DEFORESTATION AND DEVELOPMENT
A DISTRICT LEVEL ANALYSIS

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Dedicated to

My loving Parents

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Chapter 1

INTRODUCTION

Chapter 1

INTRODUCTION

Billions of years ago the earth was a fiery ball. Slowly it cooled to a harsh, inhospitable, forbidding terrain. The plants with their green touch converted the earth into a living planet replete with forests. The forests also witnessed the birth of humans. It provides the shelter and food and several many things to survive the human life. Other than for their beauty, forests are highly responsible in keeping and sustaining global ecosystems. In fact, much of the quality of life we enjoy, we owe to the forests. It is also the home of more than half of all creatures and organisms in this planet. From food to life-saving medicines, forests give mankind a variety of gifts that contribute much to our quality of life.

Sadly, today, the scenario has completely altered. The forests are at the mercy of humans who are capable of land are indeed destroying and exploiting the green wealth at the horrifying speed. In countries like India, forests were omnipresent. But today, they form just 19.27% to 20.6% of the landmass with their quality deteriorating with every passing day. It is high time that we humans, intelligent beings we are, realize that by destroying forests we are spelling our own doom. Fortunately, and of late, there is a growing realization that forests are essential for the survival of the human race. And recent efforts at protecting this natural heritage have been quite encouraging.

In the history of India forests has always been an important for the living people for their economy and livelihood and many of the epic and religious guru caurahed the people to planting the trees and protect it. The Agni Purana, written about 4000 years ago, stated that man should protect trees to have material gains and religious blessings. Around 2500 years ago, Gautama Buddha preached that man should plant a tree every five years. Sacred groves were marked around the temples where certain rules and regulations applied. It was Chandra Gupta Maurya who came to power around 300 B.C and realized the importance of forests. Therefore he appointed a high officer to look after the forests. Asoka stated that wild animals and forests should be preserved and protected. He launched programmes to plant trees on a large scale. When the British came, they gradually started using these forests as a resource for revenue generation. They made a rule in which the trees could not be felled without prior

permission, and this in turn made them the sole owner and users of the valuable Indian forests. These forests were the richest resources for the British colonies.

Development process has started in India from a long history, but it was made for the benefit for the British rule, which was exploiting the resources of the country and hardly focused on ecological balance and environmental concerns. But the when India got independence, conservation of the forest area not only for maintaining the ecological balance of India, but also the life of millions of peoples who were dependent on the forest area for their livelihood (food, fuel wood, medicine, fiber, income, etc.) as well as the religious ethics. Forests are probably among one of the most mismanaged resources in many countries. This is because forests are seriously undervalued; many of their environmental benefits are not captured by market values. The rapid rates of deforestation in the last decades are largely a result of the spillover effects of poor policies in other sectors as well as lack of governance in the forest sector itself. Helping governments to improve economic policy and the management and governance of the forest sector is therefore an important priority, including forest concessions policy and allocations.

Efforts to bring about credible systems for socially, ecologically and economically sound management of production forests should be coupled with systems for independent certification and Monitoring. Identifying and promoting markets for local, regional and global markets for forest products is a related priority. Deforestation has always been a practice of many developing communities and has contributed greatly to civilization as we know it today. Unfortunately, much of the ill effects of deforestation are caused by greed, bad agricultural practices and government neglect and some bad process of recent development processes. Deforestation is recognized as one of the most significant component in LULC (land use land cover) and global changes scenario. It is imperative to assess its trend and the rates at which it is occurring. The changes will have long-lasting impact on regional climate and in turn on biodiversity.

These development activities can affect the total forest cover, but the growths of forest areas are not only dependent on these developmental parameters, but also on the process of afforestation and reforestation activities. The current study is based on the relationship between these development indicators in the relation with forest growth rate.

The total forest area has been changed within previous two decades in terms of their quality and quantity; my work will also focus the change in the total forest in India "between" 1991 to 2009. My study will also see the total employment under the forest area and its related industries to explaining the structure of employment at the forest site. The trend forest deforestation in India in last two decades has experienced some rapid change in some of the states, which is expected to be affected by the different process of activities, which can broadly be categorized under growth-induced processes and poverty induced ones. The former, or the growth-induced processes, among other things, are determined by the changes in number of industries and nature of these industries, the ones which directly and indirectly impact demand on forest resources. And other are poverty-induced processes, which again puts some demand on forest areas and resources and are based primarily on the economy of local people and their dependence on the forest. Both processes may lead to deforestation in various states of India. Logging is among the major formal activities impacting the forest cover areas where a large number of people engaged in the forest sector are involved for their economy, but a substantial proportion are engaged in the informal sector affect the process of deforestation activities.

Private sector investment in the forest sector in developing countries is seven times greater than the total official development assistance (about $US1.5 billion) for the forest sector. This makes engaging the private sector essential in promoting socially and environmentally sustainable forest sector development in Bank client countries. Since publication of the Bank's Forests Strategy and Policy in 2002, there has been a rapid escalation of International Finance Corporation (IFC) investment in forest based industries. The IFC is giving special emphasis to both large and smaller scale industries and to projects that will contribute to the three pillars of the Bank's Forests Strategy. A particular concern of Bank management has been to ensure that Bank Group supported investments in private sector forest industrial companies meet the requirements of Bank Operational Policy 4.36. The Policy establishes guidelines for mandatory independent certification of private company forest harvesting and management operations. Now the other major rule and regulation is being implemented in the region of high forest

concentration. India is also trying to establishing the industries in those regions, which naturally not well developed and barren.

1.1 STATEMENT OF THE PROBLEM

In the recent period of time the economic development is taking part rapidly in the entire world with its globalised character. Gross domestic production is increasing with the per capita income in most countries. In the last 350 years, increases in worldwide per capita incomes have been accompanied by substantial declines in forest cover. But the experience of developing economy like India can show the different picture in terms of associations between economic development and the forest growth. Development activities are directly or indirectly related to the forest growth rate, primarily because of the space demands imposed by the industries, constructional activities, settlements, mining & quarrying activities, consumption or generation of power and spreading of transportations, those all activities are getting spaced at the cost of forest removal.

India is one of the most populated countries in the world, which needs more land for agricultural activities, high level of population density and urbanization process and that leads to removing the forest cover for more space to live. The most of the people from rural India are still engage in the forestry related activities for their livelihood, but those people are engage in the secondary work, forest based industry. In the economic reform period government opened the market at global level, which attracted the foreign investment part of which was also directed towards the areas that have forest concentration, a phenomenon that is true for mining and other natural resource-rich areas. These development activities are affecting the traditional customs and lifestyle of local people and their character of employment. In the condition of their dependency on the forest area, the local people were also engaged in protecting and conserving the forest for their future prospective. In other ways high population growth demands more land for the agricultural activities, the land under forest cover came in more pressure of high population density. In the forest concentrated regions, which is facing a continuous deceleration in growth in post economic reform period, there are also associated problems related to decline in forest related employment.

So there is need to study the impact of levels of development under new economic policy adopted since 1991 on growth of forest area and analyze it from a geographical perspective and temporal change in terms of growth, distribution, composition etc. It is also necessary to make a distinction between the development processes in forest and non-forest areas, in the context of post-economic reform period. Our purpose is also to identify the nature of process that lead to qualitative and quantitative change in the forest cover.

1.2 A REVIEW OF LITERATURE

There are several studies that have been done related to this topic, and much of this large body of literature have been carried out at the international level, and conduct comparative analysis of trends among several countries; many of these relate population growth, economic development and deforestation. There In some of the studies, HDI instead of economic development has been linked with the deforestation.

Human population and development activities affect the rate of deforestation in biodiversity hotspots in deferent countries (Jha, S. and Bawa, K.S.2005). They quantify the effect of human population growth and development on rates of deforestation and analyzed the relationship between these causal factors in 1980s and 1990s. They also compared the averages of population growth, human development index (HDI, which measures income, health, and education), and deforestation rate and computed correlations among these variables for countries that contain biodiversity hotspots. During their study, they found that when population growth was high and HDI was low there was a high rate of deforestation, but when HDI was high, rate of deforestation was low, despite high population growth. The correlation among variables was significant for the 1990s but not for the 1980s. Based on the changes in HDI and deforestation rate over time, we identified two drivers of deforestation: policy choice and human-development constraints. In their study they also found some of the important things are to prevent deforestation in the countries that have such constraints transfer of material and intellectual resources from developed countries may be needed. Popular interest in sustainable development in developed countries can facilitate the transfer of these resources.

The methodology used by them in their study is more important, they found the population growth as an important factor to decide deforestation activities, and in other side they gave the importance of HDI as an economic development factor. The HDI data was collected by the UNDP, which is published every year 1975 onwards. They also collected the data of hotspot area, which is increasing with time to time. Hotspots cover only 2.3% of the Earth's land surface, but they include 50% of the world's vascular plants species and 42% of the world's species in four vertebrate groups. Their study is country wise study and they examined 30 countries in Asia, Africa, and Latin America and considered each as unit of analysis for three conceptual and practical reasons. Data on population growth, HDI, and deforestation rate for the 30 countries (7 in Africa, 9 in Asia, and 14 in Latin America) were compiled from World Bank (1992, 2002), UNDP (2001), and WRI (1997), and World Bank (2001) sources, respectively. They used t tests to compare groups of countries and computed correlation coefficients for the variables. They tested the significance of income inequality within countries for population growth by calculating correlation coefficient for population growth and the Gini coefficient (measure of income inequality within countries).

In their study they collected the 30 countries as sample countries and calculated the correlation –coefficient value among two variables of two time period, then found the t-test of each correlation-coefficient value.

In another important study the relationship between trade policies, economic growth and deforestation has been explained, where it combines elastic ties from micro studies with estimates from a cross-country analysis to identify structural relationships explaining deforestation in Brazil, Indonesia, Malaysia, and the Philippines.(Ramon Lopez and Gregmar I. Galinato,2005). Economy-wide factors such as trade openness and economic growth explain an important portion of the variation in three key factors of deforestation, poverty, agricultural expansion, and road building. An important channel through which trade policy affects forests in all four countries is agricultural expansion. Economic growth has a negative and relatively large impact on forest cover. (JEL). Among the many factors analyzed, the roles of trade policies and economic growth have been focal points of the literature. In this study deforestation is explained by its direct causes, as identified by micro studies: namely, poverty, road infrastructure, and crop

expansion. The effects of poverty, road, and crop expansion on deforestation have been estimated by the micro studies. In this study the same method has been applied but the variable has been changed and it's also a country wise analysis, where the parameters of economic growth have been changed, those are poverty, agricultural expansion and road buildings. It studied the south East Asian countries, which has dense forest cover and in recent period of time the deforestation activity has been occurred due to the different development activities.

GDP per capita has been found to significantly affect forest cover through poverty, crop area, and, to a lesser extent, paved roads channel in all four countries, with the poverty-reducing effect having a positive influence on forests and the road expansion and crop effects having a negative impact on forests. In all four countries, the negative effects dominate, and thus economic growth causes a reduction on forest area, with an elasticity of -0.76 in the Asian countries and -0.06 in Brazil. This study has analyzed the effect of economic growth and trade policy on forest cover, focusing on three major channels: roads into forested areas, agriculture expansion into forested areas, and poverty. A significant contribution of this study has been to provide a structural approach in examining the role of economy-wide policies on deforestation as opposed to the reduced form approach adopted by previous studies. This approach has allowed us to disentangle the different channels through which trade openness, capital openness and economic growth affects forest cover.

When we see the other studies related to this topic, then most empirical studies have relied on aggregate cross- country and/or time-series data to analyze the effect of income, policies, and country characteristics on deforestation (*Cropper and Griffiths 1994; Shafik 1994a; Southgate 1994; Antle and Heidebrink 1995; Deacon 1999; Koop and Tole 1999; and Barbier and Burgess 1997, 2001*). The usual approach in these studies has been to assume a reduced form specification for a deforestation equation without trying to disentangle the various channels through which in- come and other factors can affect deforestation.

Two prominent analysts of deforestation have concluded that the FAO data on forest cover is quite unsatisfactory to apply econometric analyses for any study on deforestation (Angelsen and Kaimowitz 1999). In part because of the dissatisfaction with

the cross-country data, a number of recent studies of deforestation have used local survey data, sometimes in combination with remote-sensing information, on a micro area basis *(Panayotou and Sungsu- wan 1994; Pfaff 1999; Chomitz and Thomas 2003; Cropper, Puri, and Griffiths 2001; Vosti et al. 2001; and Deininger and Min- ten 2002).*

One studied has been done by the Richard Haeuber, (July 1993) which has focused on the development and deforestation in context of India, where some theoretical aspects have been analyzed. During the last 20 years, the Indian government has pledged to protect its environment and stop the depletion of its natural resource base.1 Despite apparent government resolve to address India's environmental problems, only modest progress has been made; problems such as air and water pollution, salinization and water logging of soil, soil erosion, and deforestation continue at a fast pace. Of these environmental problems, deforestation has plagued India since the days before its independence.

Most of the study related to this topic is the economic development and environment. There a study has been done by the Theodore Panayotou2003(economic growth and the environment), which explains the relationship between a steady increase in incomes and environmental quality. It also discusses the environmental Kuznets curve: a development-environment relationship, where it explains three time period of economic growth, in pre industrial economies the environment degradation was low but in industrial growth stages it was highest and it again came down in the period of post industrial economies (service economies).

The nature of environmental problems depends upon the level of economic development, the nature of industrialization, the degree of urbanization and the effectiveness of public policies. In this article author has examines the impact of population growth and economic development separately, but with reference to the conjectured global warming between 1991 and 2100, with special reference to India. (Global Population Growth, Economic Development and Environmental Impact Case-Study of India, 1991-2100; Mahinder Chaudhary Dec. 1995.

A micro study has been done in the context of India, which analyze the deforestation activities in Madhya Pradesh with reference to the economic activities. It's mainly concentrated in the Chhattisgarh region by *S.C. Lahiry (March 1996)*. He has

discussed many aspects of industrial development and their importance, and focuses on the objective of benefitting the maximum population in that region, while providing the employment and economic access. It has also been discussed in the past that environmental aspects of industrial developments were usually not taken into account seriously, as it was believed that this was almost inevitable and almost necessary for the economic development. In the early period of time the environment was ignored in the shed of rapid economic development and industrial development, but in the period of 1972, After Stockholm Conference of 1972, environment comes in the issue of discussion. Even the erstwhile underdeveloped countries have realised the environmental degradation can be disproportionately more than economic development unless suitable safeguards.

