,425	1,499	13,739	51,663
26	West Bengal	7,054	3,772	1,053	11,879
27	Andaman & Nicobar Island	2,929	4,242	---	7,171
28	Chandigarh	31	---	---	31
29	Dadra & Nagar Haveli	203	---	---	203
30	Lakshdweep				N.A
31	Pondicherry				
	Total	416516	223,309	125,385	765,210

Source:- State of Forest Report, 1995 by Forest Survey of India

Functional Classification - Exact details on extent of forest area on functional basis is not available. However we can broadly say that approximately 10 million hectares of forests are managed as Protection Forests for protection of catchments, conservation of soil in eco-fragile areas and other reasons, 16 million hectares are managed as production forests to meet demands of forest products for industries, railways and defence, 25 million hectares are used as social forests for meeting multifarious needs of people in general and tribals and rural poor in particular and 15 million hectares are maintained as Protected Areas for conservation of biodiversity.

Table II - Occurrence of Forest Types in India, 1988

Sl. No.	Forest Type	Area in Sq. Km.	%	Occurrence
1.	Tropical Wet Evergreen Forest	51,249	8.0	Arunachal Pradesh, Assam, Karnataka, Kerala, Manipur, Nagaland, Tamilnadu, A& N Island and Goa
2.	Tropical Semi Evergreen Forest	26,794	4.1	Assam, Gujarat, Karnataka, Kerala Maharashtra, Goa, Nagaland, Orissa, Tamilnadu, Andaman & Nicobar Island
3.	Tropical Moist Deciduous Forest	236,794	37.0	Andhra Pradesh, Assam, Gujarat, M.P, Maharashtra, Kerala, Maharashtra, Bihar, Manipur, Meghalaya, Mizoram, Tripura, Nagaland, Orissa, Tamilnadu, U.P., Goa West-Bengal, A & N Island, and Dadra & Nagar Haveli
4.	Littoral and Swamp Forest	4,046	0.6	Andhra Pradesh, Gujarat Maharashtra, Orissa, Tamilnadu, West Bengal and A & N Island.
5.	Tropical Dry Deciduous Forest	186,620	28.6	Andhra Pradesh, Gujarat, Haryana,

Sl. No.	Forest Type	Area in Sq. Km.	%	Occurrence
				H.P.,Karnataka, M.P., Maharashtra, J&K, Orissa, Punjab, Rajasthan, UP, Tamilnadu, West Bengal and Kerala
6.	Tropical Thorn Forest	16,491	2.6	Andhra Pradesh, UP,Gujarat, Haryana, Karnataka, M.P., Maharashtra, Punjab, Rajasthan, HP, and Tamilnadu
7.	Tropical Dry Evergreen Forest	1,404	0.2	Andhra Pradesh and Tamilnadu
8.	Sub-Tropical Broad Leafed Hill Forest	2,781	0.4	Assam, Maharashtra, Meghalya, and West Bengal.
9.	Sub-Tropical Pine Forest	42,377	6.6	Arunachal Pradesh, HP, J&K, Manipur, Meghalaya, Nagaland, Sikkim and UP
10.	Sub Tropical Dry Evergreen Forest	12,538	2.5	HP, J&K and Mizoram
11.	Mountain Wet Temperate Forest	23,365	3.5	Arunachal Pradesh, Karanataka, Manipur, Nagaland, Sikkim and Tamilnadu
12.	Himalayan Moist Temperate Forests	22,012	3.4	HP, J&K and UP
13.	Himalayan Dry Temperate Forest	313	-	J&K and HP
14.	Sub-Alpine and Alpine	18,628	2.8	Arunchal Pradesh, HP, J&K, Forest Nagaland, Sikkim and UP

Source: National Wasteland Development Board, 1988.

Forest Types - Forests are not distributed evenly in India, but are concentrated in Northeast, the Himalayas and Shiwalik Ranges, the Central Belt, Andaman and Nicobar Islands, strips along Western Ghats, Eastern Ghats and other hilly areas, and in patches of coastal mangroves. Of the area under forest cover, 37% is Tropical Moist Deciduous Forests (including the high value Sal forests); 29% is Tropical Deciduous Forests (where Teak is valuable species); 8% is Tropical Wet Evergreen Forests and 26% is Sub-Tropical, Temperate, Alpine and other forests. Distribution of various forest types within the country is given in Table-II**.** More than 50% forests is located within five states: Madhya Pradesh, Arunachal Pradesh, Andhra Pradesh, Orissa and Maharashtra. Most of the forests are not in contiguous blocks but rather small patches interspersed by habitations. In future it may be fragmented further due to multifarious demands on forest land mass.

Table III - Actual Forest Cover by Density Classes and Mangrove Vegetation in India (1995 Assessment) (in sq. km.)

Sl. No	State/UTs	Dense Forest (Crown density 40% and above)	Open Forest (Crown density 10 to below 40%)	Mangrove	Total Forest Cover
1.	Andhra Pradesh	24,827	21,902	383	47,112
2.	Arunachal Pradesh	54,176	14,445	-	68,621
3.	Assam	15,694	8,367	-	24,061
4	Bihar	13,343	13,218	-	26,561
5	Delhi	16	10	-	26
6	Goa, Daman & Diu	995	252	3	1,250
7	Gujarat	6,369	5,262	689	12,320
8	Haryana	370	233	-	603
9	Himachal Pradesh	9,565	2,936	-	12,501

Sl. No	State/UTs	Dense Forest (Crown density 40% and above)	Open Forest (Crown density 10 to below 40%)	Mangrove	Total Forest Cover
10	Jammu & Kashmir	9,413	-	20,433	11,020
11	Karnataka	24,859	7,521	2	32,382
12	Kerala	8,455	1,881	-	10,336
13	Madhya Pradesh	95,153	40,011	-	135,164
14	Maharashtra	25,673	18,015	155	43,843
15	Manipur	5,318	12,240	-	17,558
16	Meghalya	4,045	11,669	-	15,714
17	Mizoram	4,281	14,295	-	18,576
18	Nagaland	3,487	10,804	-	14,291
19	Orissa	27,163	19,749	195	47,107
20	Punjab	481	861	-	1,342
21	Rajasthan	3,684	9,596	-	13,280
22	Sikkim	2,424	703	-	3,127
23	Tamil Nadu	9,418	8,327	21	17,766
24	Tripura	1,819	3,719	-	5,538
25	Uttar Pradesh	22,969	11,017	-	33,986
26	West Bengal	3,463	2,694	2,119	8,276
27	Andaman & Nicobar Island	6,524	125	966	7,615
28	Chandigarh	6	1	-	7
29	Dadra & Nagar Haveli	159	45	-	204
30	Lakshdweep	-	-	-	-
31	Pondicherry	-	-	-	-
	Total	385,756	249,311	4,533	639,600

Source: State of Forest Report, 1995 by Forest Survey of India

Forest Cover - As per State of Forest report, 1995 by Forest Survey of India, the actual forest/tree cover of the country (based on satellite imageries pertaining to the period 1991-93), is 639,600 sq. km, which is 19.45% of the total geographic area of the country. Out of this 385,756 sq. km is Dense Forest (Crown Density 40% and above), 249,311 sq. km is Open Forest (Crown Density between 10% to 40%), 4,533 sq. km is Mangrove Forests and 60,528 sq. km is Scrub Area (tree land with Crown Density less than 10%). State-wise forest cover according to density classes is given in Table III**.**

The Report further shows that in comparison 1993 assessment, forest cover of the country has declined by 507 sq. km. Open Forest have decreased by 964 sq. km, while Dense and Mangrove Forests have increased by 180 and 277 sq. km respectively. Forest Cover in north-eastern region has declined by 783 sq. km (Open Forests decreased by 939 sq. km and Dense Forests increased by 156 sq. km) and in rest of the country forest cover increased by 276 sq. km (Dense Forest +24, Open Forest -25 and Mangrove +277). Even 1993 assessment has shown decrease in forest cover in north-eastern region by 635 sq. km. Loss of forest cover in north-eastern Region is attributed largely to shifting cultivation.

Protected Areas - India has a large network of Protected Areas for in-situ conservation on wild flora and fauna. At present there are 80 National Parks and 441 wildlife sanctuaries covering about 148,849 sq. km area. Representing about 4.5% of total geographical area of the country.

National Parks cover 114,164.5 sq. km and wildlife sanctuaries 34,864.53 sq. km. State-wise details of National Parks and Wildlife Sanctuaries is given in Table IV. Some more areas have been added to both the categories in the meanwhile.

Condition of Forest Resources - Forest resources in India are under very heavy biotic pressure and geographic stress. The pressure exerted by human and cattle population is further exacerbated by monsoonic pattern of rain. As nearly 90% of the country receives rainfall from varying from 2 to 6 months, the remaining 6-10 months remain dry. This heavy pressure has led to deforestation and degradation of forest resources. Various factors are responsible for this in different regions of the country in varying degrees.

Shifting Cultivation is one of the primitive systems of raising food crops with "slash and burn" technique. It has been in practice since long and got ingrained into the tradition and culture of most of the tribals in the country. This pernicious practice affects forest considerably. North Eastern states in India have more concentration of tribal people. Loss of forest cover is very acute in north-eastern region, and primary reason for this loss is shifting cultivation. Shifting Cultivation is practised in parts of the states of Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, in addition to all seven north-eastern states. Incidence of shifting cultivation is very heavy in Orissa and north-eastern states (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura). Traditionally shifting cultivation was practised on long cycles with rest period ranging from 10 to 30 years. However with increase in population of shifting cultivators cycle of shifting cultivation is reduced to below 5 years and some times down to two years. It has resulted in severe loss to forest resources and biodiversity. It has also increased misery of shifting cultivators as the agricultural yield is falling rapidly due to decreasing productive capacity of soil in the shifting cultivation area. Except for the Task Force set-up by Ministry of Agriculture in 1983 the data on shifting cultivation is very sketchy. Approximately 6.5 million tribals are practising shifting cultivation over 10 million hectares of forest lands. However it has been noticed that the practice of shifting cultivation is reducing with time. A number of initiatives have been adopted in relation to shifting cultivation, but the result has been not very encouraging. In some cases, balanced programmes introduced in areas where traditional groups still have relatively long fallow cycles (10 years or more) could allow continuance of shifting cultivation without adverse environmental impacts. In other cases combinations of agroforestry and rainfed farming needs to be introduced, but it would require implementation of appropriate development packages.

Table IV - National Parks and Wildlife Sanctuaries of India, 1995

Sl. No.	State/Uts	National Parks		Wildlife Sanctuaries	
		Number	Area (Sq.Km.)	Number	Area (Sq.Km.)
1	2	3	4	5	6
1.	Andhra Pradesh	1	352.62	20	12,084.59
2.	Arunachal Pradesh	2	2,468.23	9	6,777.75
3.	Assam	2	930.00	9	1,381.58
4	Bihar	2	567.32	10	4,624.00
5	Delhi	-	-	1	13.20
6	Goa	1	107.00	4	335.40
7	Gujarat	4	479.67	21	16,744.27

8	Haryana	1	1.43	9	229.18
9	Himachal Pradesh	2	1,295.00	29	4,576.92
10	Jammu & Kashmir	4	3,810.07	16	10,163.67
11	Karnataka	3	2,472.18	20	4,229.213
12	Kerala	3	536.52	12	1,810.36
13	Madhya Pradesh	11	6,143.12	32	10,847.51
14	Maharashtra	5	956.45	24	14,309.51
15	Manipur	2	81.30	1	184.85
16	Meghalya	2	386.70	3	34.207
17	Mizoram	2	250.00	3	720.00
18	Nagaland	1	202.02	3	34.35
19	Orissa	2	1,212.07	17	6,175.49
20	Punjab	Nil	-	6	294.82
21	Rajasthan	4	3,856.53	22	5,694.02
22	Sikkim	1	850.00	4	603.62
23	Tamil Nadu	5	307.86	13	2,527.29
24	Tripura	Nil	-	4	161.01
25	Uttar Pradesh	7	5,409.05	28	8,078.52
26	West Bengal	5	1,692.65	16	1,064.29
27	Andaman & Nicobar Islands	6	315.61	94	437.16
28	Chandigarh	-	-	1	25.42
29	Dadra & Nagar Haveli	-	-	-	-
30	Daman & Diu	-	-	1	2.18
31	Lakshdweep	-	-	-	-
32	Pondicherry	-	-	-	-
	Total	80	34,684.53	441	114,164.50

Source:- State of Forest Report, 1995 by Forest Survey of India

Encroachments on Forest Lands - Reliable data on encroachments on forest lands are not available. Forest Survey of India estimated in 1987 that over 700,000 hectares of forest lands are under encroachments. By now it has increased considerably. Most of the forest area under encroachments is being used for agricultural purpose. At several places it has been observed that some encroachments began as a sort of shifting cultivation and then turn to settlement and permanent cultivation. This act has a very devastating effect on forest which gets fragmented and mutilated. As in the case of shifting cultivation agriculture on eco-fragile forest areas are not sustainable due to faulty agronomic practices. Since they are farming illegally they can not approach government extension services for help. In the meanwhile about 0.2 million hectares of such encroached land have been regularised as per F.C. Act, 1980.

Table V - Extent of Grazing in Inventoried Forest Area of India, 1995

State or District (No. of samples)	Incidence of Grazing (%)			
	High	Medium	Light	Total
Singbhum	19.1	32.4	31.5	83.0
West Champaran (N 96)	4.6	28.5	47.2	80.3
Assam(N2462)	6.7	13.7	29.1	49.5
Cooch Bihar(N 75)	32.2	51.3	-	93.5
There Garhwal	14.6	28.2	28.6	71.4
Koraput (N 1354)	20.0	29.0	34.0	83.0
TATI (U.P.) (N 536)	5.2	15.7	65.8	86.7
South (U.P.) (N 831)	34.7	42.9	16.3	93.9

Puruliya (N 112)	42.9	33.0	17.8	93.7
Kalahandi (N 423)	19.8	30.3	27.9	78.0
Raipur (N 809)	36.0	33.0	18.0	87.0
Shimoga (N 418)	-	-	-	-
Chikmaglur/Hassan (N 357)				
Dadra & Nagar Haveli (N62)	10.0	86.0	4.0	96.0
Manipur (N 1880)	5.0	11.0	30.0	46.0
Tripura	13.5	30.0	37.0	80.5
Lower Subansiri	3.0	17.9	31.9	52.8
Arunachal Pradesh (N 328)				
Upper Subansiri (N 228)	-	2.8	24.0	26.8
Sikkim (N 401)	4.8	20.1	29.6	54.5
Meghalaya (N 1659)	4.1	17.8	42.2	64.1
Mysore (N 338)	17.6	14.2	29.8	61.6
DARJEELING (N 130)	4.6	32.6	42.8	80.0
U.P. Hill Region (N 1235)	13.0	35.4	33.3	81.7
Shimla/Rohru/Chopal (H.P.)	31.6	27.4	25.7	84.7
Chamba, Lahaul Spiti Kinnaur (N 261)	13.9	32.6	42.5	89.0
S. E. Rajasthan (N 2446)	56.5	28.4	11.5	96.4
Shivalik Range Of Haryana, Punjab (N 145)	19.7	35.9	28.2	83.8
Jammu Region (N 428)	17.4	53.2	25.4	96.0
Dhulia (N 356)	24.7	39.1	21.2	85.0
Nasik/Thane, Raigad (N 846)	27.0	35.0	24.0	86.0
Raigarh (M. P.) (N 561)	31.0	32.0	20.0	83.0
Mean	**18.3**	**31.0**	**28.2**	**77.6**

Source: State Forest Report 1995

Table VI - Extent of Fire in Inventoried Forest Area of India, 1991

State or District (No. of Samples)	Incidence of Fire (%)		
	Frequent	Occasional	Total
Singbhum	8.7	53.4	62.1
West Champaran (N 96)	15.1	80.2	95.3
Assam(N2462)	4.3	29.5	33.8
Cooch Bihar (N 75)	15.6	35.8	49.4
There Garhwal	4.8	41.4	46.2
Koraput (N 1354)	8.6	61.0	69.6
Tati (U.P.) (N 536)	40.5	34.1	74.6
South (U.P.) (N 831)	5.2	25.1	30.3
Puruliya (N 112)	15.1	30.4	45.5
Kalahandi (N 423)	30.4	52.0	82.4
Raipur (N 809)	13.0	50.0	82.4
Shimoga (N 418)	7.5	39.2	46.7
Chikmaglur / Hassan (N 357) 11.7	31.3	43.0	
Manipur (N 1880)	4.0	38.0	42.0
Tripura	6.0	83.0	89.0
Lower Subansiri	7.6	43.5	51.1
Arunchal Pradesh (N 328)	-	-	-
Upper Subansiri (N 228)	-	6.8	6.8
Sikkim (N 401)	-	33.2	33.2
Meghalaya (N 1659)	4.1	37.8	41.9
Mysore (N 338)	6.1	51.2	57.3

Darjeeling (N 130)	5.4	25.6	31.0
U.P. Hill Region (N 1235)	2.3/8.5	58.7	69.5
Shimla/Rohru/Chopal (H.P.)	2.5/6.6	51.0	60.1
Chamba, Lahaul Spiti	-	-	-
Kinnaur (N 261)	1.7/6.2	37.0	44.9
S.E. Rajasthan (N 2446)	0.5/06	22.6	23.7
Shivalik Range Of Haryana,	-	-	-
Punjab (N 145)	- /3.5	28.2	31.7
Jammu Region (N 428)	0.5/2.1	33.2	35.8
Dhulia (N 356)	2.3/5.6	49.7	57.6
Nasik/Thane, Raigad (N 846)	4.0	51.0	55.0
Raigarh (M.P.) (N 561)	16.0	61.0	77.0
Mean	8.9	44.2	53.1

Source: State Forest Report 1991

Grazing - Due to very high cattle population (450 million), there is severe shortage of fodder. Cattle are generally allowed to graze openly in forest areas. Even though grazing is prohibited in Protected Areas, 67% of National Parks and 83% of sanctuaries have reported incidence of grazing. Table V gives details of extent of grazing in the forest. Heavy grazing in forest areas damages trees, compacts soil, prevents regeneration and introduces diseases among wild animals. There are two main types of livestock pressures on forest areas. One is pressure of sedentary village livestock and small ruminants and other is pressure from migratory animals grazed by traditional ethnic grazers (Gujjars and Maldharies). Some of them also live in the forest with their livestock continually affecting the vegetation therein. In recent years there has been a reduction in number of nomadic grazers in response to competing demands on land. There has also been a change in the composition of livestock holdings, generally towards more cattle and small ruminants, away from buffalo which require high quality and more assured sources of fodder and water. It is not possible to remove livestock from forests but ways have to be found to decrease pressure on forests, through suitable management methods. High yielding cattle breeds can not be supported by rural poor through stall feeding in most areas without heavy subsidy, hence rotational grazing has to be given more stress in such cases in addition to other means. Further projection indicated at 3.1.7 and Table XV.

Forest Fires - Fires are a major cause of injury to forest areas. It is estimated that most forest suffer burns annually. Most of the fires in forest of India are surface or ground fires. Crown fires seldom occurs and reported from coniferous forests in Himalayas. Sometimes ground fires are also reported from forests at high altitudes. Nearly 98% of fires in the country are caused by people. Forests are set on fire by shifting cultivators by villagers, to induce flush shoots of grass for cattle, to collect NWFPs such as Mahua flowers Salseed, Tendu leaves and honey etc.. These fires often go out of control and cause massive damage to forest resources. Incidence of forest fires in various regions of the country and loss of forest wealth in the country due to forest fires are given in Table VI and VII respectively. Fires are also used in forest management, but uncontrolled fires can cause extensive damage to forest including wildlife in it. It is said “forest fire is a good servant but bad master” for the forest. Recently Government of India has realised the significance of forest fires, and initiated centrally sponsored scheme “Modern Forest Fire Control Methods” to support control and management of fires in forest areas.

Table VII - Annual Estimated Record of Forest Fires in India

Period	Estimated Average Annual		
	No. of fires	Area burnt (thousand ha.)	Approximate Damage value (Mill. Rs.)
1960-61 to 1964-65	6,407	534.0	0.201
1968-69 to 1972-73	3,424	258.9	94.393
1980-81 to 1984-85	3,570	114.5	104.00
1985-86	NR	985.8	21.987
1986-87	NR	975.0	26.973
1987-88	NR	1034.3	67.897

Source: Ministry of Environment and Forest, GOI, New Delhi

Afforestation - National Forest Policy, 1988 has set a goal to bring one-third of the total geographical area of the country under forest/tree cover. Present forest cover of the country, as per State of Forest Report 1995 published by Forest Survey of India is 639,600 sq. km. (19.46%). In order to achieve the goal set by National Forest Policy within 20 years afforestation has to be undertaken at the rate of about 3.0 million hectares annually, presuming there is no deforestation in the intervening period. The current rate of annual afforestation is about 1.0-1.5 million hectares only. Comparative study of successive State of Forest Reports shows that forest cover of the country is declining at the rate of 250 sq. km. per year. Thus in the present scenario does not indicate that it would be possible to achieve National Forest Policy goal within a reasonable time limit.

While on the one hand, Government does not have sufficient resources to take up afforestation at the desired rate, on the other hand private industries are denied access to forest lands to take up captive plantations to meet their raw material requirements. It is a truly paradoxical situation. Moreover it may not be possible to adopt JFM pattern in all those degraded forest lands. Attempts by the Ministry of Environment and Forests to facilitate afforestation on degraded forest lands by private industry have not been favoured yet. Final decision on involvement of private sector in afforestation on forest lands is still to be taken.

2.2 Environmental Initiatives, Protected Areas and Wildlife Resources – Status and Trends

India's immense biological diversity can be attributed to the vast variety in physiography, climatic situations and ecological habitats. It represents two of the major biogeographic realms of the world, which are further divided into 10 distinct biogeographic regions on the basis of distributional patterns of fauna and flora. India is also one of the world's 12 identified mega-biodiversity centres and two of the 18 hot-spots, namely the Eastern Himalayas and the Western ghats. The number of plant species is estimated at more than 45,000, representing nearly 7% of the world's flora. These include over 16,000 flowering plants, of which about 30% are endemic, 64 gymnosperms, 28,43 bryophytes, 1,012 pteridophytes, 1,940 lichens, 12,480 algae and 23,000 fungi. India's faunal diversity represents about 6.4% of the world's fauna, with some 81,000 species. These include 372 mammals, 1,228 birds, 428 reptiles, 204 amphibians, 2,546 fish, 5,000 molluscs and 57,000 insects. India is also considered one of the world's 12 centres of origin of cultivated plants and there are several hundred species of wild crop relatives distributed all over the country.

The ethos of nature conservation is ingrained in India's cultural heritage. Over the centuries, people have had close linkages with nature and some of the earliest recorded conservation measures can be traced to the 3rd century BC, Nature conservation is very much a part of the peoples' culture, religion, ethics and traditions. However, in recent times, the demands of a burgeoning human and livestock population have started to exert tremendous pressures on the natural resources, leading to impairment of nature's renewable capacities in some places. A number of species and their habitats are under threat, due to habitat modification, poaching and illegal trade, and genetic erosion.

India is perhaps one of the few countries whose Constitution enshrines the concept of environmental protection and specifies this as the duty of the state as well as all the citizens. A number of legal and policy initiatives have been taken to protect and conserve forests and wildlife, with its biodiversity in general. These include the Forest Policy of 1884, 1952 and 1988, which may be due for another revision to keep pace with the changing scenario. The Indian Board for Wildlife was formed in 1952 to provide advice in the field of wildlife conservation. The Indian Forest Act of 1927, (now under revision and redrafting), the Wildlife (Protection) Act 1972, the Forest (Conservation) Act, 1980 and the omnibus Environment (Protection) Act of 1986 are important central legislations. The National Conservation Strategy and Policy Statement for Environment and Sustainable development, 1992 outlines policy actions required for the conservation of biological diversity in the country. The National Wildlife Action Plan of 1983 sets out the priorities for conservation of wildlife and wilderness areas. The National Action Plan for Biodiversity Conservation and the National Biodiversity Act are under preparation. All these various major legal and policy instruments guide the development of programmes and projects for conservation of nature and natural resources. The policies and laws under formulation are a further reflection of India's commitment to further strengthen the ongoing efforts.

India's protected areas network, whose foundation was laid towards the end of the last century, today extends over 83 national parks and 447 sanctuaries covering more than 150,000 square kilometres. This represents roughly 4.5% of the country's geographical area and about 19% of its forest area. Yet the coverage is not fully representative of the various biogeographic zones and biomes and efforts are on to declare more protected areas in the regions which are under represented, such as the Indo-Gangetic planes and Western Ghats regions. However, establishment of conventional protected areas such as national parks and sanctuaries in a densely populated country like India is not an easy proposition, especially when resource use restrictions are sought to be enforced over some areas. Therefore, proposals are currently under finalization for amending the wildlife act to provide for the creation of two additional categories of protected areas. The first is a ***Conservation Reserve***, which would be declared in lands owned by the government without imposition of same restrictions on peoples activities, resource use rights, livelihoods as in the case of a national park or sanctuary. The other category would be a ***Community Reserve***, which can be declared in community or private lands when the community or individual volunteers to do so. This will provide legal safeguards to community and private conservation initiatives. Thrust is also being given to integrated conservation and development projects around protected areas through the eco-development programme to mitigate the hardship of people living in and around protected areas, while at the same time enhancing their conservation status. The wildlife act amendment proposals also seek to establish ***Management Advisory Committee*** for each major protected area, with a view to ensure the participation of local communities in

their management. All these measures are expected to strengthen further the protected areas network in the country.

India has also given a lead to the world in participatory approaches to forest management through the Joint Forest Management initiative. The concept continues to evolve and assimilate local variations as it spreads to more states and brings more forest area under its fold. Conservation outside the protected area network, including in wetlands, coral reefs and mangroves is another priority thrust area. The national committee set up for this purpose has identified 21 wetlands, 15 mangroves and 4 coral reef areas for conservation and scientific management. Six internationally significant wetlands have been declared as Ramsar Sites under the Convention for the Protection of Wetlands, especially as Waterfowl Habitat. In addition, five universally outstanding natural sites have been designated as World Heritage Sites under the World Heritage Convention. A number of special *in-situ* field conservation projects have been undertaken for endangered species and their habitats, such as project tiger, project elephant and project rhino and schemes are under formulation to cover lesser known endangered species and ecosystems outside the protected areas network. *Ex-situ* conservation is being promoted through zoological and botanical gardens, and the National Bureaux of plant and animal genetic resources.

While all the above mentioned efforts are on-going, the finalization of the National Action Plan for Biodiversity Conservation will give further impetus and direction to future policies and programmes. Involvement of people, sharing of benefits, capacity building, technology development are some of the major priorities which will receive special attention.

At present there are no uniform criteria for classification of protected areas, with the result that some areas of great biological values are declared as sanctuaries rather than national parks or left out all together, while some parks and sanctuaries includes areas of low biological values. Protected areas may be declared taking a holistic view of the ground situations and other parameters including predator and prey relationship and stability of prey base. Many of the sanctuaries are too small to maintain any viable wild populations, particularly of large mammals. In the current and proposed protected areas sociological sustainability issues are taken into account. Peoples' dependence on forest resources is so large that only a limited set of areas can be closed off on biodiversity grounds.

2.3 Overall wood production and utilization

Wood, formed of lignified, water conducting, strengthening and storage tissues, is a relatively homogeneous product derived from stems, branches and roots of trees. Based on it use, it, can be variously classified as timber, industrial wood (sawnlog, plylog, small timber, pulp wood, poles) and fuelwood. Since bamboo a non-wood, is often used in the same way as wood it is some times included in this category. Commonly bamboo is considered as poor man's timber. Sources of wood production include government forests, private lands, homesteads and farms. Only a small part of wood extracted from forests is recorded and rest collected by people residing in and around forests remain unrecorded. Authentic and reliable information regarding wood production in the country are not available and given data are estimates, which indicate only rough magnitudes. FAO Year Book of Forest Products provides production figures for various categories of wood and details for India are summarized below.

It, is assumed that all what is produced is consumed, as demand is much more than production.

Table VIII - India's Wood Production Trends for the Period l980-l994(Unit - million cu.m.)

Production of	l980	1983	1990	1994
1	2	3	4	5
Roundwood (Total)	212.1	237.7	273.7	294.0
Fuelwood	192.4	215.6	249.3	269.2
Industrial Wood	19.7	22.1	24.4	24.8
Saw/Ply logs	15.2	16.7	18.4	18.4
Pulpwood/Particles	1.2	1.2	1.2	1.2

Source FAO (1996)

Other estimates made by various institutions/agencies/missions indicate an annual removal of fuelwood alone to be more than 300 million tonnes (over 400 million cu.m.). Against this production level, the Annual Allowable Cut from Government Forests is only 66.7 million cu.m. (54.7 million cu.m. of fuelwood and 12 million cu.m. of industrial wood). It is estimated that a sustainable cut of about 60 million cu.m. (43 to 45 million cu.m. of fuel wood and l4.15 million cu.m. industrial wood) is available outside government forests. Thus the total sustainable availability is only about 127 million cu.m.. The rest of the production (about 143 million cu.m.) could have resulted from over exploitation of government and private forest resources. The bulk of the wood consumed in India, about 80 to 90%, is for burning without any value additional benefits. The estimates of fuelwood consumption in l991 ranged between 250 to 350 million cu.m. for 1994 and range is 270 to 380 million cu.m.. Fuelwood is estimated to meet some 40% of the total energy needs of the country. About 65 to 75% of the fuel wood consumption is by households and rest by commercial and industrial units 70 to 80% of rural households and about 50% of urban households use fuelwood for cooking.

According to Forest Survey of India demand for timber (including industrial raw material, poles and posts for rural constructions and wood for making agricultural implements) was about 27 million cu.m. in l987. A recent estimate gives the demand to be 53.67 million cu.m..

Table VIV - Estimated demand for Wood other than Fuelwood (unit million cu.m.)

Type of wood	1987	l994
1	2	3
Sawnwood	15.63	25.72
Panel Products	2.38	3.74
Pulp and Paper	6.57	11.88
Roundwood	3.00	12.33
Total:	27.58	53.67

From the foregoing we get the demand and supply factors shown below. A very small part of the roundwood demand is being met (1.3 million cu.m. in 1990, 0.29 million cu.m. in 1994) by imports

	(million cu.m.)
-Estimated Demand for wood (1994)	324 to 434
-Estimated production of wood (1994)	294

-Annual Allowable Cut from Govt forest	67
-Total sustainable cut from all sources (public and private)	127
-Range of overcut/gap	l97 to 307

Demand, by definition, means the desire for a particular good or service by the means to purchase it. Demand for forest products at the national level is influenced by several factors such as: population, disposable income, literacy rate, price of the product, price of substitute and complementary goods and credit terms. Elasticity of demand for a product is based on income and price changes and depends on nature and characteristics of the product. Availability of supply influences demand e.g. increased supply reduces prices and in turn pushes demand. The derived demand on the forests for raw material is based on a recovery factor which is influenced by technology and efficiency of management. Similarly demand of fuelwood is influenced by conservation measures and efficiency of use.

National Commission of Agriculture (NCA) in its report, 1976 has given projections of raw material requirements in the year 1988 and 2000 AD, under assumptions of high and low income growth scenarios.

Table IX - Wood Requirement, Projects of NCA, 1976

Material (in millions)	1985		2000	
	Low income assumption	High income assumption	Low income assumption	High income assumption
(1)	(2)	(3)	(4)	(5)
WOOD				
-Saw logs and veneer logs(cu.m.)	17.20	20.10	25.80	33.50
-Pulp wood (vcu.m.)	4.70	6.10	9.60	17.70
-Other Roundwood(cu.m.)	8.10	9.10	11.60	13.30
-Total industrial	30.00	35.30	47.00	64.50
Roundwood (CU. m)				
BAMBOO				
for pulping (air dry t)	23.30	3.10	1.90	3.50
Other uses (air dry t)	2.10	2.10	3.50	3.50
FUELWOOD(cu.m.)	202.00	202.00	225.00	225.00

India's estimated production for 1985 reported in FAO's Year Book of Forest Products is partially comparable to the NCA projection based on low level assumption.

Table X - India's wood Production, 1985

Product	Quantity (million cu.m.)
1	2
-Saw logs and veneer logs	18. 30
-Pulpwood	1.20*
-Other roundwood	4.40
-Total industrial roundwood	23.90
-Fuelwood	225.10

Source FAO Note:
* Bamboo used for pulping has not been reported.

Consumption requirement estimates of wood products and related raw materials with different assumptions and horizons made by different agencies present a considerable range of values.

Three different estimates by various studies under NFAP have projected fuelwood demand for the year 2001 as 187.2, 355.57 and 383.58 million tonnes. A recent, study by paper industry has made paper projections for the year 2010 AD. It has projected fibre resource consumption for the paper industry for the year 9010 AD as 9.93 million tonnes (consisting of 2.18 million tonnes of wood pulp, 3.07 million tonnes of non-wood pulp and 4.07 million tonnes of recycled fibres).

Estimated Future Timber demand: A study under NFAP gives following demand projections for timber in India.

Table XI - Future Timber Demand (million cu.m.)

Industry	Year		
	1994	2000	20l5
1	2	3	4
-Sawnwood	25.72	2ó.73	54.97
-Paper & Pulp	11.88	14.84	41.09
-Panel Products	3.74	6.00	25.55
-Roundwood	12.33	11.88	20.55
Total:	**56.67**	**59.46**	**136.98**

This may be compared with figures for projected consumption for India in the FAO Provisional Outlook for Forest Products Consumption, Production and Trade to 2010, published in 1997. While the study has estimated total industrial wood demand projection for the year 2000, itself as 59.46 million cu.m. corresponding projections by FAO for the year 2010 range between 31.43 to 35.96 million cu.m..

Table XII - Projected wood and wood products CONSUMPTION in India (Million c.um./million tonnes)

Products	1994	2000	2010
1	2	3	4
-Roundwood (total)	281.551	302.785	337.012
-Fuelwood/Charcoal	256.485	275.951	307.762
-Ind. roundwood	25.066	26.834	29.251
-Other ind. roundwood	5.234	5.833	6.712
-Sawnwood & sleepers	17.458	17.517	17.612
Wood based panels	0.410	0.554	0.778
-Total fibre furnish	2.911	3.868	6.070
-Recovered paper	0.753	1.117	2.005
-Other fibres	1.096	1.398	2.154
-Wood pulp	1.062	1.353	1.911
-Paper & Paper board	2.865	3.837	5.862

Source: FAO 1997 .

Supply can be defined as the quantity of a good or service available for sale at a specified price. While physical supply is a function of, among other things, land availability, land productivity, level of technology and intensity of inputs. Economic supply is influenced by the price in comparison to the cost of production. Economic supply is also influenced by the price of alternative products produced on the same land. Demand for a product can also influence its supply by increasing prices. Other factors influencing supply include: government policies regarding forest land use, deforestation control, withdrawals of forest land, sustainability criteria, size of existing inventories, yields and rotations, efficiency in the forestry sector in comparison to other land using sectors, efficiency of forest, harvesting, extent of forestry in non-forest lands i.e. agroforestry, farm forestry, estate crops (e.g. rubber, coffee, coconut use of secondary species and small dimension materials, nature and intensity of people's participation, area under industrial plantations, addressing of issues such as land tenure for tribal people and tariffs on imports and exports. Each of these will have significant influence on alternative scenarios.

Currently, supply of goods from natural forests has drastically reduced. There has been a major shift, from high quality timber from natural forests to timber growth in plantations, uncertainty of quality and yield of Plantation products, uncertainty about the future protection against legal and illegal forest land withdrawals. India's future supply scenario of goods will to a great degree depend on the extent and quality of manmade forests, supplemented by non-damaging uses of natural forests for goods (particularly NWFPs) and services, NWFPs will play a major role in generating income from forestry sector in future. Regarding wood supply, the projected production in the FAO Provisional Outlook for Forest Products Consumption, Production and Trade to 2010, published in 1997 indicates that the projected demands can be met.

Table XIII - Projected Wood and Wood Products PRODUCTION in India (million cu.m./million tonnes)

Products	1994	2000	2010
1	2	3	4
-Roundwood (total)	281.307	302.696	337.069
-Fuelwood/Charcoal	256.515	275.994	307.837
-Ind. roundwood	24.792	26.702	29.232
-Other ind. roundwood	5.234	5.833	6.712
-Sawnwood & sleepers	17.460	17.511	17.586
-Wood based panels	0.442	0.570	0.784
-Total fibre furnish	2.519	3.722	6.006
-Recovered paper	0.531	1.061	1.974
-Other fibres	1.096	1.398	2.153
-Wood pulp	0.892	1.263	l.879
-Paper & Paper board	2.626	3.62l	5.734

Source: FAO l997

Demand and Supply Balance - Exports and imports influence and are influenced by, the supply and demand situation. Simply put a gap in supply can be met. by imports and a surplus in supply can be exported FAO's Provisional Outlook for Forest Products indicate that in a low growth scenario, product supply will have to be augmented by a comparatively higher level of imports, leading to drain on foreign exchange reserve, whereas trade balance situation becomes considerably better in the high growth scenario.