Finally literature on the issue of deforestation discusses the political aspect of the economic development and environment degradation in micro regions of India, where government policies were not clearly directed on deforestation even after the impact of environment degradation was on surface to see (Ramón López and Gregmar I. Galinato 2005, V. Ratna Reddy ,1995)

To sum up, most of literature discussed above in some way or the other analyses the relationship between economic development, population growth and environment degradation. The indicators of economic development are varied in different studies, and hence the impacts of economic development on deforestation have also somewhat varied in these studies. Practically all the studies have been conducted at the country level for different parts of the world, like south Asia, Africa and Latin America. The major factor of environmental degradation was based on the deforestation activities.

1.3 RESEARCH QUESTIONS

Although, the distribution and growth of forest area in post reform period has been already discussed at state level by the forest survey of India and other research scholars in their earlier works, there has been no systematic effort to link the deforestation and processes of development. In the present work an attempt has been made to analyze the growth, distribution and change of forest area in the districts of India both in terms of qualitative and quantitative change in post reform period at the years of 1991-99 and

2001-09. Attempts have been made to identify the districts of high growth rate of forest area in all types of forest area open and dense both.

The present work also tries to provide appropriate explanation on the impact of development activities on the growth rate of forest areas in those districts especially, where forest cover are high. Further the districts have been divided in the four major physiographic regions and the analysis of forest growth trend has been analysed within this framework. In the recent period of time in post reform period, the economy has grown faster and greater demands on both land and forest resources have most of the economic activities have taken place, so it is very important to see the impact of development activities on the total change in forest areas. If there is positive impact, which regions are getting more affected by them and what are the activities, which are more responsible for the negative growth of forest? Previous studies have shown the impact of population change, growth in GDP and industrial growth on the growth rate of forest areas; here we want to see the other development activities, which are directly related with the forest growth in India, like population density, road density, electrification, agricultural area and urbanisation.

Again , a large number of population are dependent on the forest area for their livelihood , so my study to see the composition of employment in the forestry and related activities, because there are three major activities, where people are involve in the forest area, those are reforestation, gathering and logging process, but among those activities only logging process are responsible for the removal of forest area, so we want to see that, what are the share of different kind of activities under forestry and related activities?

1.4 OBJECTIVES

Considering the need for the study and major emerging issues related to the forest area the following objectives has been chosen for the study-

1. To study the qualitative and quantitative change in the forest area during post economic reform period (1991-2009).
2. To examine the impact of development activities or levels of development on the growth rate of forest areas at district level.

3. To find consider the growth induced and poverty induced activities and examines their relationship with the growth rate of forest area at regional level.

1.5 DATA SOURCE

To analyse the growth of forest in India, forest survey of India reports, which publish quantitative and qualitative level data at district level has been used. NSSO data has been used for the employment in rural forestry, logging and related activities.

- Forest survey of India (1991,1999,2001.2009)
- Census of India (2001).
- N.S.S.O. (64^{th} round, Employment and unemployment situation India, 2007-08)
- C.M.I.E.(Centre for Monitoring of Indian Economy, 2001-02)

CMIE publishes the data of different development indicators at district level has been used to levels of development in the districts of India. Some of the demography data has been taken from census of India, 2001 for regression analysis.

1.6 METHODOLOGY

Using secondary data from above mentioned sources, the analysis of growth, change and distribution of forest has been done during post reform period. The data of levels of development has been taken from the CMIE (centre for monitoring the Indian economy), which provide the data at district level of development indicators. By using the census 2001, considered the data of population density and percentage urban population in the districts. Growth in the forest area of all districts has been calculated using this formula-

$r = ((Yf-Yb)\ Yb)\ 1/n$

Where,

r = growth rate

Yf= final year

Yb= base year

N= number of years

Also the comparisons have been made "between" (1991-99) & (2001-09) period in the growth of forest areas. State wise and district wise distribution, change and growth of all types of forest (dense forest, open forest & scrub) has been analysed by the given

data of forest survey of India report of 1991, 1999, 2001 and 2009. Growth rate of forest area has been analysed of the period (1991-99) & (2001-09), then the comparative analysis has been done. The total change, growth and distribution have been discussed on the basis of their qualitative (total change in forest areas) and quantitative (total change in the dense, open& scrub areas).

Further in this study the indicators of levels of development are correlated with the growth rate of forest area in the year of 1991-99, then Z scores have been computed to analyse the regression between index of development and growth rate of forest. This analysis has been done at the regional level as stated before. These regions are...

a) Himalayan region
b) Indo- Gangetic region
c) Southern plateau
d) Coastal region

CMIE (centre of monitoring for Indian economy) provided the data of levels of development at district level. The indicator for levels of development from CMIE has been chosen of following for the year of 2000.

a) Gross sown area (% of RA).
b) Village electrified (in %).
c) Road density(in 100km square)

Data of population density and percentage urban population has been collected from the census of India 2001. Sectoral composition of rural forestry, logging & related activities employment is analysed by extracting the share of each sub sector of it from total rural employment. For employment in forestry related activities sectors in India, overall estimates from NSS reports have been taken. Regional variations in forestry related employment in rural India have been analysed for recent year 2007-08. According to the NIC classification the total employment engaged in forestry, logging and related service are classified in six parts-

0200-FORESTRY, LOGGING AND RELATED SERVICE ACTIVITIES

02001 Growing of standing timber: planting, replanting, transplanting, thinning and conserving of forests and timber tracts, Operation of tree nurseries.

02002 Logging: logging camps and loggers primarily engaged in felling timber and Producing wood in the rough such as pit props, split poles, pickets, hewn railway ties or fuel wood.

02003 Gathering of tendu leaves

02004 Gathering of other wild growing forest materials (balatta and other rubber-like gums; cork; lac, resins and balsams; vegetable hair and eel grass; acorns and horse- chestnuts; mosses etc.) Including fuel/firewood.

02005 Forestry service activities: timber cruising, timber evaluation, fire fighting and forest management including afforestation and re-forestation

02006 Logging service activities: transport of logs in association with logging chiefly within the forest.

The all above categories explained is further classified in three major parts on the basis of their nature of employment, because in the above mentioned categories, people are involve in the three kinds of activities, that relates to afforestation or reforestation, gathering process and logging activities. So a further aggregation has been done under these three heads, i.e. afforestation or reforestation (2001+2005), gathering process (2003+2004) and logging activities (2002+2006).

The above employment at individual level has been used for the logistic regression analysis with the levels of development at regional level has been done to find out the factors affecting participation of workers in forestry, logging and related activities.

1.7 ORGANISATION OF THE STUDY

The study is organised into five chapters. Chapter one introduces the research work. Chapter two discusses the changes, growth and distribution of forest area in the state, and

districts of India during post reform period (1991-99) & (2001-09). This chapter also provides a detailed analysis of growth, distribution, & change of types of forest. Chapter three discusses the links between levels of development and growth rate of forest areas in the different physiographic regions of India. This chapter also discuss the impact of development activities on the forest regions. Chapter four is devoted to the analysis of share of employment in the forestry, logging and related activities. This chapter also deals with the distribution of different kind of rural employment involved under the forestry related activities, like reforestation, gathering & logging activities. It also examines the relation between the share of employment under forestry related activities and growth rate of forest areas. Finally, chapter five reviews the conclusions of chapter two, three and four. Chapter five also contains some suggestions for protecting the forest area in the stream of development activities with the regenerating, planting and promoting the peoples for the afforestation and reforestation activities.

CHAPTER-2

THE TREND OF DEFORESTATION IN INDIA

A DISTRICT-WISE ANALYSIS BETWEEN 1991 to 2009

CHAPTER-2

THE TREND OF DEFORESTATION IN INDIA

A DISTRICT-WISE ANALYSIS "BETWEEN" 1991 TO 2009

2.1 Introduction

This chapter deals with the changes growth and structure of forest areas in India in different period of time 1991 to 2009. As stated earlier forest is an important not only for the natural or environment balance but also for the livelihood for the people. The nature of forest growth during these periods of time is such that it shows a growth in overall growth of forest area in all classes of forest areas. Moreover , betterment of forest cover of dense and open forest area are the other features of impact of better plan and management with new policy for forest protection by the help of local communities. Most of the studies on talks about a decline of forest after independence, yet it is important to see the change and its structure after the post reform period. It is important to see the changes at district level of qualitative changes and growth of forest area in all districts of India. Here the structure of forest areas refers to change the forest growth and distribution of forest cover and see the pattern of land utilization within a period of time.

India is one of the countries where natural resource is the major source for the livelihood for the major class of population. Forest is one of the important natural resources, which is not important only for the livelihood for the people but also for the nature and environment protection. Forests in India have always been one of the richest resources. Indian forests are ancient in nature and composition. India was once covered with dense forests. There is enough evidence to show this. The fact that they have existed for very long time is proven from the ancient texts all of which have some mention of the forests. The people honored the forests and a large number of religious ceremonies centered on trees and plants.

When we see the recent change and trend of forest cover in India, then we will find some of the complex picture, because somewhere there is rapid growth of forest and other side it is declining. The trend of deforestation in India in last two decades has

found some rapid change in some of the states, which is considered to affect by the different process of activities, either that is growth induced in economy, industries & population and poverty induced processes. In India there are two kind of activities which can potentially affect the process of deforestation, one is growth induced, which determined by the change in number of industries and total employment in that particular industries in a certain period of time. And other is to poverty induced processes, which based on the economy of the local people and their dependence on the forest. It may be noted here that protection of forests halt both processes, and thus it is worthwhile to enquire into the impact of both kinds of processes on deforestation. Logging is the major activities around the forest cover areas, where the large number of population are involved for their economy, but most of them are engaged in the informal sector affect the process of deforestation activities.

2.2 **Growth and Distribution Scenario of Forest In India**

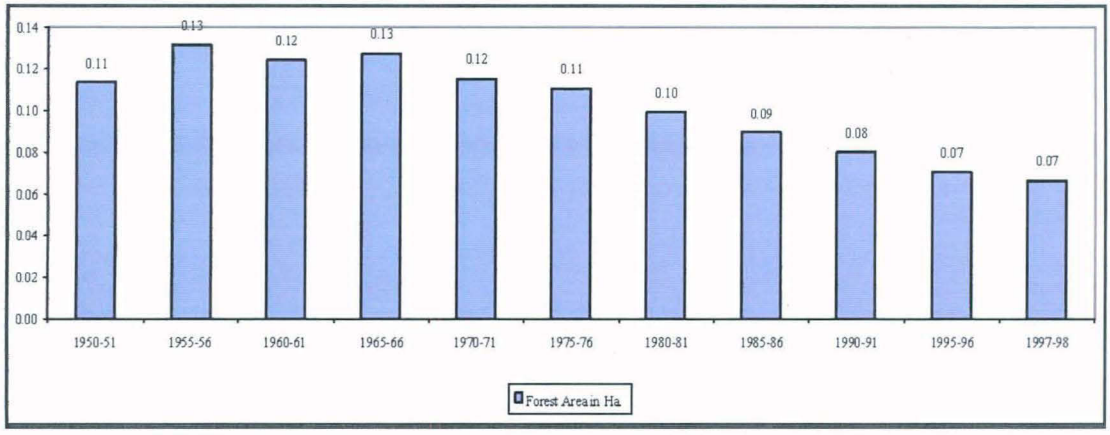
2.2.1 **History of Forest Change in India**

Indian development started through the five year plan, which consist the different aspect of the development, since forest was the major natural resource, then government also become careful towards the proper forest development with the change in economy. In India the recorded forest area in 1950-51 was reported to be 68 million ha and increased to 75 million ha in the early 1980s due to consolidation. The forest area was further reported to be 76.5 million ha in 1997. India possesses around 16 percent of the world's population and 15 percent of world's livestock, with only 2.4 percent of the world's land area and 1.7 percent of the world's forest stock. Obviously, land and forest resources are not commensurate with the proportionate burden of population and livestock on India's soil. If we see the land cover pattern of previous two decade (1991-2009) in India, then we will be analyze the real picture of changes in the different types of vegetation cover.

As per the Forest Survey of India assessment in 1997, India's total notified forest area is 76.5 million hectares, which is 23.3% of a total geographical area of 328.7 million hectares. Estimated forest cover, as per the estimate of the Forest Survey of India, is only 63.3 million hectares, which is just 19.3% of its geographical area and is way below the

stipulated target of 33% by the National Forest Policy document of 1988.

Figure 2.1-Per Capita Availability of Forest in India from 1950 To 1998.



As shown in figure 2.1, in India the per capita availability of forest area has decreased from 0.11 to 0.07ha.which is cause of the fast level of deforestation in country. In the period of 1950 to 1965, there has been fluctuation in the per capita availability of the forest area but after the 1965, there has been rapid decline in per capita availability of forest areas.

Table 2.1 Per Capita Forest Area in 1997 (sq.k.m.)

STATES	PER CAPITA FC (IN HA)	STATES	PER CAPITA FC (IN HA)
Andhra Pr.	0.07	Meghalaya	0.88
Assam	0.11	Mizoram	2.72
Bihar	0.03	Nagaland	1.18
Goa	0.11	Orissa	0.15
Gujarat	0.03	Punjab	0.01
Haryana	0	Rajasthan	0.03
H.P.	0.24	Sikkim	0.77
J.K.	0.26	Tamil Nadu	0.03
Karnataka	0.07	Tripura	0.2
Kerala	0.04	Uttar Pradesh	0.02
M.P.	0.2	West Bengal	0.01
Maharashtra	0.06	A. & N. Island	2.71
Manipur	0.95	Arunachal Pr.	7.93
		All India	**0.07**
Data source – Forest survey of India			

According to the table 2.1, the per capita forest area in Indian states 1997, which shows the very less distribution in West Bengal, Tamil Nadu, Punjab, Uttar Pradesh, Maharashtra, Kerala, Karnataka, Haryana, Gujarat, Bihar and Andhra Pradesh. But highest in north eastern states like Mizoram, Manipur, Meghalaya, Arunachal Pradesh and Sikkim.