Table XIV - Projected Wood and Wood Products IMPORT, India (million cu.m./million tonnes)

Products	1994	2000	2010
1	2	3	4
-Roundwood (total)	0.285	0.152	0.053
-Fuelwood/charcoal	-	-	-
-Ind. roundwood	0.285	0.152	0.053
-Other ind. Roundwood	-	-	-
-Sawnwood & sleepers	0.006	0.011	0.028
-Wood based panels	0.011	0.007	0.003
-Total fibre furnish	0.393	0.147	0.064
-Recovered paper	0.222	0.056	0.031
-Other fibres	0.001	0.00l	0.001
Wood Pulp	0.170	0.090	0.032
-Paper & Paper board	0.258	0.237	0.154

Source: FAO 1997:

Table XV - Projected Wood and Wood Products EXPORT, India (million cu.m./million tonnes)

Products	1994	2000	2010
1	2	3	4
-Roundwood (total)	0.04l	0.063	0.110
-Fuelwood/charcoal	0.030	0.044	0.076
-Ind. roundwood	0.011	0.020	0.034
-Other ind. roundwood	-	-	-
-Sawnwood & sleepers	000.83	0.004	0.002
-Wood based panels	0.043	0.623	0.008
-Total fibre furnish	-	-	-
-Recovered paper	-	-	-
-Other fibres	0.00l	0.001	0.001
—Wood pulp	—	_	_
-Paper & Paper board	0.019	0.021	0.026

Source: FAO l997

2.3.1 Wood Based Industries (Including Pulp and Paper) - Status, Trends, Transitions

The primary and integrated wood processing industries produce a large number of products including sawnwood, veneer, plywood, other panel products, wood pulp/paper, parquets, shingles, toys, bobbins, sports goods, boats, carts, musical instruments and pencils. There are few large and many medium & small scale forest based industries in India. Most of the industries are in private sector. Actual number of units involved in wood processing are quite large. Table XVI given below provides details of medium and large scale wood based industries. It is estimated that currently India's wood based industries consume between 24 to 30 million cu.m. of raw materials.

Table XVI - Medium and large Scale Forest Based Industries.

Industry	No. of units
Sawmills	23,000 (including small units)
Pulp and paper	
a)Paper Mills	21
b)Newsprint	4
c)Rayon grade pulp	5
d)Paper grade pulp	1
e)Paper board	305
Veneer and plywood	
a)Plywood	61
b)Veneer	14
c)Smaller units	341
Block boards and flushdoors	98
Particle Board	11
Fibre Boards and Medium Density Fibre Board	5
Safety matches	5

More than 90% of India's wood based products are presently manufactured in private sector. The production trend in major wood based industries does not show any conspicuous increase because of raw material limitations though demand is always in the rise.

Table XVII - Output of Major Wood based Processing Industries

Products	1980	1993	1990	1994
1	2	3	4	5
Sawnwood/sleepers (million cu.m.)	10.98	14.49	17.46	17.46
Wood based panels (million cu.m.)	0.25	0.384	0.442	0.442
Plywood (million cu.m.)	-	0.300	0.360	0.360
Particle board (million cu.m.)	-	0.032	0.032	0.032
Fibre board (million cum)	-	0.50	0.046	0.046
Wood Pulp (million tonnes)	0.34	0.768	0.989	1.147
Paper and paper board (million tonnes)	0.96	1.481	2.185	2.626

Source FAO 1996

Sawnwood - Of the total number of saw mills. almost 90%, are small and have a capacity of 3,000 cu.m. per year. Annual production capacity is shown as 27.12 million cu.m. and actual production is 64% of the installed capacity. Conversion efficiency is low and conversion losses are quite considerable. Main uses of sawnwood produced are: Construction (28%), box wood (18%), joinery (27%), furniture (11%), sleepers (8%) and others 8%. According to a forest conservation principle use of wooden sleepers in the railways has been reduced drastically. Seasoning and preservative treatment of sawnwood is not common. Air seasoning of sawnwood is carried out by some 470 mills and only 7% of the total sawnwood is kiln seasoned. Pressure impregnation facility is available only in 118 units. Even though the service life of sawnwood can be enhanced by 3 to 5 times, only 0.4% of the sawnwood is treated with wood preservatives.

Paper has a great impact essentially on our daily lives and "as well as on the society so much so that we take it for granted. While paper is core requirement of society, the forests are the lungs of society. Paper is a Primary medium of communication. It is an essential vehicle for literacy and progress. About 1.2% of world paper production is consumed by a populous country like India. The relevance of paper assumes greater significance with the efforts and emphasis of Govt. on education and literacy drive. Paper industry is one of oldest in India and highly capital intensive industry. Paper industry utilizes a renewable raw materials unlike other industries like mining and oil. Paper industry generates 2% of world trade and the demand of paper is ever rising. Indian paper industries are small in international standards. (India produces pulp (including rayon grade pulp) and different grades of paper such as newsprint, writing and printing paper, carton boards, kraft liner, fluting medium and speciality paper. Indian Paper industry consists of 380 mills with capacities ranging from 1,000 tonnes/year to 10,000 tonnes/year. Production capacity of paper and paper board is 1.9 million tonnes. Actual current production is about 2.6 million tonnes). The average size of a paper mill in India is 10,400 TPA as against 85,000 TPA in Asia-Pacific and 300,000 TPA in Europe/America. The per capita consumption of paper in the country is about 4 Kg, being the least in Asia Pacific region (Japan 239 Kg., China 22 Kg.) while world average is 45.6 Kg. The following tabulated data give an insight in to paper industry situation in the country.

Table XVIII - Installed capacity and production of Paper in India based on raw materials types. (In million tonnes)

Type	No. of Mills	Installed capacity	Percentage capacity	Production	Percentage Production
(1)	(2)	(3)	(4)	(5)	(6)
Forest based	28	1.449	37	0.95	38
Agro based	111	1.240	31	0.91	36
Others (Wastepaper)	24l	1.265	32	0.65	26
Total:	380	3.954	100	2.51	100

Source: Development council for Pulp, Paper and Allied Industries.

According to one estimate the bigger mills use forest raw materials (wood and bamboo), small ones use agricultural residues, waste paper and rags. The current mix of raw material in the industry is: bamboo and hardwood (53%), bagasse and straw (23%) waste pear (15%) market pulp and others (9%). However, there is potential for using non-wood cellulosic raw material.

Despite an increasing demand of paper, the industry is plagued by raw material shortage. Growth of paper industry can be achieved through economies of scale, improved technology, value added products and integration with captive plantations. There has been continuous debate on the issue without a concrete decision. It is one of the ways to reverse the process of the degradation and regreen degraded forest land thus utilizing scares resources to best use of its productivity. A collective decision with strong will power at the highest level can increase the productivity of the degraded forest areas will improved modern technology. This strategic effort of the Government, People and Industry joining hands together can be a workable and apparent solution for the funds starved forestry sector. Certainly this is one of the strong areas of partnership and cooperation between Government and Private Sector from which benefit will flow to the people in general as well as to the other partners.

Table XIX - Demand Projection paper, paper board and newsprint

Periods	Total demand as per nev. council for pulp paper & Allied Industries	Total Demand as per Expert Group constituted by the Industry
1	2	3
1994-95	3.161	3.278
2000-01	4.112	4.950
2005-06	5.045	6.700
2010-11	6.297	8.550

Table XX - Paper Production from Indigenous Raw Materials

Year	Forest based		Paper production			Total possible production of paper
	Raw mat.	Paper prod.	Bagasse	Straw	Waste paper	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1994-95	3.146	1.210	0.560	0.250	0.388	2.408
2000-01	3.210	1.235	1.090	0.250	0.683	3.258
2005-06	3.2l0	1.235	1.636	0.250	1.040	4.161
2010-11	3.210	1.235	1.963	0.250	1.462	4.910

*Source- Expert Group Constituted by the Industry.

India is a fibre deficient country and therefore, dependence on all kinds of raw materials such as agro-based residue and waste paper. There will also be deficit in spite of all the above efforts which can be overcome by creation of man made forest and captive pulp wood plantation. To avoid large scale import of pulp and save valuable foreign exchange. Plantation/afforestation is an acceptable way to grow trees for several purposes including supply of raw materials for forest based industries. Plantations need not be a monoculture operation and it can be raised with different compatible species as found in the nature in that particular agro climatic and physiographic zone. Plantation can be designed and managed in environmentally and social acceptable manner.

Table XXI - Demand and supply of paper based on domestic Raw materials

Year	Demand as per Table 3/Col-3	Possible Production as per Table 4/Col. 7	Shortfall
1	2	3	4
1994-95	3.278	2.408	0.870
2000-01	4.950	3.258	1.692
2005-06	6.700	4.161	2,539
2010-11	8.550	4.910	3.640

Table XXII - Demand and Supply of fuelwood and industrial timber (As Per 1995 figure)

	Demand	Supply	Shortfal l	Projected demand	
				2000	2010
l	2	3	4	5	6
-Fuel wood	235	40	195	287	345

-Industrial timber (Industrial Roundwood, sawn timber, paper & paper board woodbased panel)	27	12	15	55	77

Source: Centre for Science and Environment, New Delhi -July 1995 and FAO estimate.

Wood based panel covers a number of Products resulting from primary processing of wood such as plywood (including veneer), blockboard, particle board, medium density fibre (MDF) board, wet process hard board, veneered oriented strandboard, wood-wool cement, board and fibre cement panels. Globally the range of wood based panel products, both structural and non-structural has grown dramatically during the last 20 years. But no such development has taken place in India. India essentially produces 3 types of products: plywood including blockboards and flush doors, fibreboard and particle boards. Primarily due to difficulty in obtaining raw material, capacity utilization has been low; 50% for plywood, 41% for decorative veneers, 41.5% for particle board and 60% for fibreboard. Already the veneer industry is accepting smaller girth peeler logs, but this has not improved capacity utilization. There are 61 units of Medium and large Scale Sector Plywood Industry, 11 units of Particle Board Industry, 3 units of Hard Board Industry and 11 units of Medium Density Fibre hoard Industry. The requirement of timber to run all the mills at its installed capacity is 2.4 million Cu.m. At l995 actual production level the total. requirement was l.8 million cu.m. of timber. The estimated requirements of timber for these industries in 2000 AD and 20l0 AD are 5 million cu.m. and 10 million cu.m. respectively.

India's industrial policy has long been geared towards protecting domestic industries and forest industries are no exception. Raw materials for larger industries are supplied from government forests under long term contracts at prices much below market values. Government also protected domestic industries by putting tariff and non-tariff barriers. National Forest Policy, 1988 recommends that supply of raw materials to forest based industries should cease, however past commitments are still being honoured. Industrial sector was liberalised in India in 1991-92, but forest sector is still highly regulated. New regulations support small scale industries and industries which move away from woody raw material. In order to bridge shortages in raw material requirements, import of forest raw material has been liberalised. Export of timber and other non-processed forest products has been banned.

While in the past government policies have stimulated growth of forest based industries, supply of raw materials to industry, at below market prices, has resulted in transfer of resources from government to private industries. It has also encouraged waste and forest degradation. Low raw material prices have also not encouraged private producers to plant for industrial uses. The pressure to meet raw material needs to industry has often led to replacement of natural forests by monoculture plantations, thus alienating local communities depending upon multiple products generated by mixed forests.

National Forest Policy, 1988 recommends forest based industries should meet their raw material requirements by entering into direct agreements with farmers. This has put enormous pressure on a yet partly developed farm forestry sector. Farmers could supply a large part of short rotation pulp, small timber and peeler logs for core veneer, if remunerative prices are offered. They are unlikely to produce substantial amounts of longer rotation products for sawn timber and face veneer. The effect of industrial and trade liberalisation has led to sharp increase in import of forest raw material. Import of logs increased from Rs 980 million in 1986-87 to Rs 4,220 million in 1991 and to Rs 5,872 million in 1992.

Paper industry can be considered as relatively competitive as compared to other forest based industries. There are inefficiencies in both private as well as public sectors due to industries being small, highly protected and operating with obsolete equipment and old technologies.

Farm forestry is playing an important role in bridging demand supply gap in forest products. It is estimated that approximately 40% forest products are being supplied from outside forest areas. Though Farm forestry in India is still developing, a number of factors are hampering its growth. Some of these are given below.

(a) Supply of subsidised seedlings results in planting of inferior planting stock by farmers and thus low returns to them. It is discouraging growth of private nurseries which could supply good planting material at reasonable and realistic prices. Free or subsidised seedlings encourage wastage and planting of too many trees per hectares.
(b) In most of the states farmers have to go through a long and cumbersome process to obtain permission for felling and transportation of trees. In many states rules and regulations have been relaxed to encourage private tree planting.
(c) Unlike agriculture marketing system in respect of forest products is still very weak and needs to be strengthened.

Government regulates trade for many of the more important NWFPs to protect interests of tribals and rural poor living in and around forest areas and also to generate revenue for state treasury. Commercial NWFPs are collected by local people and are sold to local traders, government agents, tribal cooperatives depending on the product and the state. The various cooperatives established in tribal areas have not developed strong leadership and have often been hampered by administrative and financial constraints. Local population would benefit by taking on larger share of low level processing of NWFPs. A study of NWFP enterprises that employ large numbers of women show that they are being increasingly marginalized and men are capturing higher wage opportunities in collection, processing and marketing of NWFPs.

2.3.2. Wood Energy/Fuelwood Status, Trends and Transitions

Firewood, agricultural wastes and animal dung constitute the major biomass energy sources in India, accounting for approximately 75% of the energy consumed by households in 1978-79. A major portion of this, about 85%, was consumed in villages. On an average between 90-95% of energy consumed in rural areas is constituted of biomass based fuels. On a coal equivalent basis, firewood and charcoal together represented 62% of the non-commercial energy consumption in 1978-79. At a national aggregate level, firewood and charcoal alone accounted for 46% of the total energy consumed in India (NCAER 1985). Woodfuel is consumed in several forms - logs, billets, twigs, wood shavings, sawdust etc.. Forest areas are estimated to contribute as much as 46% of the total firewood. Much of the firewood, removed from forests, however, is unrecorded. The dependence of people on forests for firewood is not uniform and varies considerably from one state to another. There are large variations not only among states but also within the states from one locality to another. The distribution and location of forests influence considerably, the pattern of firewood use in different parts of the country. A revealing fact that has emerged in the past few decades of study of energy demand supply scenario, is that despite a major investment in the commercial energy sector which was thought to shift fuel dependence from non-commercial sources, has failed to meet the desired

effect. Even today, annual demand for Firewood is estimated to be 201 million tonnes (FSI 1996). Another surprising revelation is that though bulk of consumption of biofuels in the country is within villages, they still meet around 43% of energy requirements of urban households. Continued use of firewood for a variety of purposes other than household demands also needs to be looked into. Small restaurants, industries like bricks and tile manufacturing units, sugar, tea and handicrafts and religious rituals are some of the major consumers in the urban centres. The ever growing scarcities of firewood coupled with continuous price hike have created a special class of professionals handling the tasks of collection, transportation and marketing of firewood from forest and non forest areas, adding further to resource degradation problem.

A study on demand and supply of firewood in the country, done by Forest Survey of India in 1996 shows following important features:

- Demand for Firewood has increased over past few decades due to two factors. The first is rise in population, which has been increasing at the rate of 2.1% annually. The second is the trend in rising consumption of firewood which rose by 7% (from 54.57% in 1978-79 to 61.6% in 1992-93) in 14 years, an increase of 0.5% every year in the firewood demand due to lesser availability or alternate use of animal dung and agricultural residues.
- In the year 1996, the annual household consumption of firewood in the rural areas of forested districts in the country is around 78 million tonnes for a population of 184 million.
- In the year 1996, 74 million tonnes of firewood is consumed in non-forest rural areas by the rural population of 513 million.
- It is found that around 10 million tonnes of firewood is required in 1996 for urban household sector of the country.
- Approximately 51% of the firewood comes from forest areas and balance 49% from outside forest areas.
- In the year 1996, demands for firewood by small hotels/restaurants, cottage industries and religious rituals including cremation were 10, 25 and 4 million tonnes respectively.
- Average annual per capita consumption of firewood varies from 25 kg in urban areas of Punjab to 1299 kg in forest rich areas of Nagaland.
- Total annual demand for household sector (both rural and urban) is expected to increase to 180 and 199 million tonnes by the year 2001 and 2006 AD.

According to this study, as against total annual demand of firewood of 201 million tonnes in 1996, the sustainable productive capacity of India's forests is only 17 million tonnes.

Potential Firewood Production - The production of wood from under man-made plantations under rainfed conditions in India varies from 3 to 10 tonnes per hectares per year. It is low in arid areas and high in wet areas. Transportation of firewood over long distances is not economical due to its high bulk and low value nature. Firewood should, therefore, be produced nearer to the consumption centres. With an average production of 4 tonnes/hectare/year the total land area needed to produce 200 million tonnes of firewood is about 50 million hectares. Culturable wastelands cover 17.1 million hectares while fallow land is spread over 9.6 million hectares. Thus about 26.7 million hectares of degraded land is available within the cultivated lands. This land will be available in scattered patches. If firewood farming is developed as a business, it is quite possible to grow firewood over these areas. Presently these lands are used as grazing lands. Growing firewood will be ecologically

and socially a better use of this land. The land ceiling laws will also need to be amended to exempt their application in tree farming areas to encourage all interested in the job of tree farming and raising plantations.

2.4 Non-Wood Forest Products, Status and Trends

India is a veritable store house of Non-Wood Forest Products (NWFPs). About 16,000 recorded plant species are found in India; about 3,000 plant species yield one or the other NWFPs [(which are also called Non-Timber Forest Products (NTFP) or Minor Forest Products (MFP)]. NWFPs include a vast wealth of available from the broad spectrum of biomass obtained from the leaves, flowers, fruits, seeds, stems, roots and barks providing for most of the human needs of food, shelter clothing and a wide range of other items for local use and income generation. NWFP in India can be broadly classified into following categories.

1. Edible plants and plant parts
2. Fatty oils (edible and non-edible)
3. Exudate Gums, Resins, Gum-resins, Oleo-resins, Gum-oleo-resins and Seed gums
    a) Essential oils
    b) for pharmaceutical operations
    c) for perfumery
    d) for industrial uses
4. Medicinal plants, spices and insecticides
5. Tans and Dyes (including Katha and Cutch)
6. Fibres and Flosses (including grasses not yielding essential oils)
7. Bamboos and Canes
8. Miscellaneous NWFPs
    a) of plant origin: Fodder, Platter, Bidi wrapper leaves, Soapnuts, Beads for necklaces etc..
    b) of animal origin: Ambrette, Honey, Wax, Silks, Lac and Shellac, Ivory, Kasturi, Horns, Hides and skins etc..
    c) of mineral origin: Stones, Mica, Graphites and other minor minerals etc..

NWFPs are people's products and their use form an integral component of not only of local economies and culture from time immemorial but also find their way in trade. NWFPs are significant source of subsistence products, employment and household incomes in areas near forests. NWFP production and use is high in a number of states: Andhra Pradesh, Madhya Pradesh, Maharashtra, Orissa, West Bengal, and seven North Eastern states. Annual employment is estimated at over 2 million person years. Customarily, majority of workers in NWFP related economy are women.

In fact NWFPs have been a great source of sustenance to the people living in and around forests during pinch season and helps them to tide over the crisis of survival. Tribal populations depend heavily on NWFPs for income and subsistence. Since tribals have been already shifted towards more and more marginal areas, where agriculture yields are lower and more uncertain, consequently, reliance on NWFPs are large. Fortunately, the availability of edible NWFPs is highest during lean summer period. In four states rich in NWFPs income from sale of these items account for 5 to 55% of the seller's total income. About 30% of the

diet of Maharashtra based tribal groups living near forests is derived from forest products such as leaves, vegetables, tubers, flowers, fruits, nuts, bamboo shoots, small animals and honey. West Bengal tribal groups rehabilitated in forest areas of South Bengal collect 27 commercial products, 39 plant food products and 47 medicines for human or animal use.

NWFPs also help in maintenance of biodiversity and conservation of the eco-systems if the natural resources are sustainably harvested without damage to growing stock. NWFPs have been utilised for local use and trade without any coordinated account. Therefore accurate data is not available for most NWFPs except for products, the trade of which has been organised or nationalised. Annual production figures for some commercially important production NWFPs are given in Table XXIII.

Revenues earned by forest departments from NWFP has been rising steadily, with more use of hitherto unknown plant species for human good. The recorded revenue during 1958-59 which was only Rs 100 million for entire country which increased to about Rs 20,000 million in early 1990s. NWFP have been estimated to account for nearly 40% of state forest revenues.

Export trade statistics also increase in foreign exchange earnings through export of NWFPs. Trends of NWFP export from India are given in Table XXIV. NWFP form about 70% of the share of total value obtained from export of Forest Products.

Table XXIII - Annual Production of NWFPs estimated during 1992-93

Name of the Products		Annual production (in tonnes)
Wild edible products		101,200
Myrobalans		132,250
Sal seeds		7,097,000
Sal oil		23,000
Mahua seeds		697,600
Mahua oil		28,750
Neem seed		115,000
Other seeds		57,500
Essential Oil	i. Palmarosa oil	16,000
	ii. Eucalyptus oil	150
	iii. Sandal wood oil	160
	iv. Lemon grass oil	950
	v. Others	300
	Total essential oils	3,160
Gum Karaya		15,000
Ghatti and other gums		3,500
Resin from pines		45,000
Rosin		24,000
Turpentine (litres)		600,000
Katha		5,750
Total Tans and Dyes including cutch		222,900
Bamboos and Canes		4,716,600
Fibres and Flosses		15,000
Grasses other than oil producing		80,000
Bidi leaves/Tendu leaves		360,000
Lac		30,000

Source: NTFP study under NFAP

Although NWFPs are an integral part of lives of the people and provide for diverse needs of local people including tribals. They are also a major source of revenue for forest departments and also contribute towards foreign trade. NWFP development has not been receiving adequate attention of planners and decision makers. If current degradation of majority of NWFPs is to be avoided and true potential of NWFPs is to be realised, lot of stress has to be given to replenishment of their stock, scientific and sustainable harvesting of NWFPs, development of marketing, gradation, value addition and standardisation of forest products. In the years to come some of the hitherto unknown MFP/NTFP/NWFP will be getting into the limelight because of their importance in trade and medicine.

Table XXIV - Trend of NTFP Exports from India through decades (In crores Rs.)

Sl. No.	Division of NTFPs	1960-61	1970-71	1980-81	1990-91
1.	Crude veg materials including gums and resins, lac and Shellac	15.97	34.01	1.16	37.58
2.	Live trees and other plant roots, flower, Ede veg, Nuts	N.A	N.A	N.A	702.91
3.	Fruit, Vegetables, Nuts, Tubers	26.0	65.0	19.71	29.71
4	Rubber fabricated materials	0.34	8.86	25.77	248.56
5	Oil seeds, Nuts, Kernels	5.13	5.96	60.49	282.82
5a	Vegetable oils	8.51	7.03	14.70	-
5b	Oil & Fats processed, wax of animal & veg. Orgin.	1.25	0.62	4.37	87.63
6	Medicinal & Pharma products	0.99	8.46	67.42	767.59
7	Spices	16.63	38.80	111.36	NA
8	Essential oils, perfumes	4.14	3.81	7.25	280.36
9	Dyeing & Tanning Exts.	0.14	0.35	0.75	423.84
10	Veg plaiting materials	-	-	-	33.78
11	Veg fibres (incl. Jute etc.)	1.55	4.28	5.33	205.42
12	Basket-ware, wicker work	-	-	-	0.13
13	Fuel wood charcoal	NA	NA	0.66	25.67
14.	Coal, Coke, Briquettes	3.34	4.01	NA	NA
15	Cork manufacture	NA	NA	0.24	0.29
16	Pulp & Waste paper	NA	1.01	0.39	NA
17	Silk	0.39	0.60	0.21	NA
18	Hides, Skins & Fur skins	10.02	3.97	0.69	811.86
	Grand Total	94.55	186.77	320.50	4,198.11
	NTFPs contribution to total exports from India (%)	15%	12.3%	4.79	13%

Source: NTFP study under NFAP

2.5 Services of Forests: Status and Trends

In India forests form an integral part of the people. Forests provide a number of services to the people at large. Some of the important services rendered by forests are education, recreation, research and other social, religious and spiritual needs. Forests play an important role in ecotourism, particularly in protected areas, for both local as well as foreign tourists. From the days of yore forests are a part of the ethos and folklore of Indian people.

Since ages forests in India are considered ideal location for spiritual pursuits. In the past sages and wise people used to go to forests for penance and to seek spiritual development. Peaceful and natural surroundings in forests were considered ideal for these noble activities. Even now religious people seek refuge in hills and forests for spiritual bliss and enlightenment. Many communities protect and maintain patches of natural forests as sacred roves. These sacred groves revered by people and are usually considered as home of

religious deities. Sacred groves are used by entire community for religious celebrations on special occasions. Although with the development and fast pace of life such beliefs are gradually diminishing but in hills and remote areas these groves are still sacred and shall continue to be so for considerable time in future. In some parts of NE States these are very sacrosanct and have been kept untouched and inviolate.

In big cities and metros urban and recreation forestry is increasingly becoming more popular with passage of time. Roadside and avenue plantations are being taken up in big and small cities, which not only help in absorbing pollutants emitted by vehicles but also keep drivers and pedestrians happy and cheerful. With appropriate choice of shady and flowering trees avenue plantations contribute towards beautification of urban centres. Establishment of mixed forests near urban centres are also very popular. These forests are used by individuals and families for picnics, outings for recreation during weekends and holidays, where people can refresh themselves and escape tensions of urban life. Recently the concepts of "Smriti Vans/Vatikas" or "Memorial Forests" is also becoming popular. Individuals or families plant seedlings, on memorable occasions by paying a nominal fee. These seedlings/trees are maintained by forest departments or local bodies like Municipality, Pancahayat and a plaque indicating the names and occasion is fixed on or near these trees. Individuals/families visit "Smriti Vans" and "their trees" periodically. In order to create awareness and to attract attention of people towards importance of forests and trees. "Van Mahotsava" (Forest Festival) is celebrated during 1st week of July every year since 1952. During the Van Mahotsava various tree plantings and publicity campaigns are organised by various government and non-government agencies. Planting of trees are being undertaken on many states ceremonies and other occasions. It is important to protect the plants after ceremonial planting to serve the real purpose.

Indian forests offer excellent opportunity for eco-tourism. As forests in India have wide diversity and are habitats for wide array of diverse flora and fauna. Besides wildlife tourism Indian forests may also provide immense scope for nature and adventure tourism. Development of eco-tourism also offers opportunities for development of local economy and developing stakes of local people in preservation of natural resources. However since National Forest Policy has very strong conservation bias, foresters in India are adopting very cautious approach towards development of eco-tourism. Conservation of nature and natural habitats are given over riding preference over development of tourism. Many of the national parks and sanctuaries are already on international tourist maps. Prominent among these are Gir and Flamingo city in Gujarat; Kaziranga in Assam; Valley of Flowers and Corbett National Park in Uttar Pradesh; Kanha National Park in Madhya Pradesh; Keola Deo and Ranthambhore National Parks in Rajasthan; Dachigram National Park in Jammu and Kashmir; Sunderban Tiger Reserve in West Bengal etc. Many more national parks such as Dudhwa in UP; Simlipal, Bhitarkanika and Chilka lake in Orissa; Mudumalai in Tamilnadu; Wyanad in Kerala; Bandipur in Karnataka and Marine National Parks in Gulf of Cambay and Andaman and Nicobar Islands have considerable potential for promoting eco-tourism. Himalayas and Western Ghats offer excellent opportunities for development of adventure tourism. Recently Government of India has developed draft policy for promotion of wildlife tourism.

Indian forests, due to their wide variety and rich biodiversity, offer considerable scope for research. Forestry research has been given high priority in National Forest Policy, 1988. India has a long tradition of forestry research. Forest Research Institute (FRI) was established at Dehradun in 1906. Forestry research in India received a boost in 1986 when FRI was

upgraded as Indian Council of Forestry Research and Education (ICFRE). At present ICFRE is involved in various forestry research activities through 9 institutes and 2 centres spread in various regions of the country. Major objectives of ICFRE are:

- To undertake, aid, promote and coordinate forestry research education and its applications.
- To develop and maintain National Library and Information Centre for forestry and allied sciences.
- To act as a clearing house for research and general information relating to forest and wildlife.
- To develop forest extension programmes and propagate the same through mass media, audio-visual aids and extension machinery.
- To provide consultancy services in the field of forestry research, education and training and allied sciences.

In addition to ICFRE few states have their own forest research institutes to focus largely on applied research, while these tasks in other states is done by forest department silviculturists. Many State Agricultural Universities (SAUs) are also involved in forestry related research. Research and education related to wildlife is carried out at Wildlife Institute of India (WII) at Dehradun.

Research done by these institutes is mostly academic research. Research links between ICFRE, State FRIs and SAUs are virtually non-existent and much research is of limited usefulness to field problems. Even when useful results are found they are seldom extended to and applied in the field. The research function needs to be strengthened by need based research to increase productivity and move from deficit to surplus in forest products. The keys to that lie in increasing: (a) the research function (create senior posts, adopt research findings etc.); (b) the qualification and continuity of research staff; and (c) links with other research activities. Forest field staff need to be involved in deciding research topics. Some specialised research tasks could be contracted to private institutions and SAUs. The **first** priority for technological support should be to improve the quality of planting material. These technologies have been already standardised in other countries and require adaptation rather than experimentation. The **second** priority should be rehabilitation and revegetation of degraded forests, in this artificial natural regeneration models should be given preference over plantation models. **Third** priority should be to provide research and technological support to improve practices for high productivity plantations (commercial species) and to develop new agroforestry models. The **fourth** priority should be to develop extension to transfer the information to local people and farmers a kind of “Lab to Land” system. Within these broad priorities each state would have to set their own priorities based on local conditions. Marketing and sociological research have been completely neglected at present and should be given adequate attention in future.

2.6 Institutions and Policies

National Forest Policy, 1988 envisages involvement of local people in protection, management and development of local people. India is one of the few countries which is pioneer in actively associating local people in protection and management of forests and in giving concrete shape to concept of Joint Forest Management (JFM).

During late 1970s and early 1980s a number of experiments were done in the area of promoting active involvement of people by few imaginative and dedicated forest officers in close association with local NGOs. Some of these experiments were very successful such as Sukhomajri in Haryana, Arabari in West Bengal, Harda in Madhya Pradesh, several cases in Orissa etc.. In this process the depleting village commons which is a common property resource (CPR) has been developed to be more productive and beneficial to the villagers. These experiments encouraged conversion of "open access resources" (OAR) into "voluntary restricted resources" (VRR) by developing stakes of local people in development of forest resources. In Sukhomajri local people were organised into "Hill Resource Management Societies (HRMS)". HRMS protected forests and restricted grazing of cattle in catchment areas of Sukhomajri lake. It resulted soil conservation and increased water retention in upper reaches of hills. It not only increased agriculture production downhill but also helped in maintenance of adequate water in the lake. All the villagers, irrespective of size of their land holdings and even landless persons, were given equal share in increased water supply, people were entitled to transfer or even sell their water share to others. It led to increased agricultural yield for farmers, improved supply of fodder for grazers and increased general water supply. In Arabari highly degraded Sal (Shorea robusta) forests were regenerated through the protection provided by Forest Protection Committees (FPC's). Local people were provided free rights for collection of NWFP's and 25% share in final harvest of the crop.

These and many other such experiments in different parts of the country led to serious rethinking by policy makers. National Forest Policy, 1988 formally recognised importance of associating local people in protection, management and development of forests and officially adopted this strategy of Forest management which has been commonly known as Joint Forest Management (JFM).

Government of India issued detailed guidelines to all States and Union Territories on 1st June, 1990 giving a framework for developing JFM. A copy of the guide lines are placed at Annex-II. It basically involves organising local people in FPCs associating them in managing degraded forests through a well developed "micro plan" and allowing FPCs and its members share in usufructs on well defined principles of equity and gender. A comparative chart showing FPC structure and usufruct sharing of various states adopted so far is at Annex-III.

JFM is still a developing concept. There are a number of issues which needs to be paid attention if JFM is to become a vehicle for development of forest resources and empowerment of people living in and around forest areas.

- At present entire JFM mechanism is based on administrative resolutions and does not have any legal support. If the people are to be genuinely encouraged, on long term basis, for protection and development of forest resources, their rights should have legal basis. Indian Forest Act, 1927 which is being revised, is giving attention to this aspect.

- Presently under JFM stress is being given to institutional aspects and usufructory rights of the local people. Silvicultural aspects which should help in regeneration of degraded forests are neglected. Micro plans should concentrate on technical aspects and various technically sound models should be developed to give a boost to JFM.
- 1st June, 1990 guidelines have very clearly spelt that JFM is to be taken up only in degraded forests. However the term degraded forests is not yet defined. A number of NGOs have been insisting that gradually high forests should be brought under JFM. Communities who have assisted in maintaining high forests in good condition should not be deprived of the benefits, which are available to communities who degraded forests near their villages. Since at present, it is not possible to hand over entire forests to local people, a different criteria should be developed for the forests which are to be brought under JFM.
- In north-eastern states most of the forests are under control of local people, and degradation of forests and deforestation is highest in that region. The tree permit system has been grossly misused by not following any scientific principle and has contributed to over exploitation. Hence mere handing over control of forests to local communities is not a sufficient condition for development of forest resources. It is high time to introduce a reverse form of JFM in north-eastern states to prevent deforestation and degradation of forests.
- 1st June, 1990 guidelines envisage that grazing should not be permitted in JFM areas, it merely results in transfer of biotic pressure from JFM areas to adjacent forests and its consequent degradation. Since it is not possible to drastically reduce number of cattle dependent on forests, only practical solution is to develop a system of rotational and controlled grazing in all forest areas including JFM areas.
- There is acute pressure on land and Forest (Conservation) Act, 1980 has made it difficult to divert forest land for non-forestry purposes. Some of the State Governments have started treating JFM as a convenient tool to bypass Forest (Conservation) Act, 1980 and for distributing doles to people for short term political advantage. It is a dangerous trend and suitable steps should be taken to prevent it in future.
- Forest departments have to adjust to these changes and in future its role should be more in developing technical expertise, forestry research and extension activities. Direct management of JFM developed forest should be left to local people and private sector, with adequate technical support from forest department.

JFM is not allowed in Protected Areas (PAs) (National Parks and Wildlife Sanctuaries). However in PAs also cooperation of local people is essential. In PAs concept of eco-development has been introduced. The basic objective of eco-development is to minimise effect of PAs on local people and vice-versa. Under eco-development a number of development activities for local people are undertaken which are compatible to protection and conservation of wild flora and fauna. Such activities include raising of fuelwood and fodder outside PAs, vaccination of local cattle to prevent spreading of diseases among wild animals, training local people as guides and animal trackers, providing drinking water supply outside PAs for consumption of cattle and animals both etc.. Eco-development activities helped significantly in curbing friction among local people and protection staff of PAs.

Eco-development has contributed significantly towards easing hardships for local people and increased protection of wild flora and fauna. Active cooperation of local people on long term basis can be obtained only when stakes for local people are developed along with development of PAs. It may take the form of employment generation through development of

eco-tourism, linking local economy with concerned PA and providing alternative to dependence on the protected areas.

3. FUTURE PROSPECTS

3.1 Assessment of Future supply and Demand for forest products and Services

Forests no longer remain confined to only provide timber and fire wood to the people in the jet set modern age. The natural functions of forests in form of environmental services far outnumber the valuable economic goods which are limited comparatively. There is global concern on both goods and services from forest since the future of humanity depends on how we utilise and conserve the forest now. Throughout the world life-threatening environmental issues have surfaced and therefore the need for forest conservation acknowledged universally with unanimity.

The growth of population is a phenomena of common concern throughout. But the burgeoning increase of population in India has been threatening and rate of growth cannot he sustained by available environmental resources. India's population is 846.3 million, according to the 1991 Census, and increasing every year by 2.11%. The country's population would exceed one billion by the turn of the century and reach 1,170 million in 2011 (Srinivas, 1996): Consequently in 2011 the population density would live in rural and 408 million in urban areas. Estimates on rural poverty show that about 27.5% of the citizens live below the poverty line. If they have limited purchasing power, many depend, for their cooking and heating requirements, on biomass gathered painstakingly from forests or other public lands. If 60% of such people have access to forest lands, their number would approximate to 128 million (762 x 0.28 x 0.6 million). This represents an average incidence of 206 persons per sq. km. of forest, assuming that the extent of forests in the country stabilise at 62 Mha. The entire forest estate is unlikely to be uniformly impacted because of poor accessibility of some areas, excessive degradation etc. If roughly two-thirds of the forests estate is assumed to be so impacted, the intensity of population pressure on the accessible resource (41.5 Mha) would be 308 persons per sq. km. Inventories of forests conducted by the Forest Survey of India (FSI) show that already over 75% of the forest in the country are devoid of established natural regeneration. The results of high population pressure on forests for fuel wood alone can be visualised easily.