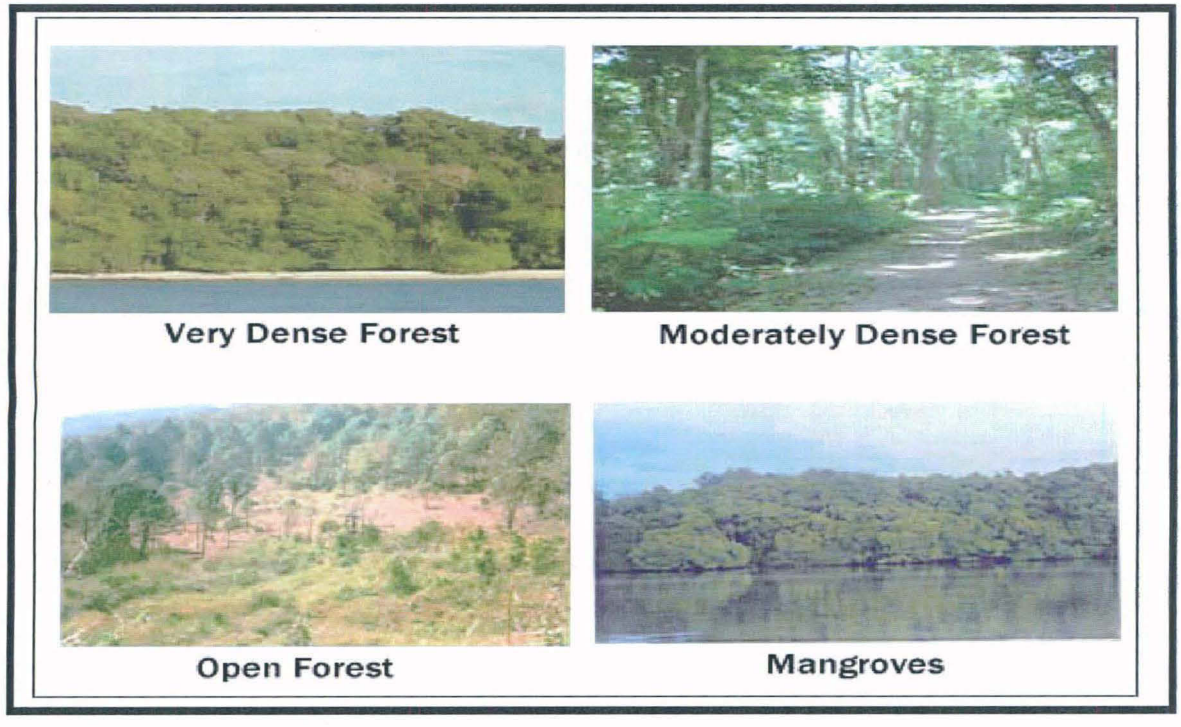
Before looking at the land cover by different vegetation cover, we see the forest classification by forest survey of India. The forest cover is broadly classified in 4 classes, namely very dense forest, moderately dense forest, open forest and mangrove. The classification of the cover into dense and open forests is based on internationally adopted norms of classification. It has not been possible to further segregate the dense forest into more classes owing to enormity of work of ground validation and limitations of methodology. Mangroves have been separately classified because of their characteristic tone and texture and unique ecological functions. The other classes include scrub and non-forest. These classes are defined is below.

Very dense Forest-All Lands with tree cover (Including mangrove cover) of canopy density of 70% and above

Moderate Dense forest-All lands with tree cover (Including mangrove cover) of canopy density between 40% and 70% above

Open forest-All lands with tree cover (Including mangrove cover) of canopy density between 10% and 40%

Scrub-All forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10 percent



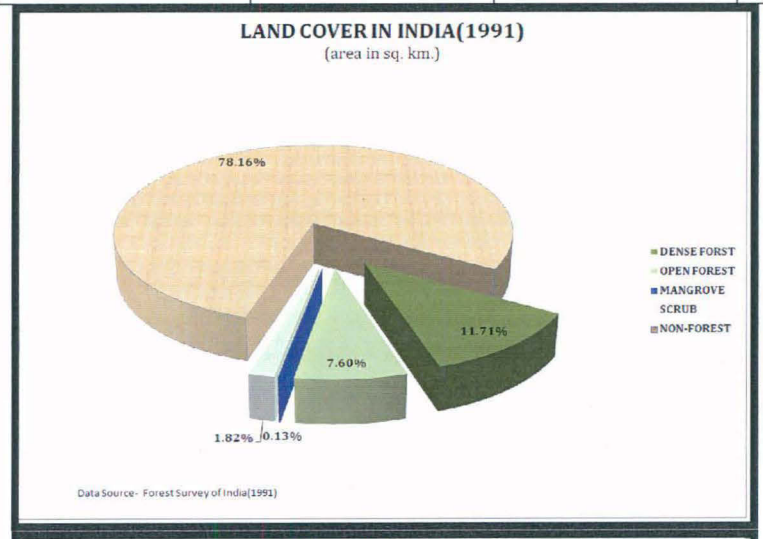
Source- Forest Survey of India

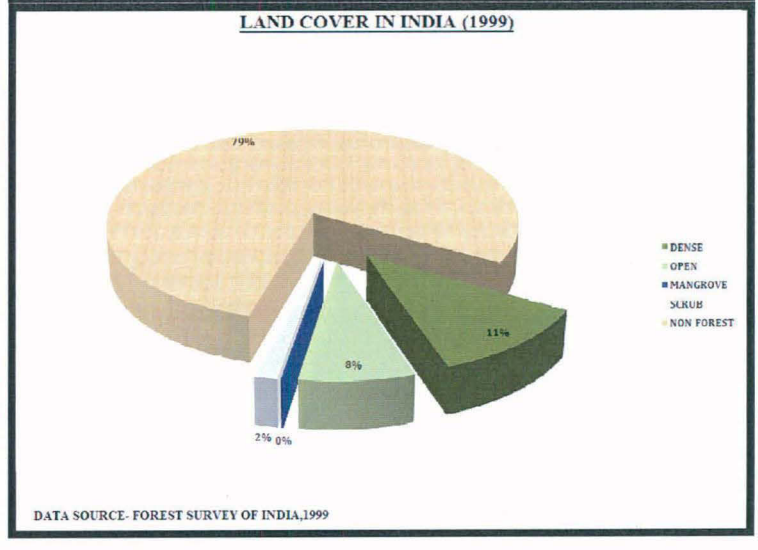
2.2.2 Land Utilizations in India "between" 1991 to 2009.

Land cover in India during the period of 1991- 2009 is almost quite similar, which explains the change in land distribution among vegetation cover in all India. Where there are some little positive change in dense forest, mangrove but open forest cover has increased highly from 7.60 to 9.71 during the 1991-2009. Other side area under scrub and non- forest cover has decreased, but the decline is not too high which can affect the total environment condition. In spite of this growth of vegetation, India is still very much behind the world percent cover of forest area (table 2.2 & figure 2.2).

Table 2.2 Composition of Forest Cover" between" 1991 to 2009.

DIFFERENT FOREST COVER	% TOTAL OF AREA	% TOTAL OF AREA	% TOTAL OF AREA	% TOTAL OF AREA
	1991	1999	2001	2009
DENSE FOREST	11.71	11.48	11.88	12.24
OPEN FOREST	7.6	7.76	8.76	9.71
MANGROVE	0.13	0.15	0.13	0.14
SCRUB	1.82	1.58	1.23	1.26
NON-FOREST	78.16	79.03	78.13	77.72





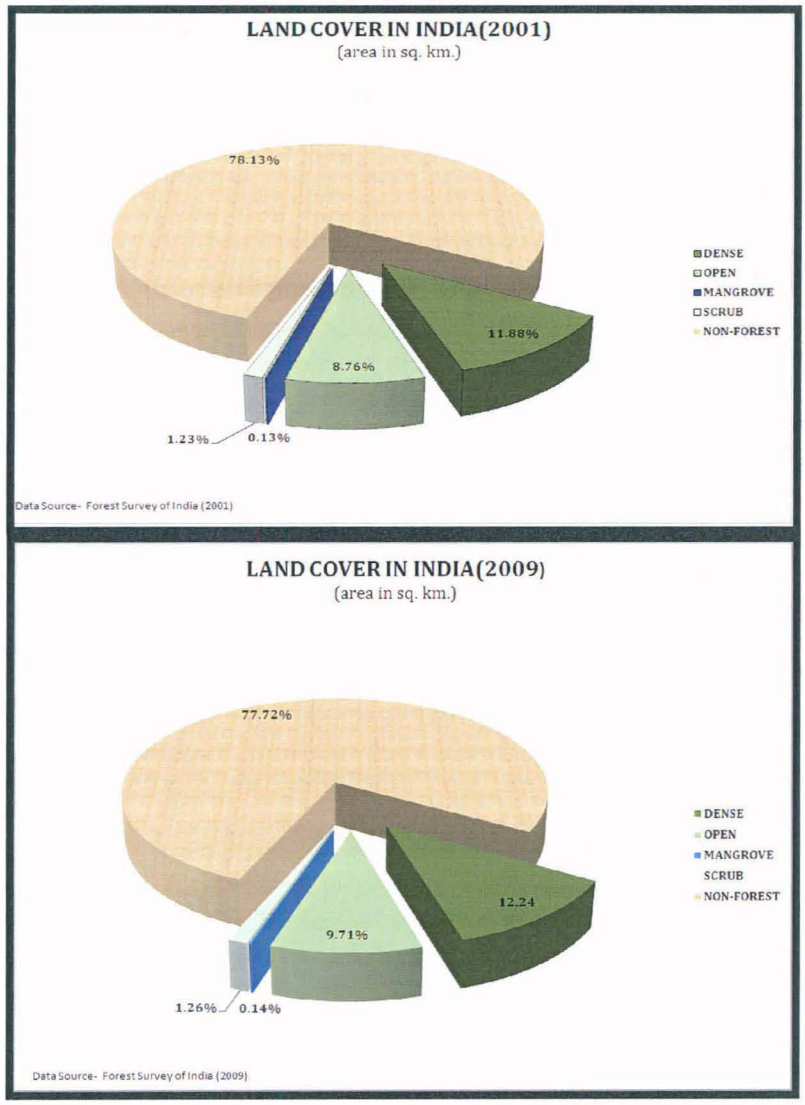


Figure 2.2a,2.2b,2.2c & 2.2d, showing the land cover by different type of forest area

Data source- Forest Survey of India (1991, 2001, 2009).

2.2.3 State Level Analysis of Forest Distribution

Forest Survey of India has started to publish the data of forest cover from 1987 after its establishment in 1980. 1991 is the 3rd assessment of the forest of the country based on visual

Table 2.3 State Level Forest Cover and Total Area under Forest "between" 1991 to 2009 (in square km.)

% FOREST AREA TO TOTAL AREA				
STATES	**1991**	**1999**	**2001**	**2009**
Andhra Pradesh	17.19	16.08	16.15	16.4
Arunachal Pradesh	82.1	82.13	81.22	80.43
Assam	31.55	30.19	35.48	35.3
Bihar	15.34	15.22	16.26	17.08
Delhi	1.47	5.89	11.46	11.94
Goa	33.85	33.79	58.24	58.1
Gujarat	6.07	6.61	7.62	7.46
Haryana	1.16	2.18	3.43	3.61
Himachal Pradesh	21.14	23.5	25.78	26.35
J & K	9.03	9.2	9.57	10.21
Karnataka	16.79	16.93	19	18.87
Kerala	26.48	26.54	40.08	44.58
M.P.	30.62	29.73	29.86	30.12
Maharashtra	14.31	15.17	15.23	16.46
Manipur	79.21	77.56	77.12	77.4
Meghalaya	70.78	69.47	75.08	77.23
Mizoram	89.43	86.6	87.42	91.27
Nagaland	86.38	84.99	82.09	81.1
Orissa	30.32	30.2	31.06	31.38
Punjab	2.67	2.8	3.14	3.3
Rajasthan	3.75	4.05	4.62	4.69
Sikkim	42.74	43.64	45.97	47.31
Tamil Nadu	13.62	13.13	17.41	17.94
Tripura	52.78	54.51	77.18	76.99
U.P.	11.42	11.55	13.11	13.19
West Bengal	9.03	9.42	13.91	14.64
Andaman & Nicobar	92.4	91.18	84.42	80.76

Chandigarh	4.39	5.91	13.16	14.91
Dadar Nagar Haveli	41.96	37.76	45.82	42.97
Daman & Diu	1.79	2.68	7.14	5.36
Lakshadweep	0	0	71.88	81.25
Pondicherry	0	0	8.33	9.17

Data Source: Forest Survey of India

Interpretation of land sat imagery pertaining to the period of 1987-89 on a scale of 1:250000. According to this latest assessment the forest cover in country is 6, 39,182 sq. km. (excluding tea gardens) which is 19.44% of the total geographical area of the country. But in the period of 2001 forest report the interpretation of land sat imagery pertaining to the period 2001-2009 on a scale of 1:50000. According to the forest cover in Indian states in previous decades, north eastern region has always been high concentration of forest area to the total land, which is more than 60% of the total area. Between the years of 1990's & 2000's, Assam, Goa & Orissa also had high forest concentration, i.e. between 30 to 60% of total area. But in 2001 & 2009 Kerala has recorded the high forest cover, which is more than 40 Percent to the total area (table 2.3).