Food production has increased from 51 million tonnes (MT) to 176.2 MT during the period 1951-1991 recording a 245% growth (Land use Statistics Table XI). The increase in food production in the preceding decades has come from an addition to the net area sown, improved infrastructure and inputs. Future increase will come solely from further modernisation of agriculture as no virgin land is likely to be available. With the introduction of modern agriculture technology, crop, yields will increase further. Annual per capita availability of food grains has increased from 144 kilograms (kgs) in 1951 to 183 Kgs in 1991. If food grain availability has to be maintained at this level in the year 2010 then the total production will have to go up to 214 MT per annum. The net sown area will continue to be between 140 and 142 Mha and the area devoted to food grain production will also be static at about 130 Mha. Looking at the past trends of production of food grains the yield will be

higher than 1,700 Kgs per hectare in 2010. Consequently the extent of land required to produce 214 MT of food will be only 125 Mha. Therefore, in an ideal situation about 5 Mha agriculture lands may be expected to be released for cultivation of long-rotation tree crops. This will call for suitable technological packages and guidance being made available, good market forecasts and the ability of the forest departments to create conditions conducive for the farmer to switch over to tree farming. With proper technical guidance, infrastructure, policy support and incentives it is likely that about 5-10 Mha of lands now under subsistence agriculture would be available for tree farming.

Table XXV - Land-Use Statistics (Area in Mha)

Land-Use Category	1950-51	1990-91
Net area sown	118.75	142.24
Forest(legal definition)	40.48	67.99
Non-agriculture uses	9.36	21.22
Uncultivable waste	38.16	19.66
Pasture	6.67	11.80
Miscellaneous tree crops	19.83	3.70
cultivable waste	22.94	15.01
Fallow land	28.12	23.40
Total reporting area	284.32	305.02

Source: Ministry of Agriculture, 1994.

Forest cover assessment carried out by FSI in 1995 shows that the total forest cover in the country is 63.96 Mha. Dense forest of more than 40%, crown cover 29%, are 29.93 MHA in extent. Mangrove forests account for 0.45 million hectares. The total standing growing stock has been estimated to be 4,740.9 million m^3 or 74.42 m^3 per hectare. This growing stock is contributing an annual increment of assessment is that it does not indicate the growing stock on the basis of the density of the forest cover. Nearly 4.5% of geographical area of the country in under national parks and sanctuaries. The working plan prescriptions in respect of timber harvesting is officially suspended in these areas. In many states ban has been imposed on green felling (principal among them are Karnataka Uttar Pradesh and Orissa). Working plans have not been prepared/revised for many forest tracts in many states for want of adequate machinery. Excluding 4.6 Mha under wildlife management and 5 Mha of inaccessible areas where the costs of the timber extraction would be high, the extent of dense forest which have a potential to produce timber is 28.97 Mha. Studies have shown that annual increment of forests, irrespective of type, is about 5 m^3 per hectare. Allowing a wide margin for risk of over-felling, failure of regeneration etc. the annual allowable cut can be reckoned as 2 m^3 per hectare. Therefore, the potential production of the country's forest could be 59 million m^3 per annum. It is clear that with improvement in the management of the forests it will be possible to meet the current demand. This is not at the cost of wildlife or biodiversity, as such areas could be excluded from commercial timber operations.

No reliable estimates are available of timber requirements for house building, furniture, agriculture implements, handicrafts, pulp, paper and other industry. While the requirements of Industry can be worked out from the installed capacity, it is not easy to do so in respect of other important consumers of timber. A study under the ongoing National Forestry Action Plan (NFAP) exercise commissioned by the MOEF has estimated the demand for industrial timbers as 56.67 million M^3 (1994). The projections for the years 2000 and 2015 are 50.46 and 136.98 million M^3, respectively. An inter-ministerial working group on wood substitution

set up by the MOEF in 1985 has estimated the demand of timber for industrial and other usage. up to the year 2000. This has been projected in the figures further to year 2010 by Vedant of the Ministry (Table XXVI) - it may be noted that these projections differ somewhat from those of the NFAP exercise.

Table XXVI - Demand of Timber (Million m^3)

Item of consumption	1985	2000	2010
1.Packaging	2.49	4.08	5.51
2.Railways	0.26	0.26	0.26
3.Agriculture implements	3.80	3.80	3.80
4.Matchwood	0.68	1.42	2.45
5.Plywood	0.60	0.75	0.88
6.Particle and Fibre Boards	0.10	0.16	0.20
7.Paper & Pulp	7.70	19.32	27.06
8.Sports Goods	0.003	0.10	0.12
9.Saw Milling Industry	13.40	22.94	37.53
10.Mining Industry	3.00	3.90	4.68
11.Furniture and Panelling	0.25	0.40	0.50
12.Construction Timber	3.00	3.50	4.00
Total	35.28	60.63	83.29

Source: MOEF (1986). Projections by Vedant, DIG, Forests, MOEF.

The term fuelwood demand is not well understood and is often used synonymously with availability and consumption. Demand is generally assumed to be the consumption of fuelwood at a given point of time. This consumption pattern is extrapolated to arrive at the future demand. Several estimates of fuelwood demand are available but vary widely. The difficulty in estimating the demand arises from the fact that substantial quantities of fuelwood are gathered by a very large number of people directly from forest outside the market system. Their numbers are estimated to be about three to four million (Agarwal, 1987) and actual numbers are probably many times greater. The gatherers do not bother to weigh fuelwood each time they return from the forest, leave alone keeping records. Those who collect it are poor and uneducated, mostly women, and, collect whatever is available. As such, biomass (plant matter) accounts for about 15% of energy used in the world and 38% in developing countries.

Fuelwood continues to be the main source of biomass energy in rural areas of India as other commercial sources of energy (coal, kerosene, gas and electricity) are either behind the reach of a large number of rural people or not easily available. Estimates of fuelwood demand in India for the year 2000 range from 97 MT to 330 MT (Sexena, 1997). One estimate of the current annual fuelwood consumption in the country is 201 MT or 563 million cubic metres (Rai, 1996) (using conversion factor of 2.8 cubic metres (m^3) = 1 tonne). The per capita consumption is therefore 214 kgs per annum. Fifty one percent of the fuelwood consumed by households was supposed to come from forests while the rest came from non-forest sources. This assessment seems to be closer to reality. A wood-consumption study conducted by FSI in Hassan district of Karnataka found that dependence of rural households on forests for fuelwood was a function of the distance of the village from the forest (FSI, 1996). The study revealed that as distance of the village from the forest areas increased, alternative sources of energy became more important. Most tend to construct a leaner model of fuelwood

consumption wherein given per capita consumption is multiplied with projected population increases to derive the expected future demand.

However, an important factor which influences fuelwood consumption is the income level of the household. As net incomes increases households prefer to replace fuelwood with cleaner modern commercial fuels. Therefore, as income rise the per capita fuelwood consumption is expected to fall. The obvious analogy is the replacement of starchy foods with protein diets. The exact correlation between rise in per capita income and the consequent fall in fuelwood consumption may be difficult to establish statistically, but is logical. A study of consumption of fuels in rural and urban households conducted by Tata Energy Research Institute (TERI) confirms this for the urban population. Such a clear trend is still not discernible in the case of households in rural areas (TERI, 1996). This can probably be attributed to low levels of awareness about the effects on smoke of health. Specific studies need to be commissioned by the MOEF to determine all the relevant factors that have a bearing on fuelwood consumption in the country and also a realistic assessment of woodfuel produced in the country.

According to an assessment 218 million m^3 of fuelwood (out of 563 million m^3) is collected from forests (39%) (Rai, 1996). This represents an average annual removal of 5.25 m^3 per hectares as a mean that only 41.5 Mha of forests are subjected to fuelwood collections. FSI has estimated the likely silvicultural availability of fuelwood from forest on a sustainable basis as 87.6 million m^3. New plantations created under the state plan schemes, centrally sponsored schemes and donor-assisted projects are estimated to contribute 4.1 m^3 of fuelwood per annum. Thus the total sustainable productions of fuelwood from the countries natural forests and plantations is estimated to be 91.7 million m^3 (2.35 m^3/ha). It is clear that the country's forests are being exploited in excess of their regenerative capacity and sustainable production capacity for fuelwood alone, resulting in lack of natural regeneration of most species from the accessible forests in the country. This trend has been observed in all the forests areas where FSI has conducted inventories. The degradation caused by such over exploitation is seen in the form of some barren hills and some in the process of being barren all over the country's landscape.

Table XXVII - Estimated consumption of fuelwood, 1996

Year	Population (million)	Per capita fuelwood consumption (Kgs/Year)	Total fuelwood requirement million m^3 (million tonnes)
1996	940	214	562 (201)
2000	1018	214	610 (218)
2010	1170	214	700 (250)

Source: Rai, 1996.

Forest fodder is an important product in India. The livestock census data show that in 1987 the cattle population of the country was 428.4 million. An increase of 46% has been recorded between 1941 and 1987 – an annual rate of the growth of 1.5% (Table - XIV). The greatest increase in the respect of pigs (143%) followed by goats (111%), buffaloes (77%), cows (26%) and sheep (17%). The cow population has increased very slowly whereas the goat population has increased rapidly. Goats are browsers and can survive better than cows and buffaloes in the countryside even where the quality of fodder has deteriorated. Mutton fetches a good price in the market and the animals can be culled at a shorter rotation. There is no religious prescription on the consumption of goat meat as in the case of beef. However it is different in NE states.

Table XXVIII - Livestock Population of India#

Category	Livestock Population (million)				
	1951	1961	1972	1982	1987 *
Cows	155.30	175.56	178.34	190.79	195.86
Buffaloes	43.35	51.21	57.34	69.00	76.76
Sheep	38.43	40.02	39.99	48.07	44.83
Goats	47.08	60.86	67.52	94.72	99.41
Horses and ponies	1.51	1.33	0.94	0.93	0.78
Pigs	4.42	5.18	6.90	9.58	10.76
Camels	0.63	0.90	1.11	1.03	--
Others	1.30	1.15	1.11	1.82	--
Total	292.02	336.21	353.34	415.94	428.40

Source : # Indian Council of Forestry Research and Education;
* Ministry of Agriculture

The use of tractors for ploughing, tilling and the transporting of harvest is becoming widespread in the countryside. Consequently the dependence on animal power for agriculture operations is decreasing. Even then in many areas dependence on draught animals for agricultural purposes will continue because of land tenurial system, land holding patterns and socio-economic status etc. The economically and socially depressed sections of the rural people now realized education as a means to move up the social ladder and enhance their status. Traditional occupation such as shepherding are reserved for only one member of the family-the youngest or the oldest-as the wages paid for these jobs are low. Young men prefer to learn special skills and seek employment opportunities in towns and cities where the same amount of the effort enables them to earn more. Families prefer to educate children so that they can earn more when they grow up.

The introduction of hybrid varieties of crops has also reduced significantly the quantity of hay and other crop residues produced. Thus, shortage of fodder for farm animals has increased. The religious ban on consumption of beef is not so stringent in the states of Karnataka, Kerala and Tamilnadu, in the South, the Kashmir region in the North, and some of the North Eastern states. All these factors have combined to make cattle rearing a difficult task. The number of cattle owned per agriculture family is gradually diminishing. In spite of these factors, the cattle population in the country is enormous. Large herds of scrub-cattle can even now be seen grazing freely in the country side although their numbers are decreasing.

Data on fodder requirement and its production from some of the known sources are available. The committee on fodder and grasses constituted by the Ministry of Environment and Forest (MOEF) in 1988 has estimated the fodder requirement in the country as 1,080 MT (dry weight). The supply of fodder from known sources (crop residue, hay, cultivated fodder etc.) has been put at 504 MT. The difference of 576 MT it is believed, comes from forests, common lands, pastures and other public lands. No attempts have so far been made to collect data on the number of cattle actually grazing in forests, the quantity of fodder and grasses utilized or the carrying the capacity of the forests for sustainable grazing. It is probable that about 40% of the cattle are able to access 41.5 Mha of forests for grazing. This represents a grazing intensity of 4.1 cattle heads per hectare and likely to increase to 5.6 per hectare in 2010 assuming the same rate of growth as in the preceding four decades (Table XXIX).

Table XXIX - Grazing intensity in forests (Cattle Population in million; Grazing intensity in cattle unit per hectare)

Year	Cattle Population	Grazing Intensity
1988	429	4.1
2000	506	4.9
2010	581	5.6

Source: projection by Vedant ‘1997.

Dry grass yields from forests and other non-forest grazing lands are estimated to be 2 and 1.5 tonnes per hectare, respectively (Singh, 1994). If two-thirds of the forests areas are grazed the yield of dry grasses would be 83 MT. Working on our earlier assumption that 40% of the cattle (136 million) may be able to access the forests for grazing, the availability of fodder per cattle head would be about 1.7 Kg. per cattle head per day. This is far short of the maintenance intake of 3% of body weight as the minimum requirement (ICFRE, 1992). Most of the cattle that graze in the forest areas are scrub cattle which do not yield much milk and are also not useful as draught animals. Regulating their entry into forest areas through the imposition of a grazing fee has often been recommended by foresters and scientists. But implementation of such recommendations are fraught with difficulties as politicians do not support such measures. The conflict between conservers and consumers as well as cause and effect continues.

Castration of unproductive bulls and introduction of hybrid imported varieties of cattle with artificial insemination has also been suggested. This is a debatable issue as hybrid cattle require much nurturing, care and nourishment. In the absence of proper health care amenities for farm animals in the rural areas, experimental introduction of hybrid cattle has not made much headway in many parts of the country. Programmes for improving local breeds through cross-breeding and improving amenities for health care holds greater promise and is readily

accepted by agriculturists. The role of the forest department (FD) in this is minimal. They can contribute in small manner by creating silvi-pastures, management of grasslands and pastures on scientific lines, and reseeding grasslands and pastures. But this is an area in which forest officers have no or little training or skills. Staff of the veterinary department concentrate on animal health care and, like foresters, do not have any skill for managing grasslands and pastures. Even the agriculture department does not have the necessary wherewithal for managing grasslands and pastures. Thus, forest as well as non-forest pastures and grasslands are in poor condition today.

Forests occupy space and space is under great stress in this growing world. Forest has to yield to surrender space to other competing agencies of development including human needs. There is a constant conflict for space from all sides and angles. It is not possible to indicate the future demand on forest land from several competing quarters even a guess would be totally wrong. But there is no denying of the fact that there will be a lot of diversion of forest land for developmental projects, mining, rehabilitation and regularization of encroachments. Loss of forest is not comparable in terms of money gained instead. Thanks to the much disliked Forest Conservation Act 1980 for which the pace of diversion of forest land for non-forestry purposes is restricted and reduced. In case of diversion of forest there is a provision of compensatory afforestation of equivalent land area. Mother's breast milk is the best for child and it cannot be replaced or substituted. So also natural forest cannot be replaced or recreated with all its biodiversity whatsoever one can do for compensatory afforestation. A loss of natural forest area is a loss for ever. The progress of compensatory afforestation is quite tardy. It has been observed that the interest of the states is much more for diversion of forest land rather than in compensatory afforestation. A very strong political and bureaucratic commitment and will is required in this regard to save the dwindling forest. To ensure availability of services from forest in totality adequate forest and tree cover need to be maintained. The responsibility is not only of government but also of the civil society as a whole.

3.2 Future Development and Development Objectives

One thing is constant in the world that is change. This change is a continuous process and is progressive. In a developing country like India development encompasses several wide ranging issues. The prime aim of development for a welfare country is peoples welfare and for public good. In fact every country throughout the world strive towards this objectives and so also all the countries in the region. Forest is a part of the environment, Development and environment both are inseparable. Man lives in a given environment and strives to improve his lot by certain actions within it in the name of development. Every act of man affects environment. People's well being is the ultimate goal of all governments and all development polices and programmes are usually tailored to cater to that objective. While everything is changing land remains and will continue to remain limited. Growth demands space and forest is the only area having some geographic spread. This perhaps has been also the cause of liberal use of its area and extent. The increasing need and influence of other sectors has made forestry sector a diminishing entity.

In the economic terms and financial accounting system externalities (social costs) are not considered very often. Services from forest such as soil protection and productivity, regeneration of water and improvement of hydrological cycle, all forest products other than

timber and bamboo, carbon sink and bio-diversity have immense value of far reaching consequences. Such benefits flowing from forests are not only local but regional and global. Large scale industrialisation does not mean development if it does not pay due attention to environment. Further development has to have social content in every sphere. The material progress has to be blended with old values, ethics and morals. Earlier no one talked of environment in development projects and activities. The craze for development subdued the simmering after effects or fallout of those activities which do not seem visible initially in the beginning. Forests destroyed to make way for development and industries which later polluted air and water causing several difficulties and problems to the people in general. In this regard the examples of devastating effect of indiscriminate development are not wanting. Government have taken care against such reckless development and ruthless predatory exploitation of forest (natural resources) and environment. Otherwise the cure becomes much more cost prohibitive than the disease itself. Realisation has come for the old saying "Prevention is better than cure".

Visualising the scenario for the future as well as for the incoming century government of India with its age-old wisdom is the first country to make constitutional provision for protection and improvement of environment in 1976. Forestry and wildlife are in the concurrent list of the Constitution of India. Ministry of Environment and Forests is the nodal administrative structure at central level for planning, promotion and co-ordination. Ministry is responsible for policy formulation, monitoring, and co-ordination with Government and International agencies. Environmental impact assessment of developmental works, prevention and control pollution, research education and training and providing financial and technical assistance to states, NGO's and others through various schemes are also the responsibility of the Ministry. Conservation and development efforts have been facilitated by several legislative and administrative instruments. Government of India through such measures have tried to ensure "Development without Destruction". The 1988 national forest policy is a landmark instrument with wide ranging coverage and focusing on conservation efforts in Indian Forestry coupled with sustainable utilisation and peoples participation. The National Conservation strategy was adopted in 1992 laying down stress on environmental considerations. The principal aim of National Forest Policy (1988) is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms - human, animal and plant. The derivation of direct economic benefit must be subordinate to this principal aim. The policy lays down the overriding considerations for the environmental concerns rather than commercial interests. Accordingly the conservation of bio-diversity, genetic resources, species, their habitats and production of wood and NWFP for local consumption and use as well as for meeting the industrial requirements on long term basis are important factors determining sustainability. India has unique and diverse forest ecosystems some being fragile and critical needing special treatment.