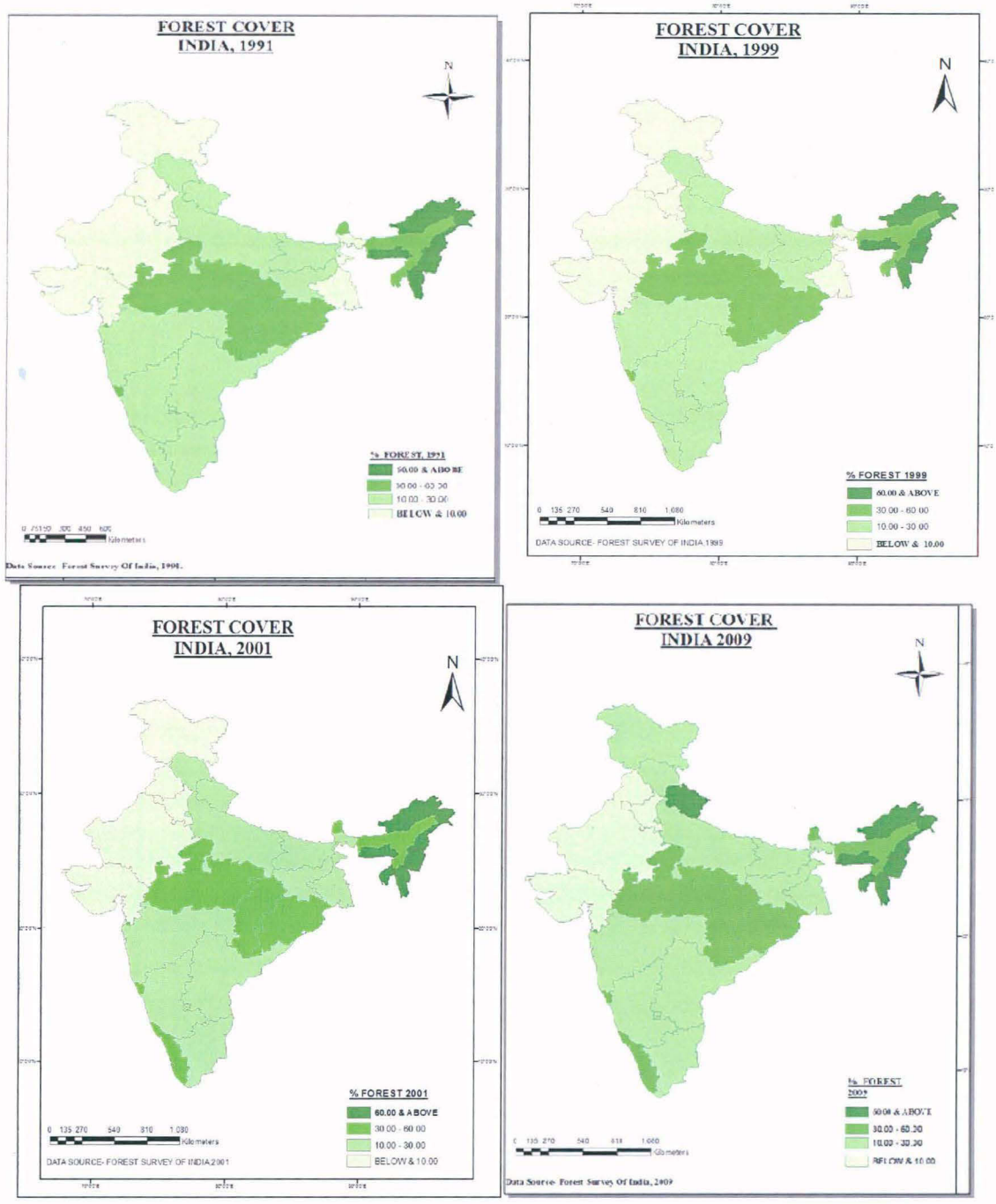


Figure 2.3a,2.3b, 2.3c & 2.3d showing the forest cover in all Indian states between 1991to 2009.

In the figure 2.3d, Uttaranchal due to partition from Uttar Pradesh, and came under the category of states having more than 60% forest cover to the total land cover.

The maximum part of the northern plain area of India and Indian peninsula are comes under the medium cover of forest (10-20%). North West region were comes under the geographically dry region, which has their own geographical reason for having the less forest cover.

North eastern part of India has always concentrated the highest forest cover due to its hilly and climatic condition, like high altitude areas, high rainfall and closeness with the Himalayas. North-East India is one of the recognized global biodiversity hotspots but it is of concern that this region experienced some negative change in forest cover at the district level. This region harbors variety of rare and endemic species of flora and fauna. This phenomenon has strong bearing on regional climatic conditions. Approximately 30% of total forest cover is under pressure of rapid land use changes. Extensive shifting cultivation, compounded by increasing population pressure and demands for agriculture land are the prime drivers of deforestation in addition to other proximate drivers of deforestation. It is therefore of prime concern to analyze forest cover changes in the region, assessing rate of change and extent and to identify the areas, which show repetitive changes.

In the decade of 1990's , this was the period of economic reform in early 1990's, which implement the high subsidies industrial set up in mining areas especially Madhya Pradesh, Orissa & Jharkhand, which further promote the high concentration of industries and infrastructure, leads to the deforestation activities in 1990's. But in the early period of 21st century government became concuss for loss of forest in those regions especially, where industrial set up was high & mining activities were taking place and several scheme of forestation like protected the forest, set up several sanctuaries and planting trees by the help of local peoples and launching the scheme related to forest conserve like JFM, CFM & PFM, started for the beneficiary of these region. So in the given pictures which shows the distribution of forest area in India , in the 1991 Madhya Pradesh , Orissa has high forest cover and in 2001 it started to decline, but when we see the recent picture of forest cover in 2009, it again reached to that level of 1991.

The states of Kerala and West Bengal have low forest cover in early 1991's but achieved the highest growth in afforestation growth during previous decades. It was the

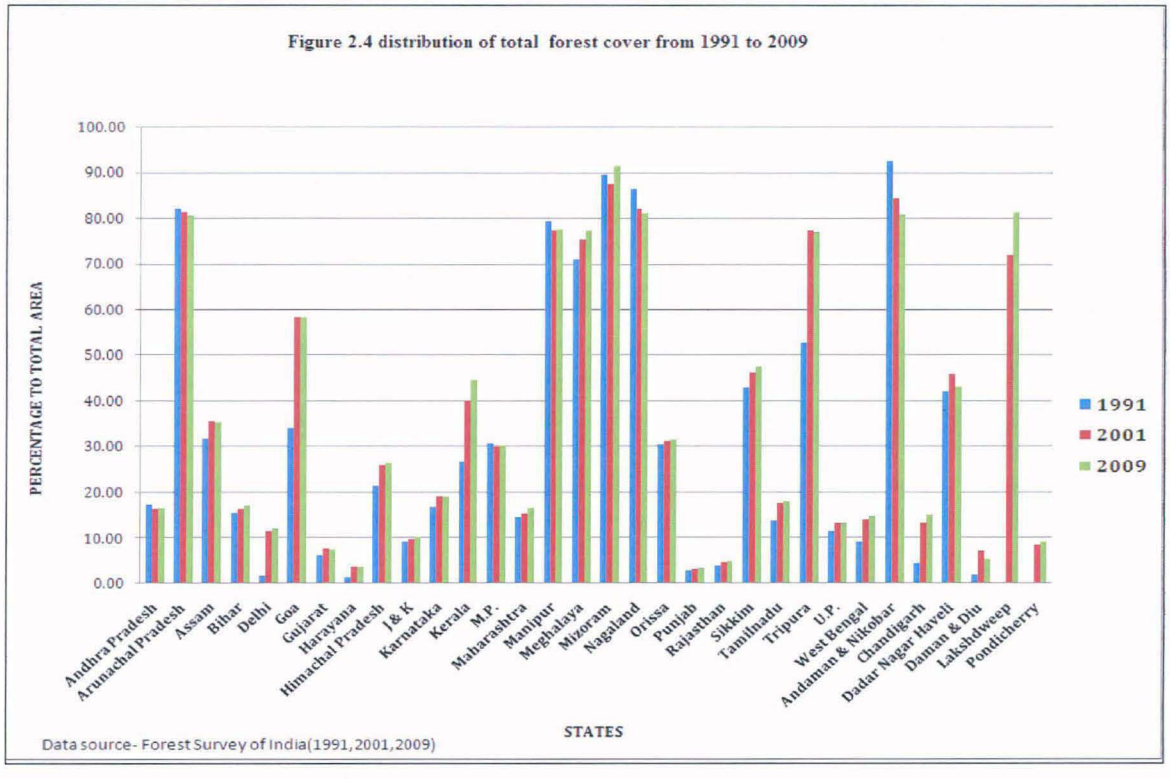
efforts of the government as well as local community. Kerala is one of the Indian states which has high literacy rate, and has made significant changes in its forest policy, which has enabled it to perform better in the recent years. Some of the highlights of this policy are

- To conserve and expand unique and complex natural forests of Kerala for posterity, in particular with regard to water, biodiversity, extent, productivity, soil, environment, historical, cultural, and aesthetic values, without affecting their ecological processes.
- To increase the productivity of forest plantation through appropriate management interventions and use of modern technology to meet the needs of the present and future generations.
- To increase the tree cover both inside and outside the forest to meet the timber and non-timber demands of the society.
- To conserve, maintain and enhance the existing gene pool of the state for posterity.

West Bengal is one of the major states where community forest management process had taken off somewhat successfully, which was supported by the local government and has probably shown up in better performance in preserving forest cover after 2001. There has been found some rapid change in the forest cover during the previous two decades, if we compare the changes in forest cover with the given in histogram presentation for showing the forest changes in each state, then we find, in the given following pictures, in north eastern states Arunachal Pradesh, Manipur, Mizoram and Nagaland has lost the forest areas during two decades, but in Assam, Meghalaya, Tripura and Sikkim has positive changes in forest cover. In the northern region states, almost all states like Bihar, Jammu and Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh but the states like Delhi has got the drastic changes in forest cover which is highest positive change among all states. Haryana is one of the states, which increased the forest cover during 1990-2001, but there is decline in 21st century.

The states like Andhra Pradesh, Gujarat, Madhya Pradesh and Andaman & Nicobar have experienced negative change in forest areas during previous two decades.

But the state likes Goa, Delhi, Kerala and Tripura. Kerala during the last 10 years, during 1993-1999, the area under forest cover in the State was around 26.59 per cent and the national average was around 19.4 per cent. This stable status of the ecosystem showed a sudden increase during 2001-03, reaching an average of 40 per cent for the State, whereas the national average showed a slight increase reaching 20.50 per cent. This shows that the drastic increase, as interpreted from remote sensing data, was not real and probably, other tree covered areas like rubber plantations, which is on the increase in the State during the period, might have contributed to the increased coverage. Moreover, the area recorded under forests during the period by the State Forest Department also supports this conclusion.



As shown in the figure 2.4 the comparative forest distribution in India "between" 1991-2009. The difference between forest cover as assessed in 2009 from that assessed in 1991 is not entirely due to change on the ground during the intervening period. Substantial proportion of it may have occurred over a longer period of time but could be detected only now due to technical reasons means using the new method for measuring

the forest by Forest Survey of India. Also, certain forest cover might have got included due to revision in the definition of forest cover.

In the art of interpretation of digital data, it is well known that use of coarser resolution overestimates forest cover in the large contiguous forested areas and underestimates it in other areas. If differences on account of these technical factors could be separated out, only then the change in forest cover on the ground during the intervening period can be estimated. In the report of 2001 all perennial woody vegetation including bamboos, palms, coconut, apple, Mango, Neem, Peepal, etc. have been treated as tree. So these may be the reason behind the increasing the total forest cover.

2.2.4 Growth Rate of Total Forest Cover in India from 1991 to 2009

As table 2.4 shows that growth of forest area in previous decades, where in the period of 1991-2001, highest forest growth rate has been calculated in Haryana and Goa but most of the part of India has found the positive change in forest area during these period, but when we see some other part of the country where negative growth rate in forest has been calculated are north eastern part (Arunachal Pradesh, Nagaland and Manipur), Madhya Pradesh, Andhra Pradesh and Chhattisgarh.

Table 2.4 Growth Rate of Forest Areas in India during 1991-2009

STATES	(91-99)	(01-09)
Andaman & Nicobar	0.00	-0.04
Andhra Pradesh	-0.06	0.02
Arunachal Pradesh	0.00	-0.01
Assam	-0.04	0.00
Bihar	-0.01	0.05
Chandigarh	0.40	0.13
Dadra & Nagar Haveli	-0.02	-0.06
Daman & Diu	0.50	-0.25
Delhi	3.00	0.04
Goa	0.00	0.00
Gujarat	0.09	-0.02
Haryana	0.88	0.05
Himachal Pradesh	0.11	0.02

Jammu & Kashmir	0.02	0.07
Karnataka	0.01	-0.01
Kerala	0.00	0.11
Lakshadweep	0.00	0.13
Madhya Pradesh	-0.03	0.01
Maharashtra	0.06	0.08
Manipur	-0.02	0.00
Meghalaya	-0.02	0.03
Mizoram	-0.03	0.04
Nagaland	-0.01	-0.01
Orissa	0.00	0.01
Pondicherry	0.00	0.10
Punjab	0.05	0.05
Rajasthan	0.08	0.01
Sikkim	0.03	0.03
Tamil Nadu	-0.04	0.03
Tripura	0.04	0.00
Uttar Pradesh	0.01	0.01
West Bengal	0.04	0.05

Source –Forest Survey of India

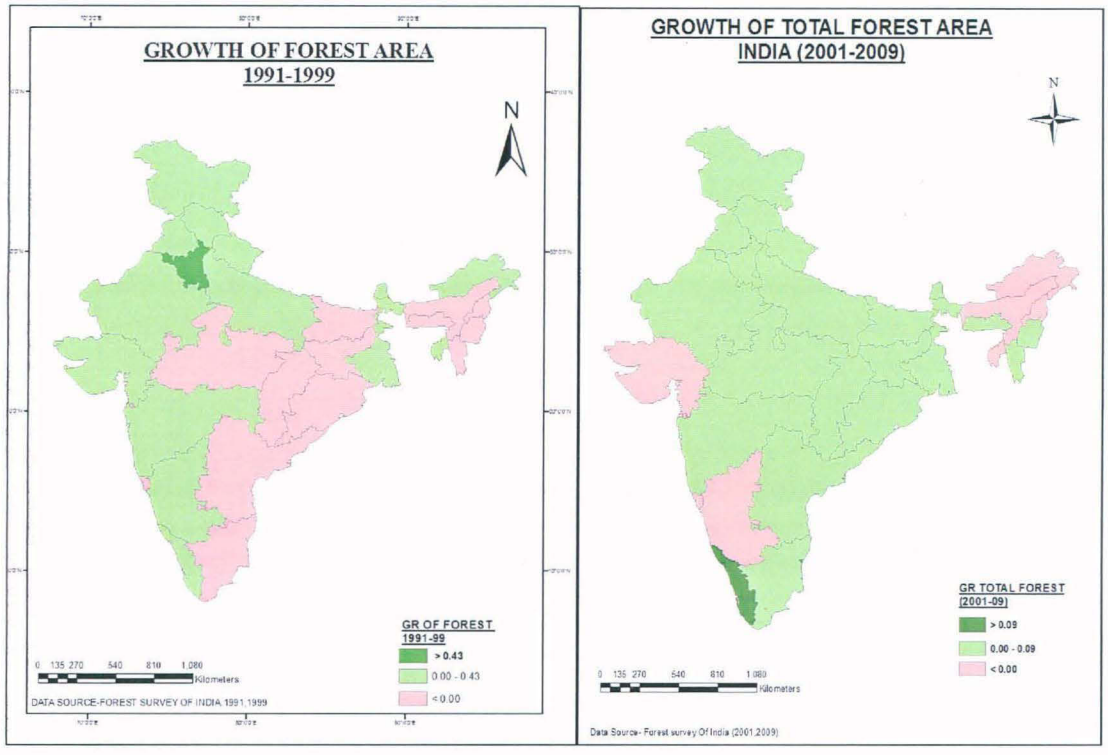


Figure 2.5a & 2.5b showing the total growth rate of forest areas betwee (1991-99),(2001-09).

These region has been calculated the negative growth rate if forest areas. But during the period of 2001-2009, picture is quite different because in these calculations Kerala is only one state which has found the highest growth rate in the forest areas among all states. Gujarat, Goa, Karnataka has been calculated the negative growth rate in forest areas except north eastern states. in the early period of 1990's, when government policy took place and industrial set-up initiated, but it was not effected in the state of Haryana, so Haryana has positive growth rate of forest, but in the period of 2001-09, process of economic development and land requirement for the infrastructural development came in the demand in Haryana states, so growth rate of forest could not maintain during the period of 2001-09(figure 2.5).

In the north eastern states, there has been always negative growth rate in forest areas, which is probably the result of traditional agricultural processes, mining activities, high population pressure, high dependency on forest areas and policy against the natural

forest. The bases of the land-use practices are also important to explain the trends. The north-eastern states had low land-use practices which were intrinsically tied up with forest reserves, like shifting cultivation. As the population pressure increase, those practices are getting converted into sedentary cultivation, which would have a direct effect on reducing the forest cover. But in the coming years there have been several policies that has been formulated to protect of forest areas by the help of government and local peoples. Industrial activities, population pressure, mining & quarrying activities, more land for agricultural activities and some other natural hazards were the causes of deforestation activities in the states of Madhya Pradesh & Chhattisgarh, Gujarat, Karnataka, Andhra Pradesh and Goa. In the period of 1991-99, Assam has major negative changes in forest area but during 2001-09, it had a positive growth rate, which was the result of the kind of attention given to the issue of forest protection by the state government and local institutions.

When we analyze growth rates during the period of 1991-1999 in all Indian states, some interesting trends emerge. Madhya Pradesh including Chhattisgarh, Andhra Pradesh, Tamil Nadu, Orissa, Bihar Including Jharkhand, Goa, Meghalaya, Manipur, Nagaland and Mizoram are those states which have experienced negative forest growth rate. Haryana, Delhi. Kerala, Goa and west Bengal, on the other hand, have had high positive growth rate of forest. West Bengal is one of the major state, which found the positive growth rate of forest area because this was the only first state which started the protection of forest with the help of local people and community called community forest management(CFM), which determined the share of each caste and community and given them responsibility. Kerala was another state, which also follow the same process of protecting the forest and emphasized over the more other techniques of protecting forest like free distribution of plants, set-up the Van Panchayat , use of new techniques of agriculture, spreading the awareness for saving the environment through media.

2.3 Distribution of Forest Types in India

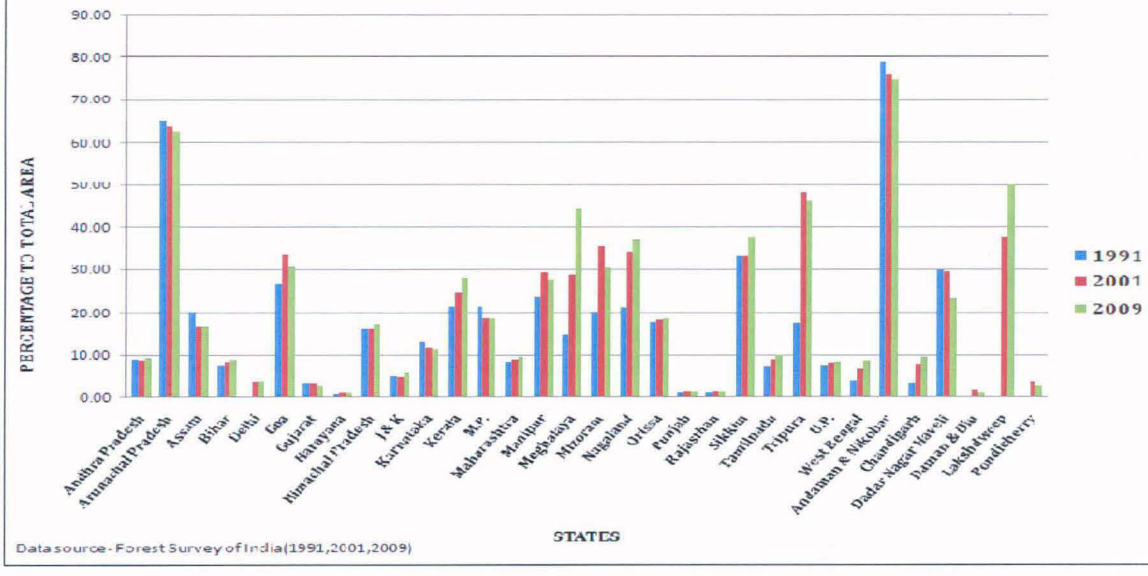
Forest survey of India has classified the forest in two categories, which is dense forest and open forest according to the forest survey in 1991. But again in 2003 survey in forest,

dense forest is again classified in two category dense forest and moderate forest. But here the changes, distribution and growth rate of forest areas during previous decades has been calculated. Other than forest cover areas, which comes under the scrub are also share the other classification, which consist some of the part to the total area.

2.3.1 Distribution and Growth of Dense Forest Area

According to the forest survey of India dense forest is called "All Lands with tree cover (Including mangrove cover) of canopy density of 70% and above". The present distribution of the dense forest area in India at state label is considerable for the major distribution of total forest area.

Table 2.6 Distribution of dense forest area between 1991 to 2009



Data source - Forest Survey of India (1991, 2001, 2009)

If we see the pattern of change in dense forest area during previous two decades at state level then we can see in the given picture that in most of the state has increased the dense forest area but that state like Meghalaya, Kerala, Nagaland, Orissa, Tamil Nadu, Maharashtra ,Sikkim, and West Bengal has been in positive change during previous two decades but states like Andhra Pradesh, Bihar, Goa, Himachal Pradesh, Jammu and

Kashmir, Manipur, and Tripura has been increased the area under dense forest but it was discontinuous(table 2.6).

In the state of Arunachal Pradesh, Assam, Karnataka, Madhya Pradesh and Gujarat, the percentage of dense forest area has been decreased to the total forest area.

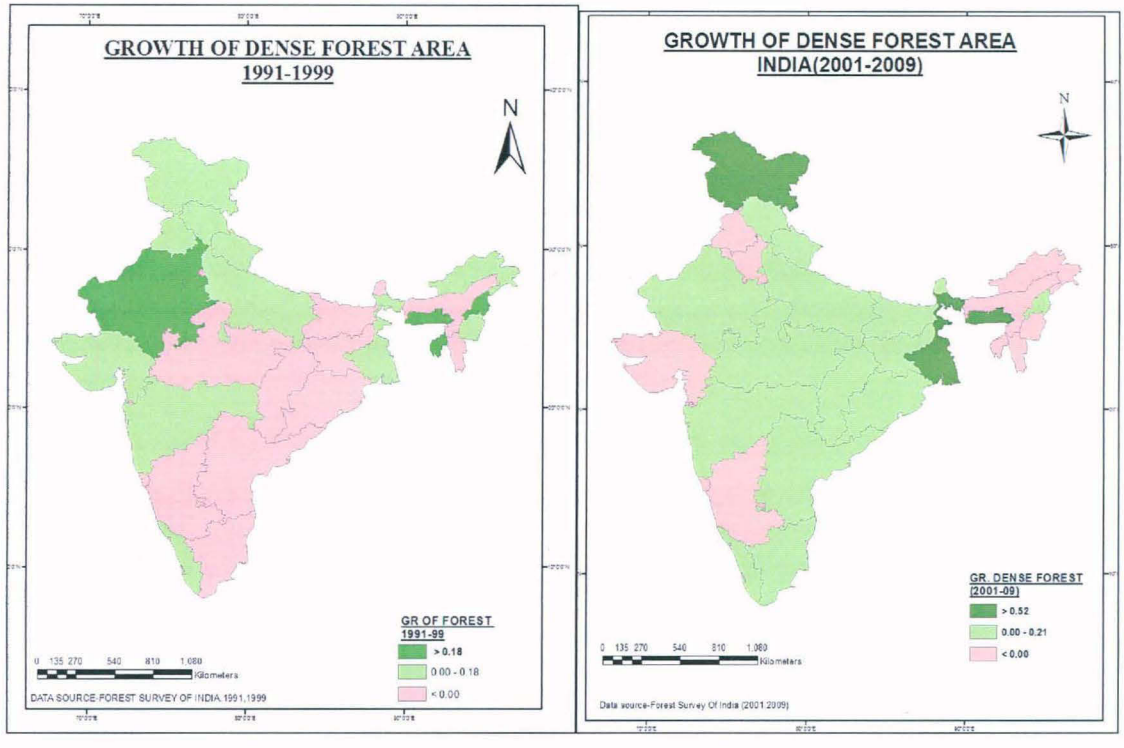


Figure 2.7a & 2.7b showing the growth rate of dense forest area between (91-99) and (01-09).

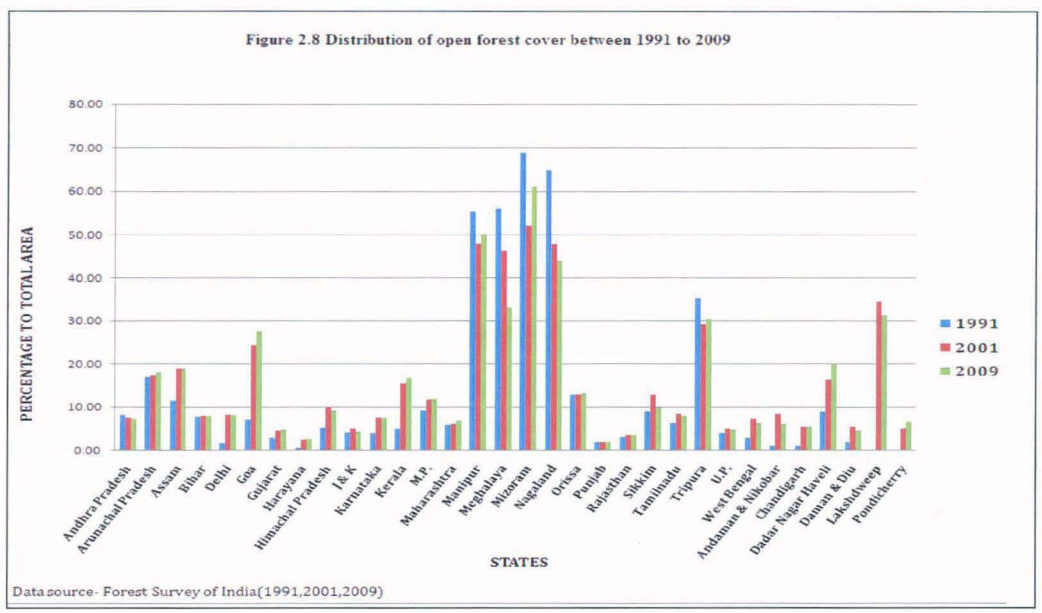
Dense forest area are mostly concentrated in north eastern part and western Ghats of India where hilly region and high rainfall is occurred and other climatic condition are in favor of dense forest habitation. During the period of 2001-2009, the growth rate of dense forest area is high in those Indian states, where the forest cover is comparatively less. Rajasthan, Haryana, and north-eastern states (Nagaland, Tripura, & Meghalaya) are those states(figure 2.7a & 2.7b), where the growth of dense forest area is high during 1991-99, which was the cause of agricultural activities, forest plantation at mass level, new techniques for water conservation for agricultural activities and awareness among the peoples. In other side Madhya Pradesh including Chhattisgarh, Andhra Pradesh, Karnataka, Assam, Manipur, Tamil Nadu, Orissa and Bihar including Jharkhand were

those states, where dense forest has been decreased during this period (1991-99) due to the change in the forest nature and other development activities as well as population pressure, because these region comes under the highly tribes populated areas and they are dependent on the forest for their livelihood.

In the period of 2001-09, Punjab, Haryana, Gujarat, Karnataka, and north eastern states has declined the dense forest area, which has got the negative change in dense forest areas, while other side Jammu & Kashmir, West Bengal and Meghalaya found the high growth rate of forest area, which was due to the change in the techniques for measuring the forest cover and other specified caused discussed earlier.

2.3.2 Distribution and Growth of Open Forest Area

According to the forest survey of India open forest are called "All lands with tree cover (Including mangrove cover) of canopy density between 10% and 40%". In the maximum part of India open forest area are wide spread due to its climatic nature. Distribution of open forest cover in India can be seen by the figure 2.8,



Open forest cover has been increased over a period of time among all states of India except Andhra Pradesh and north eastern part of India during 1991-2009. In the earlier explanation Assam , Goa and Kerala are those states ,which has got the highest

positive change in total forest areas, now it can be seen that those positive change occurred in the open forest areas , which was highly increased.

Growth Rate of Open Forest Area

During the period of 1991-99, the maximum growth rate for the open forest areas has been recorded in the states of Haryana, Delhi & Himachal Pradesh and negative growth rate for open forest area has been recorded in the states of Andhra Pradesh, Rajasthan, Goa, Bihar including Jharkhand and north eastern states (Nagaland, Arunachal Pradesh, Tripura, and Meghalaya & Manipur).