Most of the India's Forests being under the control of government are managed on scientific lines with detailed field work, inventory and mapping with due regard to principles of sustainable development. The policy document stipulates that holders of customary rights and concessions in forest areas should be motivated and encouraged to identify themselves with protection and development of forest from which they have been deriving benefits. The 1st June 1990 circular reflects governments commitment to manage the forests through participatory process which envisages active involvement of village communities, specially women and weaker sections of society and voluntary agencies. Rights and concession of the tribals and other poor living within and near forests are protected and their bonafide domestic

requirements are regarded as first charge on forest produce. In spite of general denudation of forests and lack of regeneration there has been at places instances of good regeneration in natural forest by changing forest management practices involving more effective collaboration between government forest staff and rural communities having willingly controlled their access to natural forest for grazing and cutting. This is an emergence of new approach hitherto not given adequate attention and importance. It is an integrated approach for ecological security and stability.

Adoption of participatory forest management with communities providing them incentives and support (both technical and financial) has wide acceptance now and is also more cost effective. This philosophy of forest development is a silent social revolution and has considerably reduced general degradation of the commons. People have responded to the cry of forest "first care and then share" and thereby people themselves have developed a stake in forest protection. This process has generated a sense of belonging amongst people. They have voluntarily turned "from free user to regulated user of resources and from consumer to producer". Consequently forest management is done with a human face and for the people by harmonising various parameters of forest management. In a way it is liberalising and feminizing forestry. This has helped the forest department to feel oneness with society with a concept of social justice and distribution of rights.

Joint forest management - Forestry in the country is in transition from a statist to a more people centred approach. The country's forest policy today talks in terms of empowering and involving people in managing forest locally. That participatory approach is a viable alternative to the traditional methods of forest management became known when the FD in the state of West Bengal tried this concept for the first time in the early 1970's in Arabari. It started as an attempt by a harassed FD, unable to prevent the destruction of forests in spite of strenuous efforts at policing, to involve people in policing forests in return for a share in the harvest. In general people were depending on forest and degradation of forest continue with way flow of produce. People were only concerned with their rights and concessions without bothering for their responsibilities. In the process poverty became endemic to degraded forest areas. People were persuaded first to care and then manage the forest and share the benefit in shape of goods though the services and functions from the forest so protected was uniform for the entire community. Involving people in this collective endeavour has in cost-effective and very radical in approach.

Protection alone enhances the bio-diversity of the area and thereafter helps in equitable sharing of biotic wealth. The novel attempt had salutary and significant effect on forest and local society as well and made them more aware and concerned for the benefits of forests and optimal use of resources not only for own generation but for generations to follow. Rules of self-abnegation were framed by the local communities leading to the laying of the foundation for collective efforts at regenerating degraded forests. Such efforts both of local governments and village communities have been also taking place in other parts of the country. In one instance a villager narrated to the author about their case as "Necessity is the mother of inventions" resulting in extensive degraded forest area regenerating by their voluntary protection. People realised the ecological advantages by their action contrary to legacy of ecological exploitation and generated ecological movement which contributed more for survival of poor. The causative factors of forest degradation were taken care of by use of this renewable resource with restraint care and caution. The success that these efforts met with led

the MOEF to formulate a strategy to involve people in collaborating with the FD to regenerate forests and get a share of the benefits (harvest) from the forests so managed.

In India participating in forest management is called Joint Forest Management (JFM). JFM involves the collaboration of the FD, the people of the area and a local non-governmental organisation (NGO) to serve as an interface between people and government. From this modest beginning, JFM has acquired the shape of a movement with over 15,000 village forests committees (VFCs) managing in collaboration with FDs over 2.0 Mha. of degraded forests. The experience in the last few years has shown that many complex issues of social, political, administrative, legal and silvicultural are emerging and require to be addressed. This mechanism for enhancing forest area both within and outside legal limits of forest has a great future because of recognition of its utility and universal acceptance. The trust of the people has to be sustained to continue the process towards prosperity. It can be emphatically foretold that the coverage under JFM and involvement of people will increase several times of what it is now since the awareness for forest conservation is gaining ground at the base in rural India nearer the forest. The return from forest varies widely in the country depending on the locality and species occurring therein.

The practice of forest working from the beginning has a scientific base in which both present and future needs were considered without sacrificing the biodiversity existing in the local forest types. The imbalance crept in when the demand surpassed the supply impinging and impairing the existence of the very forest. Wood alternatives and substitutes have been found and more and more research is on to save the overuse of wood and wood products. Both the aspects of supply and demand have to he tackled to conserve the natural forest in its pristine glory. Conservation encompasses both protection and management. Legal and Administrative framework have to be strengthened with proper human resource development and with a paradigm shift in their approach to various problems of forest management. Modern tools like GIS (Geographical Information System) and MIS (Management Information System) have to be used to hasten the process of building up of lost ground in forest management. The forest management has to be “Technically sound, Environmentally compatible, Commercially viable and Socially acceptable” and its ultimate aim and approach has to be humane and people oriented. That would include both short term and long term gains.

Natural forest extent may not remain static in view of growing population and cattle pressure and its consequential welfare needs and demands which include several developmental projects mining etc. Shifting cultivation, though likely to reduce, will have its toll on the forest land. The reality of the projection ultimately means less of forest and more per capita demand. That being the case efforts have to be made for enhancing forest productivity with adequate research supports. The natural regeneration in the forest can be supplemented with artificial regeneration wherever necessary to maintain the forest stocking to the optimal state. Timber harvesting from forests in India is linked to rural employment and economics. However, the importance of remote and inaccessible forests tracts as a source of timber will diminish considerably. Plantations will gain importance as a source of all woody raw material in the 21st century. The NGO activists have contributed in no small measure to this change. But there will still be some tracts of natural forests from where it will be necessary to manage forest scientifically and to extract timbers of selected species or dimensions. The returns from logging of such areas would be high and would cost sufficiently low to make harvesting of natural forests competitive with those of the plantation industry.

If timber has to increasingly come from plantations there would be a need to reappraise policies regarding the proportion of natural forests to plantation. An important change that has been seen in the developed West is the realisation by activist NGOs that environmental amenity value of forests can be maintained even when timber harvesting is continued in old growth forests. Similarly industries and forestry professionals are recognizing the need to modify harvesting practices so as to reduce its adverse impacts. The extent and quality of the forest cover a country can maintain is linked to the biotic pressures it is subjected to. It is expected that forest cover in most developing economies will continue to diminish till they are able to bring down the rates of population growth to manageable levels, develop their economies and create avenues for alternative sources of employment for people who now derive their livelihood from forests and forestry. When this happens the forest cover will cease to decline further. But the threshold levels at which the U-turn will take place will be different for different countries. Even in the country different states will have different area coverage in forest because of their geographical location, population and development status.

Assuming an end of deforestation or forest degradation and continuation of afforestation/reforestation/agro-forestry activities at the rate of one million hectares per year, forest resources, by 20l0 AD, could be somewhat like this:

- Area of natural forests	50 Million ha.
-Protected areas	15 million ha.
-Area with production potential	30 million ha.
-Area of forest plantation	40 million ha.
-Area under agro-forestry/homestead forests	8 to 10 million ha.

If a sustainable development scenario with effective protection of existing forests and increased investment in creating new-manmade forests is followed, India can avert the developing crisis and take a growth path in forestry. Even if the productivity of existing plantations (which is about 4 cu.m./ha/Yr.) is increased to a level of 10 cu.m./ha/yr. (i.e. the lower limit to be qualified as fast growing), it should he able to produce about 500 million cu.m. from Plantations alone.

Implications of Projected Outlook - The supply/demand situation and resulting changes have several implications affecting: investment, skill needs, employment, income, government revenue, product substitution and diversification, product distribution, new entrepreneurial activities, value addition, operational efficiency, community welfare, environmental conservation, trade, prices and more importantly institutions and institutional arrangements.

Afforestation - It is simply clear from the foregoing discussions that India's forests are being exploited in excess of their sustainable productive capacity. This is in spite of the fact that the country has increased the pace of its reforestation programme in recent years. Between 1951 and 1997 the country has reforested 21.78 Mha of degraded forest and other public lands at a cumulative cost of Rs. 68,842.8 million (approximately US $ 1.9 billion) as per details in Table-XXX**.**

Table XXX - Progress of reforestation in the country

Plan period	Area reforested	Cumulative	Expenditure incurred (Rs.	Cumulative

	(Mha)		million)	
First plan (1951-1956)	0.05	0.05	12.8	12.8
Second plan (1956-1961)	0.31	0.36	68.6	81.4
Third plan (1961-1966)	0.58	0.94	211.3	292.7
Annual Plans (1966-1969)	0.45	1.39	230.2	522.9
Fourth plan (1969-1974)	0.71	2.11	443.4	966.3
Fifth plan (1974-1979)	1.22	3.33	1,072.8	2,039.1
Annual Plans (1979-1980)	0.22	2.55	371.0	2,410.1
Sixth plan (1980-1985)	4.65	7.20	9,260.1	11,670.2
Seventh Plan (1985-1990)	8.86	16.06	25,868.4	35,128.6
Annual plan (1990-1991)	0.75	16.81	5,999.5	41,128.1
Annual plan (1991-1992)	1.15	17.96	7,701.3	41,898.4
Eighth plan(1992-1997)#	3.82	21.78	26,944.4	68,842.2

Source: MOEF # Provisional

Afforestation is very labour intensive operation and it is estimated that about 200 to 300 mandays are generated for plantation of one ha. In addition a sizeable employment is generated in collection, processing and marketing of NWFP. Reforestation on this scale is probably the largest effort undertaken by the forest service of any country in the Asia-Pacific region. Productivity of these plantation has, however been an issue on an extensive debate. The choice of species has often been pointed out by the critics to be inappropriate to the condition of soil, climate or the requirements of the local people. This is attributed to be an important region for the poor productivity or the lack of enthusiasm on the part of the local people to protect or nurture the plantations. The people also suspect, often for justifiable reasons that a larger share of the final harvest will be taken away by the government to feed industry or the towns. A study of the out-turn of a plantation (of Eucalyptus hybrid) raised by the FD in Mysore district in Karnataka under the rural fuelwood plantation scheme found that only fourteen percent of the saplings planted had been survived up to the harvest stage (Vedant, 1989). A large number of trees had been harvested by the local communities illegally. The Final harvest was removed by the FD to a nearby town for supply at prices which were below the prevailing market rates. The study went on to show that selling the wood at the rates determined by the state government involved hidden subsidies. Although the study was limited in scope to one plantation, yet this is true of majority of plantations raised under schemes purported to meet rural fuelwood and fodder requirements. Social forestry, which included agro and farm forestry models, was conceived as a possible alternative for enhancing production of wood on farm bunds, roadsides, canal-banks, tank foreshores and other public lands or block planting. In all such plantations protection has been the main problem in spite of involvement of communities. A common responsibility is not individual responsibility and the casualty has been the plantations raised at huge cost and forest also.

Moreover plantations have long gestation period and no substantial result can be obtained unless protection and care is taken for that length of time.

The concept of social forestry was mooted as a means of ensuring production of wood, fibres and other tree products, used by people, on their own lands. It was thought that a shift in emphasis to meeting people's requirements from private and community owned lands closer to their areas of habitation would help in reduction of pressure on natural forests. Conceptually social forestry meant for the people (community/village) by the people and for the people with support and assistance of forest department. NGOs acted as an interface and catalyst between the governed and the government. The implementation of projects translating these ideas into action began in early 1980s. India received substantial aid from international donor as well as aid agencies for launching social forestry projects in different parts of the country (Table-XXXI).

By the close of the 1990s most aid agencies had lost interest in supporting social forestry programmes, Evaluation of social forestry in the country revealed that choice of species did not take into account local factor such as soil, climate and preferences of the people. Forest Departments lacked sufficient machinery to carry out micro-planning at the grass-root level of the village. Difficulty in obtaining concurrence of local authorities for raising village wood lots or pastures was also encountered. Although the country has nearly 12 Mha of pastures and 40 Mha of non-forest lands classified as fallow and culturable wasteland, much of it is in degraded conditions. It was not possible to obtain these lands for planting under alternative use. Forest Department initially did not make any attempt to allow local institutions or communities to take over the execution of the physical work. This would have led to creation of local institutions and acquisition of skills to undertake and manage such projects. But subsequently at many places the local institutions and NGOs were involved in the process. The Forest Department initially viewed social forestry projects no differently from the normal forestry projects – as a means for increasing green cover in the respective states. Participatory approaches in forest management on the other hand have opened up the possibility of tackling issues like choice of species, sharing of final harvests, pricing of the produce and a host of other issues which Forest Department cannot alone handle.

Table XXXI - International assistance received for Social Forestry Projects

States	Project period	Expenditure Incurred (Rs. million)	Area covered (Hectares)
Uttar Pradesh	1979-80 to 1983-84	500.00	76,000
Maharastra	1982-83 to 1989-90	720.00	75,726
Andhra Pradesh	1983-84 to 1990-90	427.6	45,217
Bihar	1985-86 to 1991-92	486.00	53,375
Jammu & Kashmir and Haryana	1982-83 to 1990-91	1,061.90	186,281
West Bengal	1981-82 to 1990-91	640.00	242,578
Karnataka	1983-84 to 1991-92	852.10	53,351
Kerala	1984-85 to 1992-93	896.80	131,000
National Social Forestry Projects (UP, HP, Rajasthan, Gujrat)	1985-86 to 1992-93	6,981.08	1,198,742

The country has made significant progress in reforestation, yet the productivity of these man-made forest is suspected to be low. Production in the public sector suffers from many deficiencies, chief among which is related to price determination. Government intervention can mean that market forces cannot competitively decide the price for the forest produce. This is a result of the government's anxiety to avoid being seen as promoting elitist interests. Therefore, as a producer, the FD cannot get a fair return on its investments. Private sector investment is also driven away from this activity. Competition cuts out inefficiencies, brings in new technology and allows more efficient use of resources. In the absence of competition neither the consumer benefits nor does the sector. Initially the goods and services produced by the private entrepreneur may cost more than the consumer can afford. But this by itself will be attained at the price at which the market is able to consume all that is produced. Liberalisation of economy will also affect the management of forests in the country. Governments in the country would be unable to provide budgetary support for uneconomic activities in different sectors of the economy.

As long as fuelwood, fodder and timber continue to be subsidised there will be no incentive for the Forest Department to make large investment for its production. The subsidies on these will be inevitable and politically forced so long as the FD burdens itself with the responsibility of producing a commodity that can be easily and more efficiently produced by farmers and others. Therefore production of fuelwood, fodder and timber should be partially shifted from public sector to the private sector. This will be accompanied by a shift in production from natural forests to plantation forests This seems to be the only way of conserving the remaining native forests. Private plantations would also include individuals and institutions. In private, plantations can be raised with higher inputs for faster growth with a view of higher economic return. In some cases industries have invested large sums in research and extension and carrying out plantation work in the field. Adoption of "Tree Pass book" system and formulation of "Green Brigade" in schools are few examples in this direction. Thereby the green tree culture will be established throughout. As it is women have a great role in forestry and while adopting the aforesaid issue the case of gender has to be kept in view. But private sector involvement in production forestry is possible only if land ceiling laws are relaxed for enabling operationally viable holding size. Also, the policy of not giving degraded forest land for production forestry to the private sector needs to be revised considering overall scenario without being dogmatic and biased and without leaving the control over land by Government. Such a mechanism will enable private entrepreneur to generate more forest produce for every

one, while regreening the barren landscape profitably. The delay in such a broad based pragmatic decision may not be appropriate for forest conservation in the long run. Out of country's degraded forest land, the request of such captive plantation will be very little. Why should not this be given a fair trial for a few years and observe the outcome rather than a stubborn attitude of "Touch me Not"?

The decision-making processes in the forestry field in the country are not keeping pace with changing forest scenario. In spite of the availability of modern tools such as remote sensing, geographic information systems (GIS) and management information systems (MIS), Forest Departments use archaic and time-consuming decision-making systems for management prescriptions. Lately many foresters have shown a greater inclination to specialise and use GIS, remote sensing and MIS in their profession. Yet the number of foresters specialising in these disciplines is very small and insufficient for the magnitude of the tasks ahead. It will be necessary to induct professional GIS, MIS and remote sensing specialists into the Forest Department. Foresters have so far kept the forest service as a closed house where entry is restricted to people selected from a narrow range of traditional disciplines. Forestry training institutions in the country train foresters to be generalists.

Forestry is today highly specialised requiring new tools and skills, not included in the training curricula at the in-service training institutions. What forestry in India requires today is a cadre of highly motivated specialists in nursery, seed production, silviculture, wildlife biology, microbiology biodiversity, tree breeders, genetics and genetics engineering, ecologists, GIS, MIS, remote sensing, communications, human resource development, forest pathology and a host of other disciplines. Similar would be the case in wildlife management including Zoos. Lateral entry of professionals will enrich the professional content of the work of the forester and help the service regain confidence of the people. The modern demand from the forest service is to be more responsive, more open and transparent, more sympathetic, more accommodative and to keep people in the centre stage of all activities. Accordingly training curricula should include relevant subjects as per demands of changing times. Thereby the forester being the trustee of a resource can gain the trust and confidence of the people and the government.

3.3 Implications of Scenario

In view of the special conditions prevailing in Indian Forestry Scenario, specific criteria and indicators (C&I) have to the ascertained for each type of forests. Due to rich biodiversity and multitude of variations one set of C&I for the whole country will be irrelevant and misleading. Biodiversity is an important source of rebuilding ecological balance and sustainability in agriculture production and our own survival. For sustainable forest development the broad guiding principles are the forest resource base, continuity of flow, environmental control, socio-economic efforts and institutional framework.