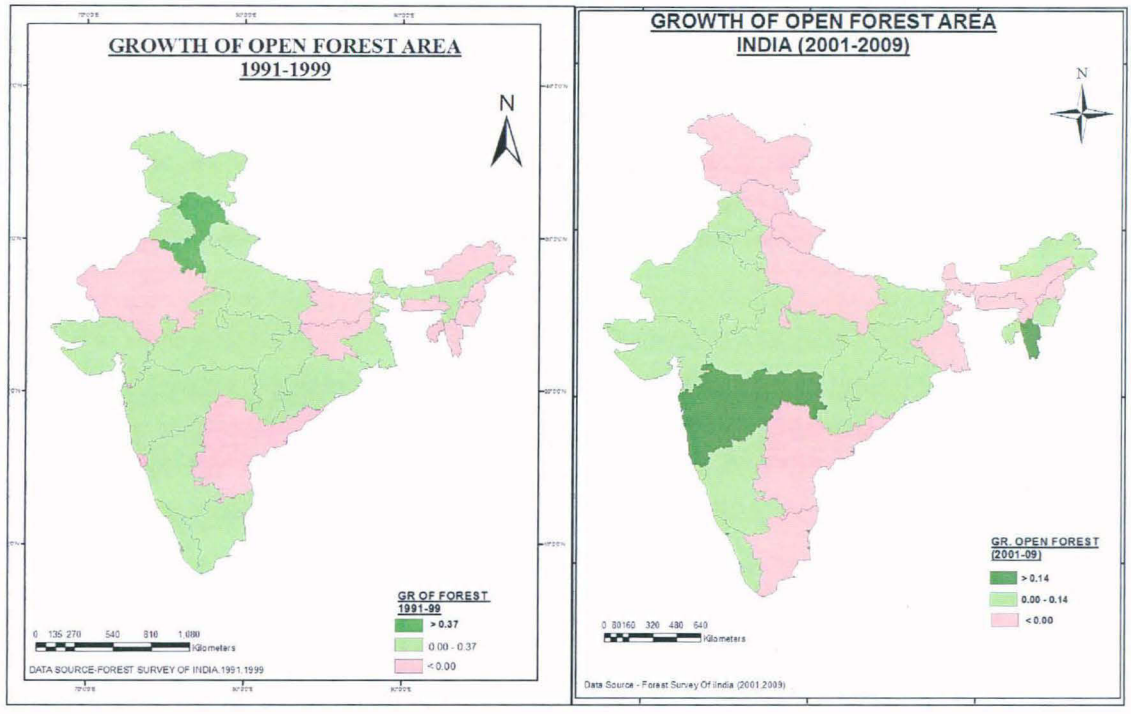


Figure 2.9a & 2.9b showing the growth rate of open forest areas between (1991-1999) and (2001-2009)

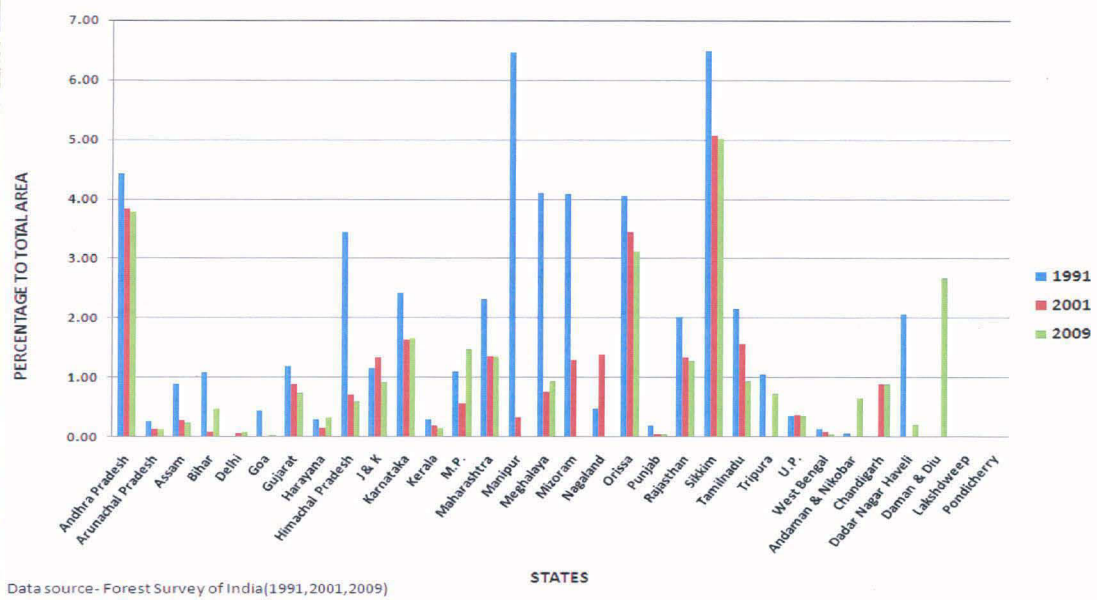
But in the period of 2001-09, the maximum growth rate has been shifted into the Maharashtra and Manipur. During this period most of the Indian states has been recorded as a negative growth rate of forest areas, those states are Jammu &Kashmir, Himachal Pradesh, Uttaranchal, Uttar Pradesh, West Bengal , Assam , Andhra Pradesh and other north eastern states (figure 2.9).

2.3.3 Distribution and Growth of Scrub Area

Those areas covered by the green areas but not considered under the forest are called scrub, according to the all forest lands with poor tree growth mainly of small or stunted

trees having canopy density less than 10 percent. The distribution of the scrub is not so important for the purpose of study but when we see its distribution (figure 2.10), among the all Indian states during the 1991-2009, it throws useful insight into our analysis.

Figure 2.10 Distribution of scrub area between 1991-2009



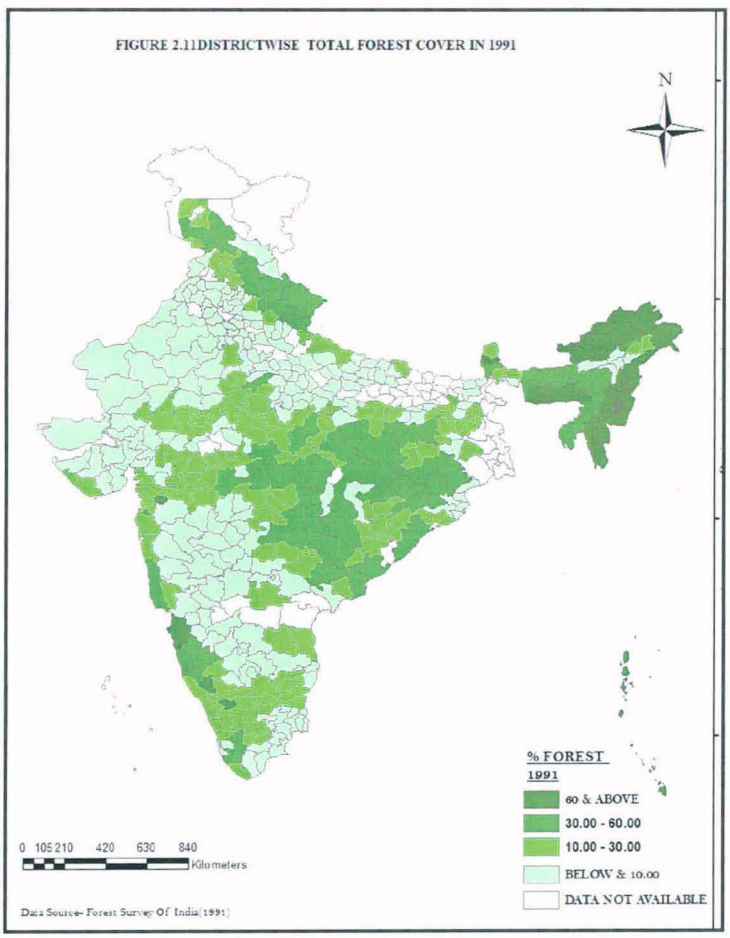
Data source- Forest Survey of India(1991,2001,2009)

- Most of the state has very less scrub areas, which has not so much importance for the environmental purpose, but it area has the potential to change into the open or dense forest areas.
- Most of the states has been seen a negative change in total scrub areas except Madhya Pradesh, Uttar Pradesh and Delhi.
- Earlier the percentage of total scrub were high but with the change in time the decreased due to the different use of the land covered by the scrub areas, like agricultural activities, mining and use as a CPR(common property resources).
- Government also focuses on the maximum utilization of scrub areas for non-forming activities.
- Grazing is the major activities on the land covered by scrub.

2.4 District wise Forest Cover in India (1991-2009)

2.4.1 District wise Distribution of Forest

An attempt, for the first time, has been made to assess district-wise forest cover of the country. As per available figures from survey of India, there are 413 districts in the country in 1991. The results of assessment of forest cover of these districts are summarized in the given pictures. This was the first report when forest cover classified in three categories, those are dense forest, open forest and mangroves. The identified tea gardens and tree groves/orchards have not been included under forest cover.



As figure 2.11shows, it has been classified in four classes for the forest distribution, which shows the concentration of forest areas in each Indian district in 1991 figure. Here can be easily recognize that highest forest concentration is showing in the north eastern states, districts of Uttaranchal, Jharkhand, Orissa, Madhya Pradesh,

Chhattisgarh and north-western part of Karnataka. The maximum district of Bihar, Uttar Pradesh, West Bengal, Rajasthan, Maharashtra, Gujarat and Western Andhra Pradesh has less than 10% forest area to the total land cover. There were several districts in the period of 1991, where forest cover data was not available; those were mostly from Bihar, Uttar Pradesh, Andhra Pradesh, and Jammu & Kashmir.

Table 2.5 Number of Districts within States under Different Classes of Forest Cover

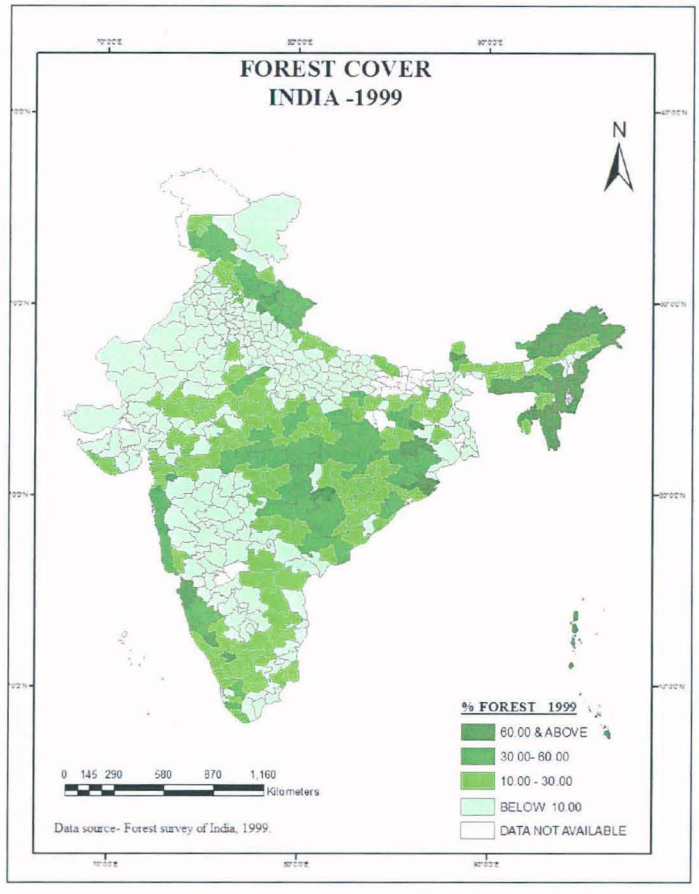
	Number of Districts			
States	**>33%**	**19-33%**	**0.1-19%**	**no forest**
Andhra Pradesh	3	5	15	0
Arunachal Pradesh	9	0	0	0
Assam	7	0	3	0
Bihar	3	3	10	15
Delhi	0	0	1	0
Goa	1	0	2	0
Gujarat	1	1	17	0
Haryana	0	0	10	2
Himachal Pradesh	3	6	3	0
Jammu & Kashmir	4	6	3	1
Karnataka	5	1	12	1
Kerala	2	3	7	0
Madhya Pradesh	16	13	14	2
Maharashtra	3	4	20	0
Manipur	6	0	0	0
Meghalaya	5	0	0	0
Mizoram	3	0	0	0
Nagaland	7	0	0	0
Orissa	7	3	3	0
Punjab	0	0	10	2
Rajasthan	0	0	26	0
Sikkim	4	0	0	0
Tamil Nadu	1	4	11	0
Tripura	3	0	0	0
Uttar Pradesh	8	2	35	11
West Bengal	1	1	14	0
Andaman & Nicobar	2	0	0	0

Chandigarh	0	0	1	0
Dadra & Nagar Haveli	1	0	0	0
Daman & Diu	0	0	0	0
Lakshadweep	0	0	0	1
Pondicherry	0	0	0	4

Data source: Forest Survey of India

According to national forest policy 1988 recommends that 33% of the geographical area should under forest cover. The actual forest cover of the country in 1991 as assessed is around 19% of the total geographical area. This basis is adopted for the grouping of the districts in the country.

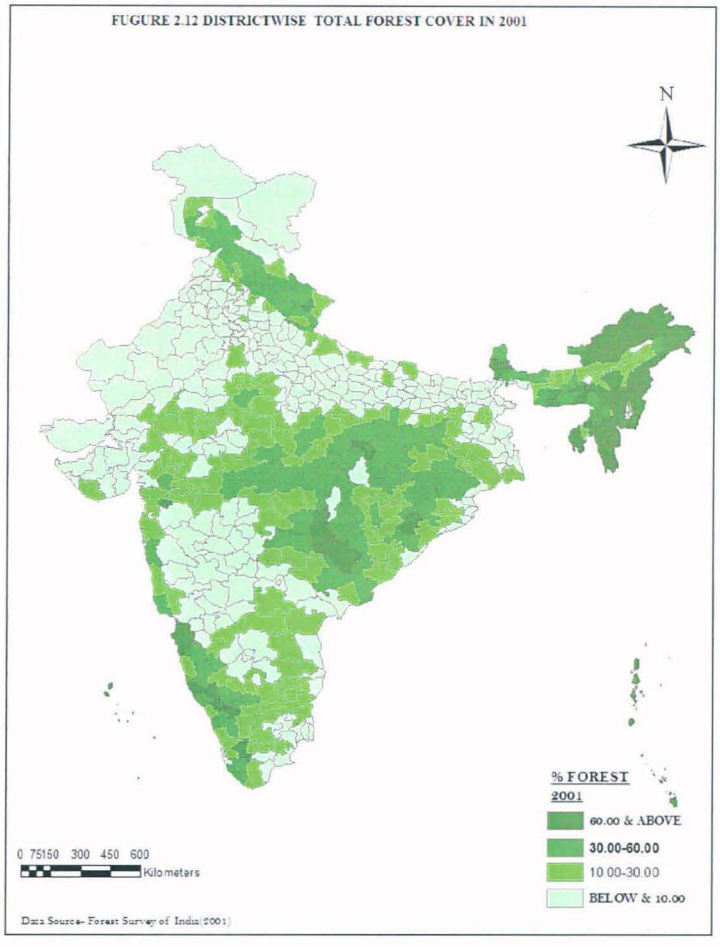
An overview of this has been given in table indicates that out of a total of 413 districts for which the forest cover assessment has made, 105 districts of the country are having forest cover more than 33%, 52 districts have forest cover between 19 to 33%, 217 districts have forest cover ranging from 0.1 to 19% and 39 districts do not have any discernible forests. The districts which fall below the national forest cover of 19% are summarized in the given table 2.5.



In the forest report of India of 1999, forest were mainly concentrated north-eastern states (Arunachal Pradesh, Nagaland, Tripura, Meghalaya & Manipur), where more than 60% area are covered with the forest. Except the north eastern states some of the districts with high forest cover are from Uttarakhand, Kerala, Himachal Pradesh, Orissa, Jharkhand, Chhattisgarh, and Madhya Pradesh & Karnataka. The report of 2001, the present report i.e., the SFR 2001 is the eighth assessment in the series. Steady improvements have been made in the methodology for estimating forest covers in each of the subsequent report by employing latest data with higher resolution and scale, with more intensive coverage under ground verification and by using superior techniques of interpretation. While in the first assessment, resolution of data used was 80m x 80m and scale of interpretation 1:1 million, the same in the eighth assessment are 23.5m x 23.5m and 1:50,000, respectively. The SFR 2001 provides much more comprehensive status of forest and tree cover in the country at district level than the previous seven reports. FSI

has taken several initiatives to accomplish this. These new features, introduced for the first time in SFR 2001. There has been assessment of tree cover at the national level using field inventory data for the district-wise area. In the 2001 report Field inventory data have been used to assess tree cover in the country. Substantial tree resources exist in the country in the form of linear plantations along roads, canals, etc., scattered trees on farmlands, homesteads and urban areas and blocks of plantations and woodlots smaller than 1 ha that could not be captured by remote sensing data used in the present assessment. For assessment of such tree cover, data collected from field inventory, based on appropriate stratification and sampling techniques have been used.

District wise information on forest cover is provided as per the latest administrative maps of states and union territories containing several new districts for the first time. As per the latest census report (2001), the country has 593 districts whereas SOI maps are available for the years when there were only 453 districts. Survey of India (SOI) is the authentic source of geographic area but editions of SOI topo sheets showing boundaries of newly created districts may become available only after a long gap of time. Due to this constraint, derivation of forest cover area for new districts becomes a problem. However, in this report, FSI has been able to provide district wise information of forest cover for as many existing districts as possible. In this report, information on forest cover for 589 districts (out of a total of 593 districts in the country) has been given. District-wise forest cover can be seen in the given map below.



As figure 2.12 shows the forest concentration in all Indian districts, has been classified in four classes that is very dense (> 60 %), dense (30-60%), medium (10-30%) and low (< 10%). The districts comes under very dense and dense are mostly concentrated in north eastern states of India, Madhya Pradesh, Uttaranchal, Orissa, Jharkhand, Kerala, Chhattisgarh and Himachal Pradesh. Medium forest concentrations are also spread around the very dense and dense forest area and rest of the part of the India are covered with the low forest cover which consist the 10% to the total forest areas.

In the report of 2009, forest cover has been classified in three major classes, which was earlier in two classes, that dense forest, moderate forest and open forest. Moderate forest is a further classification of the dense forest area, which is divided

because dense forest areas has wide area, which was presenting, so canopy size more than 70 is considered under dense forest and canopy size 40-70 is considered under the moderate forest areas, which also include the mangrove forest area. The forest cover of the country as per 2009 assessment is 690,899sq. Km. which is 21.02 percent of the geographical area of the country. Very dense forest constitutes 83,510 sq. km (2.54%), the moderately dense forest 319,012 sq. km (9.71%) and open forest constitutes 288,377 sq. km (8.77%) of the geographical areas. The scrub accounts for 41,525 sq. km. (1.26%). This report also focuses on the forest cover in hilly regions and tribal areas, where the total value of forest is more important and its value is quite indifferent there.

Forest cover in hilly terrain is important from the ecological considerations. Recognizing this fact, the national forest policy (1988) aims at maintaining two thirds of the geographical area in hills of the country under forest and tree cover. The hill districts identified for the forest cover analysis are the ones identified by the planning commission for all hill areas and Western Ghats development programs.

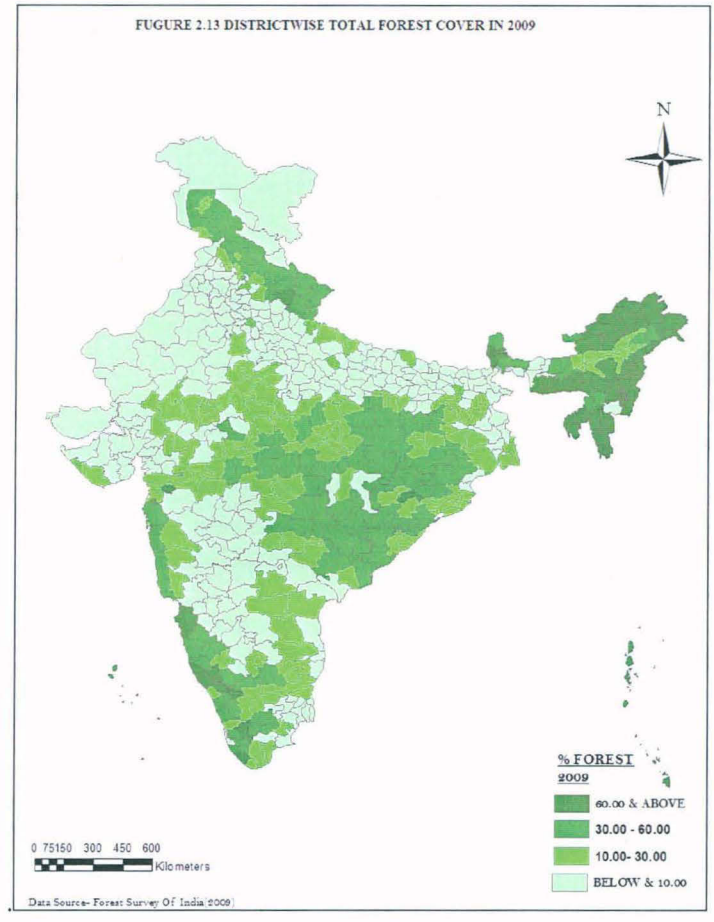
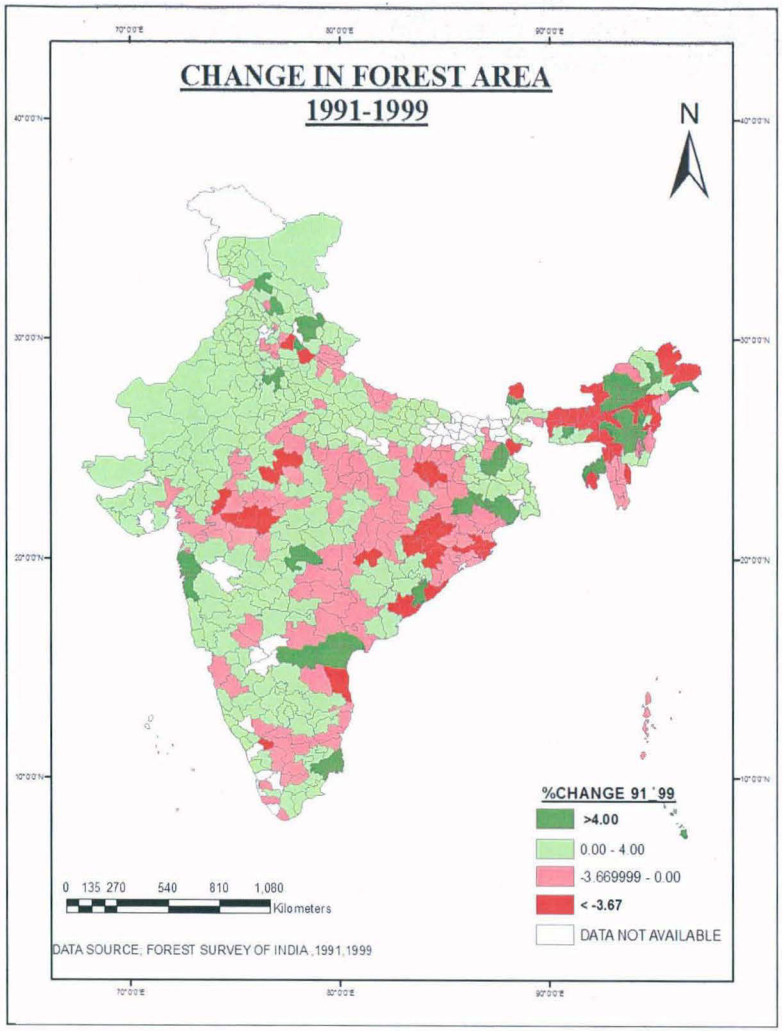


Fig no 2.13 shows the distribution of forest cover in all Indian districts in 2009.The districts that come under dense & very dense forest cover are again concentrated in the north eastern part of India, which was the case even in the last period under analysis. However, in the Middle East part of India like Orissa, Jharkhand, Madhya Pradesh, Chhattisgarh, many districts have shifted area from dense forest cover category to the very dense forest and other side in the state of Kerala & Western Ghats has got the more forest cover to the total land cover.

2.4.2 Change in Forest Covers (1991-1999) and (2001-2009)

During the period of 1991-2009, the total forest change in all Indian districts can be analyzed by showing these given map, which shows change in forest cover over three time periods across all Indian districts.



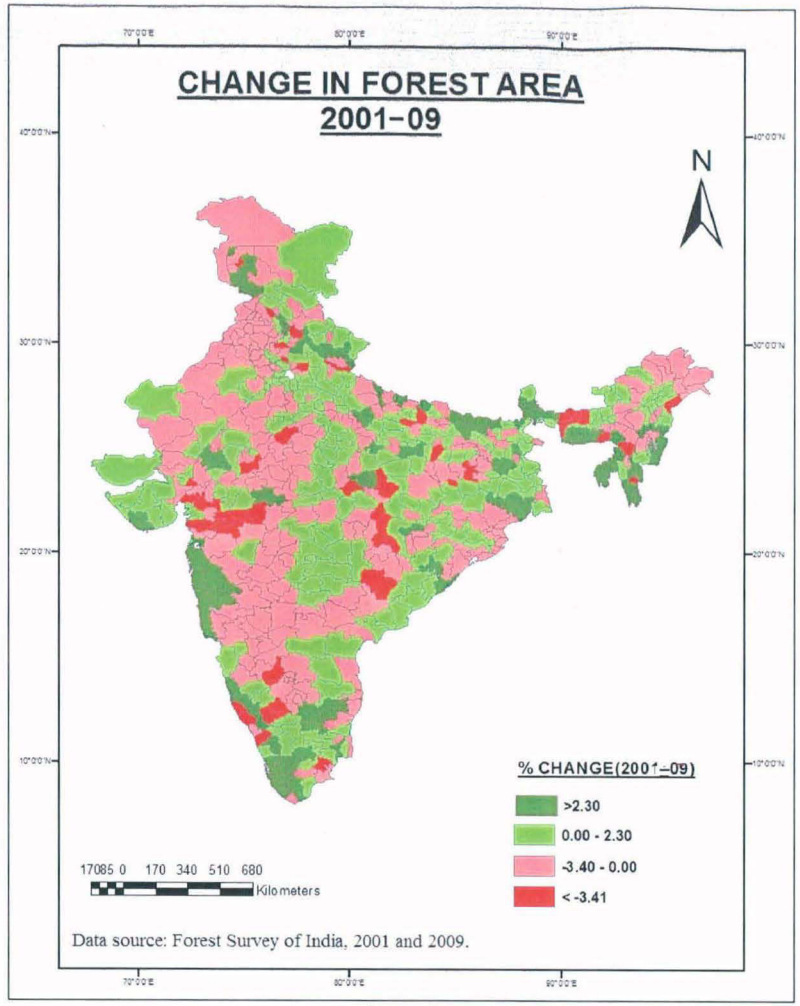


Figure 2.14a & 2.14b showing the districtwise forest change between 1991-1999 & 2001-2009.

If we see the total change in percentage cover in given figure 2.14a & 2.14b, then a very clear picture is looking here, in the period of 1991-1999, most of the districts has been recorded positive change in forest cover, in the hilly districts situated in north eastern states of India and middle part of country from western Madhya Pradesh, western Assam, south-west Tamil Nadu, Chhattisgarh and northern Andhra Pradesh has high negative change among forest areas. North eastern states are the most important habitats as well as a vital corridor for animals which connects all these three important patches of forests very critical for the survival of the several animals' population. The importance for the biodiversity conservation and its contribution for the environmental impurity, the north eastern states have been praised at international level. Other side some of the districts from Kerala , southern Tamil Nadu, Assam and Orissa have positive change in the total forest, which is not due to the a forestation process rather than use of new techniques for measuring forest cover and delineating the new boundary of the districts.