It is now generally recognised that forest management needs to become increasingly effective in adapting to local ecological and socio-economic conditions and demands. This is reflected in the current debate on criteria and indicators (C&I) to measure the effect of management practices on the sustainability of forests. Even if national governments, in consonance with international agreements, impose limits within which forest management could function, decisions on product optimisation and the degree to which forest systems can be modified

from their natural state will still have to be made by local stake holders. The definition of sustainable forestry will vary greatly over space and time as society's needs and perceptions evolve. Sustainability of forest connotes maintaining or enhancing the contribution of forests to human well being, both of the present and future generations without compromising the integrity of the ecosystem, that is, their resilience, function and biological diversity. The objective of research on C&I is to identify key components that can be measured either quantitatively or qualitatively on the ground. There is increasing recognition that foresters must adapt their management practices to satisfy the people's changing needs for forest goods and services. This requires sensitive indicators to measure changes in the attributes of forests and the ability to predict the responses of the ecosystem to modified management regimes. The C&I debate is leading forestry professionals to rethink the meaning of environmental sustainability so as to explicitly identify the various elements that collectively comprise sustainability. Some of the key components have been discussed at other places.

The competition for land has always been intense. The country's first policy on forests, enunciated by Voelker in 1884, stated that foresters would have to give up their claim to lands on which agriculture was more profitable. A period of aggressive settlement of land for enhancing food production saw a rapid pace of extension of agriculture into virgin areas. Forests have been cleared indiscriminately into virgin area, for rehabilitation and development of infrastructure such as dams, irrigation, roads and industrial estate. Forestry professional's opposition to such indiscriminate diversion of forest land was decried unfortunately as a manifestation of their anti-development orientation, though foresters have been true to their profession and committed to professional integrity, training and mindset. In the three decades between 1951 and 1980, 4.328 million ha. of forests were diverted for the following purposes:

Agricultural activity	2.623 million ha.
Submerged under reservoirs	0.502 million ha.
Industrial townships	0.134 million ha.
Road/rail routes	0.061 million ha.
Miscellaneous	1.008 million ha.
Total	**4.328 million ha.**

Thereafter from 1981 to June 1996, 0.42 million ha have been diverted to various development works including mining and regularization of encroachments. Political parties in their eagerness to pursue 'vote bank' politics and appease commercial lobbies followed policies that had deleterious effects on forests in the country.

The Forest (Conservation) Act passed into law in 1980 now requires the state governments to take prior permission of the Central government before diverting forest lands for non-forestry purpose. But in spite of the new law about 0.8-1.0 Mha of forest land is under illegal occupation (encroachment) by cultivators and settlers which is expected to intensify further, Forestry will inevitably have to be satisfied with remnant marginal lands with poor soil and nutrient regimes. On the brighter side it is noted that forest plantations in the tropical and subtropical regions can succeed even on lands of intermediate productivity on which agriculture would not be profitable. One of the questions that is expected to be asked repeatedly in the future is 'How much forests, natural or otherwise, do we need to maintain essential environmental services'. Although there are no answers as yet, it is generally held that a smaller proportion of natural forests kept under rigid protection would serve the purpose

of bio-diversity conservation while a larger part of forests would have to be in the economic intervention zone to meet the essential needs of the society in general.

The Export - Import policy 1992-97 has provided stability within a dynamic framework enabling periodic harmonisation of national priorities with global change. With the long term exim policy providing a stable policy matrix, advances have been made in restructuring the economy and the consequent changes that are possible and desirable towards the objectives of trade liberalisation. The Exim Policy 1992-97 is a land mark in India's trade policy regime ushering in a new environment through major trade policy reforms. Exim policy restricts imports and exports of certain specified items. Panels, certain types of paper and paper products, boards, shavings, chips, particles, saw dust and other wastes of wood, certain wood and wood articles etc., are restricted for import. Import and Export of plants, their products and derivatives, some wildlife and their parts are subject to the provisions of Convention on International Trade of Endangered Species of Wild Flora and Fauna (CITES). Economic pressure at times are very intense but the fact that Trade and Environment are mutually supportive should not be lost sight of.

Marketing and Trade - Forest products do not figure prominently in India's international trade. There has hardly been any export in recent past and imports were mainly pulp paper products and logs. Production has been directed essentially at domestic market, with consumption limited to what has been produced. Domestic market of forest products in India is a large, even though considerable exchange and utilization of forest products takes place outside market. Scarcity of wood has caused rise in its prices at a rate of 9 to 13.5% per annum since 1982 as compared to annual price increase of rice at 7.5%, wheat 7.0% oilseeds 9.5% for the same period. As per FAO report on Forest Product Prices 1995, the increase in prices of wood in main producer countries like USA, Canada and Malaysia was from 3.9 to 8.3% per annum which was much lower than Indian trend.

India's export of wood products has been minimal. Small quantities of sawnwoods, veneer sheets, about 38,000 cu.m. of speciality plywood and limited quantity of furniture (total value about US$ 25 million) were exported from India in 1994. In terms of export trade performance of NWFPs was considerably higher. Main items exported were edible products, crude drugs and medicinal plants, species, essential oils, gums and resins.

India has imposed complete ban on export of logs and restrictions on interstate movement of special quality wood e.g. rosewood, red sanders and sandal wood. While India cannot compete in bulk markets for forest Products abroad it can capture niche markets for forest based consumer goods. Substantial foreign exchange may be earned through export of designer furniture, furniture components, wood carvings, handicrafts, fancy articles, bamboo and rattan works, spices, aroma chemicals pharmaceutical and perfumes. Considering the scarcity of wood raw materials, and to ease the situation in processing industry India relaxed trade barriers and liberalized imports. Customs duty on logs and wood chips was substantially reduced from over 100% to 5% and 10% respectively.

Table XXXII - Important Import Tariffs for Forest Products (1993)

Raw Materials	Tariff (%)	Finished Goods	Tariff (%)
-Logs	5	Veneer sheets	30
-Sawnwood	l5	Particle board	30

-Woodchips	10	Plywood and veneered Panels	40
Pulp	10	Newsprint	0-45*
Waste Paper	20	Other paper products	65

* Zero percent for papers, books and periodicals.

This policy has led to increased imports of timber and forest products. India's import bill for these items increased from about US$ 195 million in 1985 to US$ 277 million in l994. In particular Roundwood imports rose from 27, 000 cu.m. valued at US $3.1 million in 1985 to l.3 million cu.m. valued at US $ 937.4 million in l990. Import of round timber in 1994 was 285.000 cu.m. valued at US $ 48.l million. Marketing system for forest products is weak in India, particularly so far production in informal sector in rural areas involving agroforestry products. NWFPs handicrafts, bamboo and rattan ware. The rural producer is often on a debt hosed relationship with middlemen, where he is denied a reasonable and remunerative price. The Tribal Cooperative Marketing Development Federation of India Limited (TRIFED) has provided a national network of procurement, processing and marketing of forest (and agricultural) products from tribal areas. It, has established some 5,000 single-window service centres in traditional tribal markets in rural areas of the country. But most rural producers are unable to avail of or have access to such facilities.

In any trade, investment to the required extent is necessary by which development can he ensured. Further in modern times trading has to be environment friendly for its own survival as well as its sustainability. In the liberalized trade policy scenario of the country a considerable amount of prudent decision making is required for overall growth of the sector.

Forest is no doubt nature’s gift as a valuable resources, but it is not unending for ever. Any resource can not continue to provide services without adequate investment. The concept of unilateral utilisation of forest resource with no or little investment is undergoing change gradually. The mindset of all in this regard is slowly by transforming. There is dilemma in forest investment since no immediate return is obtainable from forest trees in tangible terms. Forest tree take long time to grow in nature even though it can be hastened marginally by human intervention. But in the long run the return from investment in forestry is more than realised in shape of both goods and services from forest. Evidently therefore the investment in forest in the country and in the states has been quite low. Of late some states have increased allocation to forestry sector up to 4-8% of state plan allocation. But the allocation in the centre is dismally low considering the contribution from forestry monetized and non-monetized, tangible and intangible. Certain allocation are made to allied sectors for forestry work but that is often diverted away from core forest sector work. It has to be forest sector allocation exclusively to utilise in forest operations both inside and outside forest area. In a way forest sector has been a neglected sector in spite of the recent attention to it from all quarters. Efforts have been made time and again to allocate more funds to forestry but it hardly got any satisfactory attention.

Forest Department is the core organisation to deal with all forestry and allied matters. But of late the job is distributed to very many agencies and departments whereas forest department is answerable for any lapse. It would be worthwhile to bring all those (from RD and NAEB) under one umbrella of forest department and make it more effective and strong. Evidently therefore there will be more fund flow to the organisation (FD) for which the Department would have to be accountable and answerable. In view of international recognition to forestry it may be that forest and wildlife is made a separate department or ministry in future. Having

done that it is likely that forestry sector gets enough allocation and the investment becomes commensurate to its contribution.

Adequate investment will necessitate sufficient infrastructure, human resource development with due competence and proper responsive attitude and deployment of modern tools for conservation management and development of forests. Priority has to be given to need based research to make the department more open and transparent as well as accountable to all. While doing so the linkage has to be established with other land using and allied departments and research organisations with access to biotechnology to make the Forest Department march and progress with time and gain the trust of all concerned. In all these a fact has to be acknowledged that forestry science has a longer time span for any visible result, unlike agriculture or any other sector.

Very often the foresters are subjected to skewed criticism critically for their anti-people stance. Unfortunately those critics have formed one-sided opinion from a distance with occasional forays into forest area and peripheral knowledge about the people living therein both tribal and non tribal and men and women. Such a view is improper and unjust. Rather factually foresters are represented in the last remotest village and have seen the ground reality from very close quarters. They are a disciplined lot and technically competent to manage forest themselves as experts in field work provided necessary legal and administrative support is extended by the authorities. But for their dedications and commitment the country's landscape would have been quite different, leave aside the consequential climate devastation and natural calamities. They are custodian and caretaker of about 1/5 - ¼ land area of the country which is repository of very valuable treasure and are emotionally attached to it. Given the chance to exhibit their ability they can surpass many both administratively and technically. Even then the service has not been given its due in all aspects. Forestry professionals are record holders, conservers and protectors (defenders) of all forest land and technical managers of forest area for ultimate benefit of the countrymen. With such onerous duties they need adequate incentive and encouragement to attract the best talent India has and can produce in the younger generations. Such band of dedicated lot can certainly be given the responsibility of providing food, shelter and clothing to the millions of Indian peoples through Forestry enunciated in Forestry Principles (Rio-1992).

Earth is the only planet having life and our only home is this mother earth. Preserving forest and eco-system is preserving water (essence of life), and preserving human life. Let us not devastate forest today to repent tomorrow since future depends on the choices made today. It is said end of a tree is end of mankind. Living trees is more valuable than a dead tree. Forest is nature's gift and has to be nurtured for good of human kind.

Considering the above analysis it is a fact that by 2010 India may have a population of 1,170 million or more needing adequate food, shelter and clothing. All matters relating to human good and betterment have bearing on forest directly or indirectly. The demand of the growing millions will reduce and impoverish forest and goods produced in it but would also demand the services of forest on several counts for their survival. Therefore forest and forestry have a dual role to play in future as well as now for the well being of the society. Peoples need gets priority over immediate environmental need though healthy environment is essential for peoples welfare. With less land under forest after diversion to many pressing spheres of activity, the foresters with their innovation and dedication will have to produce more goods and services from reduced forest area with adequate support from research and modern tools

of management. Further forestry has to be equally developed outside the forest land to meet the increasing demand of forest goods. There has been some remarkable efforts by industries, public and private sector companies and private individuals and communities in greening areas under their possession and control by which the material progress has been blended with old conservative values. It is a big support to government to maintain healthy environment. Challenges where there before the forest and the foresters. It increased but were overcome. With the march of time it would appear again and again. Hopefully it would be surmounted by the Indian people according to their spiritual dictates of “live and let live” and “global friendship/relationship” and there is every reason for this optimism and future hope.

ANNEX 1 - NATIONAL FOREST POLICY - 1988

No. 3-1/86-FP
Ministry of Environment and Forests
(Department of Environment, Forests and Wildlife)

Paryavaran Bhavan, CGO Complex,
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Dated the 7th December, 1988.

RESOLUTION
NATIONAL FOREST POLICY, 1988

1. PREAMBLE

1.1 In Resolution No. 13/52/f, dated the 12th May, 1952, the Government of India in the erstwhile Ministry of Food and Agriculture enunciated a Forest Policy to be followed in the management of State Forests in the country. However, over the years, forests in the country have suffered serious depletion. This is attributable to relentless pressures arising from ever-increasing demand for fuelwood, fodder and timber; inadequacy of protection measures; diversion of forests lands to non-forest uses without ensuring compensatory afforestation and essential environmental safeguards; and the tendency to look upon the situation and to evolve, for the future, new strategy Conservation includes preservation, maintenance, the natural environment. It has thus become necessary to review and revise the National Forest Policy.

2. BASIC OBJECTIVES

2.1 The basic objectives that should govern the National Forest Policy are the following:-

- Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country.

- Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country.

- Checking soil erosion and denudation in the catchment areas of rivers, lakes, reservoirs in the interest of soil and water conservation, for mitigating food and droughts and for the retardation of siltation of reservoirs.

- Checking the extension of sand-dunes in the desert areas of Rajasthan and along the coastal tracts.

- Increasingly substantially the forests/tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands.

- Meeting the requirements of fuelwood, fodder, minor forest produce and small timber of the rural and tribal population.

- Increasing the productivity of forests to meet essential national needs.

- Encouraging efficient utilisation of forests produce and maximising substitution of wood.

- Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimise pressure on existing forests.

2.2 The principal aim of Forest Policy must be to ensure environment stability and maintenance of ecological balance including atmospheric equilibrium which are vital for sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim.

3. ESSENTIAL OF FOREST MANAGEMENT

3.1 Existing forests and forest lands should be fully protected and their productivity improved. Forest and vegetal cover should be increased rapidly on hill slopes, in catchment areas of rivers, lakes and reservoirs and ocean shores and on semi-arid, arid and desert tracts.

3.2 Diversion of good and productive agriculture lands to forestry should be discouraged in view of the need for increased food production.

3.3 For the conservation of total biological diversity, the network of national parks, sanctuaries biosphere reserves and other protected areas should be strengthened and extended adequately.

3.4 Provision of sufficient fodder, fuel and pasture, specially in areas adjoining forest, is necessary in order to prevent depletion of forests beyond the sustainable limit. Since fuelwood continues to be the predominant source of energy in rural areas, the programme of afforestation augmenting fuelwood production to meet the requirement of the rural people.

3.5 Minor produce provides sustenance to tribal population and to other communities residing in and around the forests. Such produce should be protected, improved and their production enhanced with due regard to generation of employment and income.

4. STRATEGY

4.1 Area Under Forests - The national goal should be to have a minimum of one-third of the total land area of the country under forest or tree cover. In the hills and in mountainous regions, the aim should be to maintain two-third of the area under such cover in order to prevent erosion and land degradation and to ensure the stability of the fragile eco-system.

4.2.1 A massive needs-based and time bound programme of afforestation and tree planting, with particular emphasis on fuelwood and fodder development, on all degraded and denuded lands in he country, whether forest or non-forest land, is a national imperative.

4.2.2 It is necessary to encourage the planting of trees alongside of roads, railway lines, rivers and streams and canals, and on other unutilized lands under State/corporate, institutional or private ownership. Green belts should be raised in urban/industrial areas as well as in arid tracts. Such a programme will help to check erosion and desertification as well as improve the micro-climate.

4.2.3 Village and community lands, including those on foreshores and environs of tanks, not required for other productive uses, should be taken up for the development of tree crops and fodder resources. Technical assistance and other inputs necessary for initiating such programmes should be provided by the Government. The revenues generated through such programmes should belong to the panchayats where the lands are vested in them; in all other cases, such revenues should be shared with the local communities in order to provide an incentive to them. The vesting, in individual, particularly from the weaker sections (such as landless labour, small and marginal farmers, scheduled castes, tribals, women) of certain ownership rights over trees, could be considered, subject to appropriate regulations; beneficiaries would be entitled to usufruct and would in turn be responsible for their security and maintenance.

4.2.4. Land laws should be so modified wherever necessary so as to facilitate and motivate individuals and institutions to undertake tree-farming and grow fodder plants, grasses and legumes on their own land. Wherever possible, degraded lands should be made available for this purpose either on lease or on the basis of a tree-patta scheme. Such leasing of the land ceiling laws. Steps necessary to encourage them to do so must be taken. Appropriate regulations should govern the felling of trees on private holding.

4.3 MANAGEMENT OF STATE FORESTS

4.3.1 Schemes and projects which interfere with forests that clothe steep slopes, catchments of rivers, lakes and reservoirs, geologically unstable terrain and such other ecological sensitive areas should be severely restricted. Tropical rain/moist forests, particularly in the areas like Arunachal Pradesh, Kerala, Andaman and Nicobar Islands, should be totally safeguarded.

4.3.2 No forest should be permitted to be worked without the Government having approved the management plan, which should be in a prescribed format and in keeping with the National Forest Policy. The Central Government should issue necessary guidelines to the State Governments in this regard and monitor compliance.

4.3.3 In order to meet the growing needs for essential goods and services which the forests provide, it is necessary to enhance forest cover and productivity of the forests through the application of scientific and technical inputs. Production forestry programmes, while aiming at enhancing the forest cover in the country, and meeting national needs, should also be oriented to narrowing, by the turn of the turn of the century, the increasing gap between demand and supply of fuelwood. No such programme, however should entail clear-felling of adequately stocked natural forests. Nor should exotic species by introduced, through public or private sources, unless long-term scientific trials undertaken by specialists in ecology, forestry and agriculture have established that they are suitable and have no adverse impact on native vegetation and environment.

4.3.4 RIGHTS AND CONCESSIONS

4.3.4.1 The rights and concessions, including grazing, should always remain related to the carrying capacity of forests. The capacity itself should be optimised by increased investment, silvicultural research and development of the area. Stall-feeding of cattle should be encouraged. The requirements of the community, which determined, should be met by development of social forestry outside the reserved forests.

4.3.4.2 The holders of customary rights and concessions in forest areas should be motivated to identify themselves with the protection and development of identify themselves with the protection and development of forests from which they derive benefits. The rights and concessions from forests should primarily be for the bonafide use of the communities living within and around forest areas, specially the tribals.

4.3.4.3 The life of tribals and other poor living within and near forests revolves around forests. The rights and concessions enjoyed by them should be fully protected. Their domestic requirements of fuelwood, fodder, minor forest produce and construction timber should be the first should be made available through conveniently located depots at reasonable prices.

4.3.4.4 Similar consideration should be given to scheduled castes and other poor living near forests. However, the area, which consideration should cover would be determined by the carrying capacity of the forests.

4.3.5 Wood is in short supply. The long-term solution for meeting the existing gap lied in increasing the productivity of forests, nut to relieve the existing pressure on forests for the demands of railway sleepers, construction industry (particularly in the public sector), furniture and panelling, mine-pit props, paper and paper board etc. substitution of wood needs to be taken recourse to. Similarly, on the front of domestic energy, fuelwood needs to the substituted as far as practicable with alternate sources like bio-gas, LPG and solar energy. Fuel-efficient be popularised in rural areas.

4.4 DIVERSION OF FOREST LANDS FOR NON-FOREST PURPOSES

4.4.1 Forest land or land with tree cover should not be treated merely as a resources readily available to be utilised for various projects and programmes, nut as a national asset which requires to be properly safeguarded for providing sustained benefits to the entire community. Diversion of forest land for any non-forest land for any non-forest purpose should be subject to the most careful examinations by specialists from the standpoint of social and

environmental costs and benefits. Construction of dams and reservoirs, mining and industrial development and expansion of agriculture trees and forests. Projects which involve such diversion should at least provide in their investment budget, funds for regeneration/compensatory afforestation.

4.4.2 Beneficiaries who are allowed mining and quarrying in forest land and in land covered by trees should be required to repair and re-vegetate the area in accordance with established forestry practices. No mining lease should be granted to any party, private or public, without a proper mine management plan appraised from the environmental angle and enforced by adequate machinery.

4.5 Wildlife Conservation - Forest Management should take special care of the needs of wildlife conservation, and forest management plants should include prescriptions for this purpose. It is specially essential to provide for "corridors" linking the protected areas in order to maintain genetic continuity between artificially separated sub-sections if migrants wildlife.

4.6 Tribal People and Forests - Having regard to symbiotic relationship between the tribal people and forests, a primary task of all agencies responsible for forest management, including the forest development corporations should be to associate the tribal people closely in the protection, regeneration and development of forests as well as to provide gainful employment to people living in and around the forest. While safeguarding the customary rights and interests of such people forestry programmes should pay special attention to the following:-

- One of the major causes for degradation of forest is illegal cutting and removal by contractors and their labour. In order to put an end to this practice, contractors should be replaced by institutions such as tribal co-operatives, labour co-operatives, government corporations, etc. as early as possible;

- Protection, regeneration and optimum collection of minor forest produce along with institutional arrangements for the marketing of such produce;

- Development of forest villages on par with revenue villages;

- Family oriented schemes of improving the status of the tribal beneficiaries; and

- Undertaking integrated area development programmes to meet the needs of the tribal economy in and around the forest areas, including the provision of alternative sources of domestic energy on a subsidised basis, to reduce pressure on the existing forest areas.

4.7 Shifting Cultivation - Shifting cultivation is affecting the environment and productivity of land adversely. Alternative avenues of income, suitable harmonised with the right land use practices, should be devised to discourage shifting cultivation. Efforts should be made to contain such cultivation within the area already affected, by propagating improved agriculture practices. Area already damaged by such cultivation should be rehabilitated through social forestry and energy plantations.

4.8 Damage to Forests from Encroachments, Fires and Grazing

4.8.1 Encroachment on forests lands has been on the increase. This trend has to be arrested and effective action taken to prevent its continuance. There should be no regularization of existing encroachments.

4.8.2 The incidence of forest fires in the country is high. Standing trees and fodder are destroyed on a large scale and natural generation annihilated by such fires. Special precautions should be taken during the fire season Improved and modern management practices should be adopted to deal with forest fires.

4.8.3 Grazing in forest areas should be regulated with the involvement of the community. Special conservation areas, young plantations and regeneration areas should be fully protected. Grazing and browsing in forests areas need to be controlled. Adequate grazing fees should be levied to discourage people in forests areas form maintaining large herds of non-essential livestock.

4.9 Forest-based Industries - The main considerations governing the establishment of forest-based industries and supply of raw material to them be as follows:

- As far as possible, a forests-based industry should raise the raw material needed for meeting its own requirements, preferably by establishment of a direct relationship between the factory and the individuals who can grow the raw material by supporting the individuals with inputs including credit, constant technical advice and finally harvesting and transport services.

- No forest-based enterprise, except that at the village or cottage level, should be permitted in the future unless it has been first cleared after a careful scrutiny with regard to assured availability of raw material. In any case, the fuel, fodder and timber requirements of the local population should not be sacrificed for this purpose.

- Forest-based industries must not only provide employment to local people on priority but also involve them fully in raising trees and raw-material.

- Natural forests serve as a gene pool resources and help to maintain ecological balance. Such forests will not, therefore, be made available to industries for undertaking plantation and for any other activities.

- Farmers, particularly small and marginal farmers, would be encouraged to grow, on marginal/degraded lands available with them, wood species required for industries. These may also be grown along with fuel and fodder species on community lands not required for pasture purposes, and by forest department/corporations on degraded forests, not earmarked for natural generation.

- The practice of supply of forests produce to industry at concessional prices should cease. Industry should be encouraged to use alternative raw materials. Import of wood and wood products should be liberalised.

- The above considerations will, however, be subject to the current policy relating to land ceiling and land-laws.

4.10 Forest Extension - Forests conservation programme cannot succeed without the willing support and co-operation of the people. It is essential, therefore, to inculcate in the people, a direct interest in forests, their development and conservation, and to make them conscious of the value of trees, wildlife and nature in general. This can be achieved through the involvement of educational institutions, right form the primary stage. Farmers and interested people should be provided opportunities through institutions like Krishi Vigyan Kendras, Trainers' Training /centres to learn agrisilvicultural and silvicultural techniques to ensure optimum use of their land and water resources. Short term extension courses and lecturers should be organised in order to educate farmers. For this purpose, it is essential that suitable programmes are propagated through mass media, audio-visual aids and the extension machinery.

4.11 Forestry Education - Forestry should be recognised both as a scientific discipline as well as a profession. Agriculture universities and institutions dedicated to the development of forestry education should formulate curricula and courses for imparting academic education and promoting postgraduate research and professional excellence, keeping in view the manpower needs of the country. Academic and professional qualifications in forestry should be kept in view for recruitment to the Indian Forest Service and the State Forest Service. Specialised and orientation courses for developing better management skills by in service training need to be encourage, taking into account the latest development in forestry and related disciplines.

4.12 Forestry Research - With the increasing recognition of the importance of forests for environmental health, energy and employment, emphasis must be laid on scientific of the research base as well as new priorities for action. Some broad priority areas of research and development needing special attention are:-

i) Increasing the productivity of wood and other forest produce per unit of area per unit time by the application of modern scientific and technological methods.

ii) Revegetation of barren/margin/waste/mined lands and watershed areas.

iii) Effective conservation and management of existing forests resources (mainly natural forests eco-system).

iv) Research related to social forestry for rural/tribal development.

v) Development of substitutes to replace wood and wood products.

vi) Research related to wildlife and management of national parks and sanctuaries.

4.13 Personnel Management - Government policies in personnel management for professional foresters and forest scientist should aim at enhancing their professional competence and status and attracting and retaining qualified and motivated personnel, keeping in view particularly the arduous nature of duties they have to perform, often in remote and inhospitable places.

4.14 Forest Survey and Data Base - Inadequacy of data regarding forests resources is a matter of concern because this creates a false sense of complacency. Priority needs to be accorded to completing the survey of forest resources in the country on scientific lines and to updating information. For this purpose, periodical collection, collation and publication of reliable data on relevant aspects of forests to modern technology and equipment.

4.15 Legal Support and Infrastructure Development - Appropriate legislation should be undertaken, supported by adequate infrastructure, at the Centre and State levels in order to implement the Policy effectively.

4.16 Financial Support for Forestry - The objectives of this revised Policy cannot be achieved without the investment of financial and other resources on a substantial scale. Such investment is indeed fully justified considering the contribution of forests in maintaining essential ecological processes and life-support systems and in preserving genetic diversity. Forests should not be looked upon as source of revenue. Forests are a renewable natural resources. They are a national asset to be protected and enhanced for the well-being of the people and the Nation.

(K.P. Geetha Krishnan)
Secretary to the Government of India

ANNEX 2 - GOVERNMENT INSTRUCTIONS ON INVOLVING COMMUNITIES IN REFORESTATION

No. 6-21/89-PP
Government of India
Ministry of Environment and Forests
Department of Environment, Forest and Wildlife
Paryavaran Bhawan, CGO Complex, B-Block

Lodhi Road, New Delhi
Dated: 1st June, 1990

To

The Forest Secretaries
(All States/UTs)

Subject:- Involving of village communities and voluntary agencies for regeneration of degraded forest lands.

Sir,

The National Forest Policy, 1988 envisages people's involvement in the development and protection of forests. The requirements of fuelwood, fodder and small timber such as house building material, of the tribal and other villagers living in and near the forests, are to be treated as first charge on forest produce. The policy document envisages it as one of the essentials of forest management that the forest communities should be motivated to identify themselves with the development and protection of forests from which they derive benefits.

2. In a D.O. letter no. 1/88-TMA dated 13th January, 1989 to the Chief Secretary of your State, the need for working out the modalities for giving to the village communities, living close to the forest land, usufructory benefits to ensure their participation in the afforestation programme, was emphasised by Shri K. P. Geethakrishnan, the then Secretary (Environment and Forests).

3. Committed Voluntary Agencies/NGOs, with proven track record, may prove particularly well suited for motivating and organising village communities for protection, afforestation and development of degraded forest land, especially in the vicinity of habitations. The State Forest Departments, Social Forestry Organisation ought to take full advantage of their expertise and experience in this respect for building up meaningful people's participation in protection and development of degraded forest lands. The Voluntary Agencies/NGOs may be associated as interface between State Forest Departments and the local village communities for revival, restoration and development of degraded forests in the manner suggested below:-

I. The programme, should be implemented under an arrangement between the Voluntary Agency/ NGOs, the village community (beneficiaries) and the State Forest Department.

II. No ownership or lease rights over the forest land should be given to the beneficiaries or to the Voluntary Agency/NGO. Nor should the forest land be assigned in contravention of the provisions contained in the Forest (Conservation) Act, 1980.

III. The beneficiaries should be entitled to a share in usufructs to the extent and subject to the conditions prescribed by the State Government in this behalf. The Voluntary Agency/NGO should not be entitled to usufructory benefits.

IV. Access to forest land and usufructory benefits should be only to the beneficiaries who get organised into a village institution, specifically for forest regeneration and protection. This could be the panchayat or the Co-operative of the village, with no restriction on membership. It could also be a Village Forest Committee. In no case should any access or tree pattas be given to individuals.

V. The beneficiaries should be given usufructs like grasses, lops and tops of branches and minor forest produce. If they successfully protect the forest, they may be given a portion of the proceeds from the sale of tree when they mature. The Government of West Bengal has issued orders to give 25% of the sale proceeds to the Village Forest Protection Committees. Similar norms may be adopted by other States.

VI. Area to be elected for the programme should be free from the claims (including existing rights, privileges, concession) of any person who is not a beneficiary under the scheme. Alternatively, for a given site the selection of beneficiaries should be done in such a way that any one who has a claim to any forest produce from the selected site is not left our without being given full opportunity of joining.

VII. The selected site should be worked in accordance with a Working Scheme, duly approved by the State Government. Such scheme may remain in operation for a period of 10 years and revised/renewed after that. The Working Scheme should be prepared in consultation with the beneficiaries. Apart from protection of the site, the said Scheme may prescribe requisite operations, e.g. inducement to natural regeneration of existing root stock, seeding, gap filling and whenever necessary, intensive planting, soil-moisture conservation measures etc. The Working Scheme should also prescribe other operations e.g. fire-protection, maintenance of boundaries, weeding, tending cleaning, thinning etc..

VIII. For raising nurseries, preparing land for planting and protecting the trees after planting, the beneficiaries should be paid by the Forest department from the funds under the Social Forestry Programme. However, the village community may obtain funds from other Government agencies and sources for undertaking these activities.

IX. It should be ensured that there is no grazing at all in the forest land protected by the village community. Permission to cut and carry grass free of cost should be given so that stall feeding is promoted.

X. No agriculture should be permitted on the forest land.

XI. Along with trees for fuel, fodder and timber, the village community may be permitted to plant such fruit trees as would fit in with the overall scheme of afforestation, such as aonla, Imli, mango, mahua, etc. as well as shrubs, legumes and grasses which would meet local needs, help soil and water conservation, and enrich the degreased soil/land. Even indigenous medicinal plants may be grown according to the requirements and preferences of beneficiaries.

XII. Cutting of tree should not be permitted before they are ripe for harvesting. The forest dept. also should not cut the trees on the forest land being protected by the village communities except in the manner prescribed in the Working Scheme. In case of emergency needs, the village communities should be taken into confidence.

XIII. The benefit of people's participation should go to the village communities and not to commercial or other interests which may try or other interests which may try to derive benefit in their names. The selection of beneficiaries should, therefore, be done from only those families which are willing to participate through their personal efforts.

XIV. The Forest department should closely supervise the work. If the beneficiaries and/or the Voluntary Agency/NGO fail or neglect to protect the area from grazing encroachment or do not perform the operations prescribed in the Working Scheme in a satisfactory manner, the usufructory benefit should be withdrawn without paying compensation to anyone for any work that might have been done prior to it. Suitable provisions in the memorandum of Understanding (MOU) for this purpose should be incorporated.

Yours faithfully,

Sd/-
(Mahesh Prasad)
Secretary to Government of India

Copy for information and necessary action to:-

1. Principal Chief Conservator of Forest/Chief Conservator of Forest (All States/UTs)

2. Additional Secretary, National Wasteland Development Board, Ministry of Environment and Forests, New Delhi.

3. Chief Conservator of Forests (Central) of all Regional Offices located at: Bhubaneshwar, Bangalore, Bhopal, Shillong, Lucknow and Chandigarh.

4. All DIGs including N.W.D.B., New Delhi.

5. All Officers of the Ministry of Environment and Forests.

Sd/-
(K. M. Chadha)
Joint Secretary to Govt. of India

ANNEX 3 - SHARING OF FOREST IN JOINT FOREST MANAGEMENT (JFM)

Sl. No	State	Date of Notification	Forest Category	Institutions	Benefit Sharing
1.	Andhra Pradesh	28.08.92	Degraded Forest	Van Samrakshana Samithi	1. First preference to wage employment 2. NTFP: All usufructs free except reserve items for which members have right to collect for delivery to FD against payment. 3. Timber: Instructions would be issued later on.
2.	Bihar	08.11.90	Degraded (Protected) Forests	Village Forest Management and Protection Societies	1. NTFP: Dry branches, grasses and leaves free other MFP available on market price. 2. Timber: 33% income from timber deposited as village development fund.
3.	Gujrat	13.03.91	Degraded forests	Co-operative Societies	1. NTFP: All usufructs free. 2. Timber: 25% of final harvest if financed by government. 50% of final harvest if financed by own or other sources.
4.	Haryana	13.06.90	Degraded Forests and Strip Forests	Hill Resource Management Societies (HRMS) in degraded forests	1. NTFP Grasses and water free. Other and Timber: Commercial MFPS are leased to HRMS. Net income from sales of timber, katha, food and medicinal herb, etc. would be shared with HRMS which may invest back into the joint management area. 2. Strip: 50% trees shared by farmers having an adjoining agricultural fields.
5.	Himachal Pradesh	12.05.93	Protected Forest and Village Common Lands	Village Forest and Development Committee	1. NTFP: Entire usufructs free. 2. Timber: 25% of net sale of final harvest will be given to VFDC & kept in common fund as Village Development Fund.
6.	Jammu & Kashmir	19.03.92	Degraded Forest	1. Village (Rehabilitation of degraded forest)	1. NTFP: All usufruct free. 2. Timber: 25% of net revenue from final

Sl. No	State	Date of Notification	Forest Category	Institutions	Benefit Sharing
				committee. 2. Village (Protection & Management) committee.	harvest.
7.	Karnataka	12.04.93	Degraded Forest: Canopy less than 25% tree patta scheme on strips and institutional and community line.	Village Forest Committee.	1. NTFP: All grasses, lops tops and leaves free. 2. Timber: Degraded forest: 50% to government, 25% to beneficiaries through VFC and 25% to village forest development. Tree patta: 100% usufruct free 75% of final to beneficiaries and 25% to Government. Community/Institution: 50% to institution/community and 50% to forest department.
8.	Madhya Pradesh	10.12.91	Degraded Forest and sensitive to damage	Forest Protection Committee.	1. NTFP: All usufructs. 30% of net income from nationalised MFP. Entire quantity of fuelwood, timber (Poles) and bamboo from thinning, cleaning etc. 2. Timber: 30% of total quantity from final harvest.
9.	Maharastra	16.03.92	Degraded and Barren forest and similar rural lands.	Forest Protection Committee	1. NTFP: All MFP free except cashew and tendu. 2. Timber: Distribution methods differ from area to area depending upon scheme.
10.	Orissa	03.07.93	Degraded RF & PF	Van samrakshana samiti	1. NTFP: All usufructs except that leased out by forest department. All interim yields. 2. Timber: 50% of net sales proceeds.
11.	Punjab	14.07.93	Government Forest, Private and Community Forest under LPA 1990.	Forest Protection Committee	1. NTFP: All usufructs free except bhabhar & fodder grass given to local people on cheaper rates. 2. Timber: All produce to

Sl. No	State	Date of Notification	Forest Category	Institutions	Benefit Sharing
					go to owner to private and community lands. No instruction about government forest.
12.	Rajasthan	16.03.91	Degraded Forest	Tree growers co-operatives: Forest labour co-operative societies and Village Forest Conservation and Development Society.	1. NTFP: all usufruct free except bamboo. 2. Timber: 60% of net income to societies.
13.	Tripura	20.12.91	Degraded Forests	Forest Protection and Regeneration Committee.	1. NTFP: All usufructs free of cost. 2. Timber: All bonafide needs free and 50% of net surplus revenue.
14.	Uttar Pradesh	08.08.95	Degraded Forest: Community land and strips along roads, canals and rails.	Joint forest management committee	1. NTFP: All usufructs free but in proportion to the efforts of member. 2. Timber: Instruction are to be issued.
15.	West Bengal	12.07.89	Degraded Forest	Forest Protection Committees	1. NTFP: Cashew, 25% sal seeds, kendu leaves on approved tariff. Rest usufructs free. 2. Timber: 25% of net income except in certain areas.
16.	Tamilnadu				
17.	Kerala				
18.	Nagaland				

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APFSOS/WP/03	The Implications of the GATT Uruguay Round and other Trade Arrangements for the Asia-Pacific Forest Products Trade
APFSOS/WP/04	Status, Trends and Future Scenarios for Forest Conservation including Protected Areas in the Asia-Pacific Region
APFSOS/WP/05	In-Depth Country Study - New Zealand
APFSOS/WP/06	In-Depth Country Study - Republic of Korea
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