Table 2.6 Districts having Extreme Changes in forest cover (91-99)

DISTRICTS	% CHANGI	DISTRICTS	TOTAL CHANGE	DISTRICTS	% CHANGE	TOTAL CHANGE	DISTRICTS
Paschimi Singhbhum	71.19	KARBI ANGLONG	4941	Maldah	-41.63	Palamu	-4833
PURBI SINGHBHUM	71.19	Paschimi Singhbhu	3722	Nellore	-40.33	Kandhamal/phu	-3450
NORTH CACHAR HILLS	51.43	NORTH CACHAR HI	2514	gardwa	-37.91	DARRANG	-3318
KARBI ANGLONG	47.35	Thane	2216	Palamu	-37.91	KAMRUP	-2117
east kameng	34.83	Kurnool	2169	DARRANG	-37.68	Goalpara	-1618
dimapur	30.74	east kameng	1440	Baudh	-31.10	Maldah	-1554
South Sikkim	30.59	Midinipur	1384	BALANGIR	-31.10	lohit	-1405
West Sikkim	23.56	lower subansiri	1264	Kandhamal	-31.10	Sambalpur	-1386
RAIGARH	23.18	Kuchch	1130	Sonapur	-31.10	dibang valley	-1218
Thane	23.18	Bastar	965	TAWANG	-24.96	NAGAON	-1152
EAST GARO HILLS	22.58	Thanjavur	828	South Tripura	-24.88	Nimar West	-949
East Sikkim	21.83	Pudukkottai	813	Srikakulam	-23.07	South Tripura	-891
Prakasham	17.88	santhal paragna	773	Vishakapatna	-23.07	CACHAR	-805
West Tripura	17.58	Lakhimpur	751	BARPETA	-21.50	JAINTIA HILLS	-698
Pudukkottai	17.44	EAST GARO HILLS	588	NALBARI	-21.50	RAIPUR	-631
North Tripura	14.68	Chittoor	584	KAMRUP	-21.50	North Sikkim	-627
Dhalai	14.68	Yavatmal	570	nilgiri	-20.83	west kameng	-615
DHEMAJI	13.62	North Tripura	569	MARIGAON	-20.81	TAWANG	-542
SONITPUR	13.62	West Tripura	534	NAGAON	-20.81	Bilaspur	-534
Lakhimpur	13.62	Mandla	419	JAINTIA HILLS	-18.27	nilgiri	-531

In the given table 2.6, this shows the top 20 districts in India which has performed negative and positive change as well as total highest change in forest areas. In the negative change most of the districts are from north eastern part. The districts which have found the maximum positive change among forest area those are from Orissa, Bihar, Assam and Kerala.

The reason behind the negative change among forest in north eastern states primarily the nature of transition that the region is going through currently. In spite of the existence of several forest laws and regulation the forest of North-East is declining by extent, as per the FSI data.

In the period of 1991-1999, that was the initial time period for the starting development processes after the implementing the liberalization policy in India. In the districts of Madhya Pradesh, Chhattisgarh and Orissa the mining & quarrying activities have been occurred and major industries set up as well as infrastructural development taken place.

During 2001-2009 there has been negative change in total forest cover most of the Indian districts, which shows that the cause responsible for the deforestation activities has been taken place rapidly during this period. Most of the western part of the India has found the negative change in forest areas. Karnataka, Maharashtra, western Madhya Pradesh, Rajasthan, Punjab and Jammu & Kashmir have been more affected by the negative changes in forest.

Table 2.7 Districts having Extreme Changes in forest cover (01-09)

DISTRICTS	% CHANGE	DISTRICTS	TOTAL CHANGE	DISTRICTS	% CHANGE	DISTRICTS	TOTAL CHANGE
Dhamtari	-56.25	AIZAWL	-6173	Dhalai	67.99	east kameng	6599
KASARAGOD	-36.55	Nimar West	-4478	Udupi	39.18	west kameng	3688
PANIPAT	-23.39	Jabalpur	-3939	Srinagar	30.44	JAINTIA HILLS	2111
CACHAR	-23.14	Mysore	-2648	Kottayam	30.28	Ratnagiri	1988
KANNUR	-22.89	Hazaribagh	-2620	Panchkula	29.43	Udupi	1520
Badgam	-18.38	Udhampur	-1880	Udhampur	28.56	Midinipur	1127
Mysore	-15.49	Kannad Daksh	-1857	JAINTIA HILLS	26.43	Dhalai	954
EAST KHASI HILLS	-15.42	EAST KHASI HI	-1732	Ratnagiri	24.22	baharaich	830
Gandhinagar	-15.41	Palamu	-1708	WEST GARO HILLS	23.47	Kottayam	667
Sirmaur	-15.12	Dhule	-1610	Kupwara	20.53	RAIGARH	576
RAJNANDGAON	-13.64	Shahdol	-1601	Lawngtlai	20.10	Lawngtlai	514
Nimar West	-12.63	Baramula	-1472	Pulwama	17.71	MAHARAJGANJ	461
Gorakhpur	-12.59	Kupwara	-1471	WEST KHASI HILLS	16.59	Pune	418
BARPETA	-10.39	LUNGLEI	-1239	LUNGLEI	16.58	Rayagada	393
Dhule	-10.22	Punch	-1186	Thiruvanthapuram	16.24	Panchkula	381
NICOBARS	-9.83	Vadodra	-1168	MAHARAJGANJ	15.62	Satara	367
Vadodra	-9.27	Kota	-1141	Kawardha	14.54	Kathua	364
udhamsing nagar	-8.89	North Tripura	-1120	Saiha	14.00	Thiruvanthapuram	356
Ambedkar Nagar	-8.34	Rohtas	-999	Kathua	13.73	Dharampuri	332

In the given table 2.7, those districts that have experienced high percentage change in forest, either negative or positive during the 2001-2009. In this period the district Dhamatri from Orissa, Kasargod, and Panipat from Haryana are the most degraded districts, while Aizawl from Mizoram, Jabalpur from Madhya Pradesh Mysore from Karnataka and Hazaribagh from Jharkhand has highly negative change in forest in absolute areas. The districts from Kerala

Udupi, Kottayam, have major positive change in total percentage but in absolute number districts from north-eastern states are high.

If we see the total change in the forest areas among all districts during the period of 1991-2009, then we have some different picture, which shows the changes of total percentage forest areas. Most of the districts achieved the highest change in growth rate of forest areas, which determine the total effect over the deforestation process of those all activities which cause the degradation of forest. Most of the districts, which has consisted highest change, belongs to the south Indian region especially from Kerala, Karnataka, Tamil Nadu, and Maharashtra. Some of the districts from Jharkhand, Chhattisgarh, Jammu & Kashmir, Tripura, Meghalaya and Uttar Pradesh including the Uttaranchal also those districts, which has consisted the highest growth rate of forest change.

2.4.3 Growth of Forest Cover during 1991-1999 and 2001-2009

The growth of forest between "1991-2009" in Indian districts is one of the major concerns for the purpose of study in environmental issues, because forest is one of the important parts of the environment. According to the past history of India of previous 200 years, forest extent has declined but these declines are not taken place equally in all region of India. So now this is an important issue to find out those pockets of districts or region, which has achieved the positive or negative growth rate of forest at that time when environment issue is more important at present time on global concern. In our earlier discussion that total growth of Indian forest has been positive during 1991-2009, so it's more important to see the change of forest and their districts.

Table 2.8 Growth Rates of Forest Cover for Districts having Highest & Lowest growth rate (1991-1999)

DISTRICTS	GROWTH RATE	DISTRICTS	GROWTH RATE
Hardoi	21.00	Daman	-1.00
Rewari	11.41	Diu	-1.00
Gurgaon	11.41	Gardwa	-1.00
Lahul & Spiti	7.82	Palamu	-1.00
Siddharth Nagar	7.75	Mumbai City	-1.00
Sant Kabir Nagar	7.75	Mainpuri	-1.00

Basti	7.75	Maldah	-0.99
Nagapattinam	7.14	Darrang	-0.96
Thiruvarur	7.14	Nellore	-0.83
Thanjavur	7.14	Rajgarh	-0.79
Pudukkottai	6.21	Baudh	-0.58
Raibareli	5.50	Balangir	-0.58
Bhiwani	5.50	Kandhamal	-0.58
Jodhpur	5.18	Sonapur	-0.58
Faridabad	5.15	Barpeta	-0.55
Mansa	5.00	Nalbari	-0.55
Bhantida	5.00	Kamrup	-0.55
Paschimi Singhbhum	4.63	Imphal West	-0.55
Purbi Singhbhum	4.63	Thoubal	-0.55
Firozpur	4.00	Bishnupur	-0.55

Data source – Forest Survey of India

According to the given table 2.8, the highest growth rate of forest has taken place in certain districts, which belong to the different parts of country. If we see the map of growth rate of India then we will be easily able to analyze that most of the part of country has been positive growth rate of forest, but the maximum forest growth rate of forest has been taken place in Rajasthan,

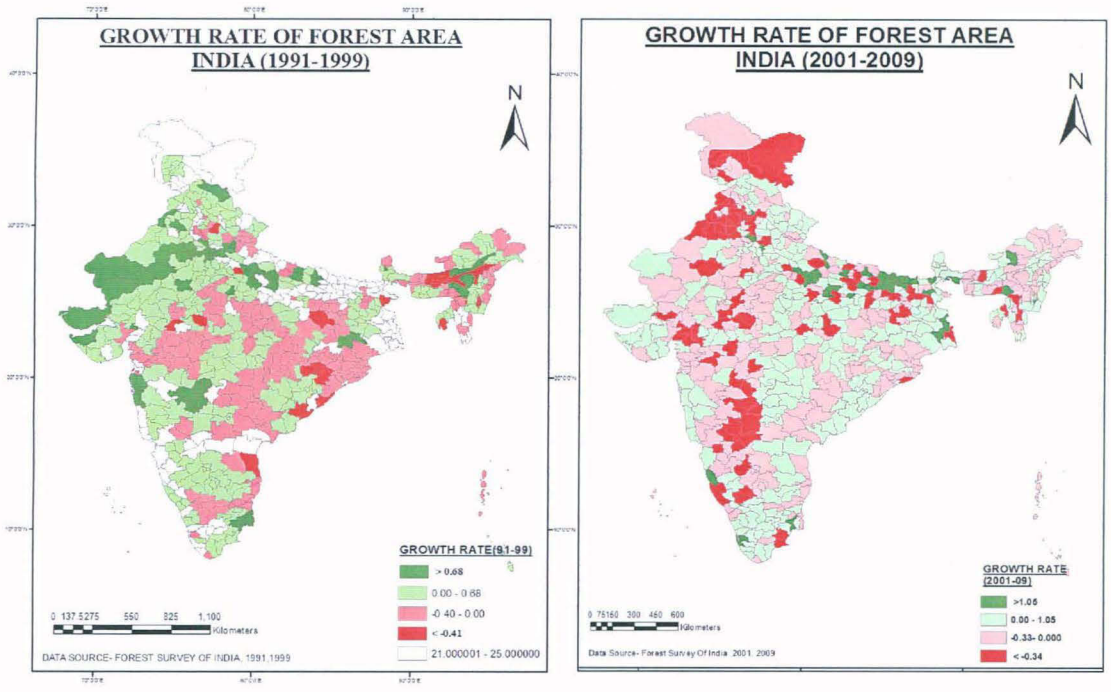


Figure 2.15a and 2.15b showing the districtwise total growth rate of forest area between (91-99) &(01-09).

Madhya Pradesh including Chhattisgarh, Andhra Pradesh, Orissa, Tamil Nadu and some part of the North eastern region is calculated the highest negative growth rate of forest areas between 1991-99. In other side the maximum negative growth rate of forest areas has been calculated in the districts of Rajasthan, Punjab, Jammu and Kashmir, Karnataka, Gujarat and Maharashtra during 2001-2009(figure 2.15). In Rajasthan considering the increasing biotic pressure on the land in arid Rajasthan and the trend of more intensive land cultivation on larger area there is need to accelerate the growth of forest in this region so that the natural base here could be improved to sustain the vital life support systems and also to help in bringing about favorable changes in the harsh climate of the region. The causes behind the drastic growth rate in Rajasthan's districts during 91-99 are the efforts towards forestation process by the government and local people. Several steps have been taken by the government for increasing the forest areas, which was not only important for the environment issue but also for the livelihood for the local people.

In the early period of time there were more industries based in the forest cover but in change of that there were not proper plantation of forest. Rajasthan is reach in natural resources,

so in the early stages of mining activities, the deforestation taken place at high level. If we see the map of 2001-09 growth rates then it can be identified easily that once again deforestation activities taken place highly and most of the districts got the highly negative growth rate of forest areas. Rajasthan also focus on the eco tourism by implementing some strategies like by applying the help of local peoples and provide its benefits to those peoples. Joint forestry management has been successful in most part of the region and Udaipur is the most important districts other districts which has highest growth rate of forest areas is Churu.

In the given table 2.9 below this shows the list of those districts, which has highest and lowest growth rate of forest. In this list maximum districts are not from the north eastern part of India, but they are from north western part of India and south India. Shekhpura from Bihar has lowest growth rate of forest most of the districts are from Punjab, Haryana and Karnataka. In this period of time Punjab and Haryana has more demand of land for the agriculture, infrastructure and industrial set up. In other side the districts from Bihar, Uttar Pradesh and some of the from West Bengal & Kerala, which has achieved the highest growth rate of forest area.

Table 2.9 Districts with Extreme Growth Rate of Forest Cover (01-09)

Districts	Growth Rate	Districts	Growth Rate
SHEIKHPURA	-1.00	HOWRAH	72.00
BIJAPUR	-0.98	BAHARAICH	46.11
PANIPAT	-0.94	MUZAFFARPUR	30.20
MANSA	-0.94	PANCHKULA	20.05
LATUR	-0.92	SHEOHAR	18.00
FATEHGARH SAHIB	-0.92	ALAPPUZHA	18.00
KARGIL	-0.89	VARANASI	11.00
AMBEDKAR NAGAR	-0.89	MADHUBANI	8.07
FIROZPUR	-0.87	KAUSHAMBI	8.00
SANGRUR	-0.87	DARBHANGA	7.04
GORAKHPUR	-0.87	PURBI CHAMPARAN	5.83
JALANDHAR	-0.87	UNNAO	5.58
KAPURTHALA	-0.85	SITAMARHI	5.31
RAICHUR	-0.84	KISHANGANJ	5.25
DHULE	-0.83	KATIHAR	4.64
BHAGALPUR	-0.81	VAISHALI	4.06
SHAJAPUR	-0.81	HOOGLI	3.69
PARBHANI	-0.80	KANPUR NAGAR	3.54

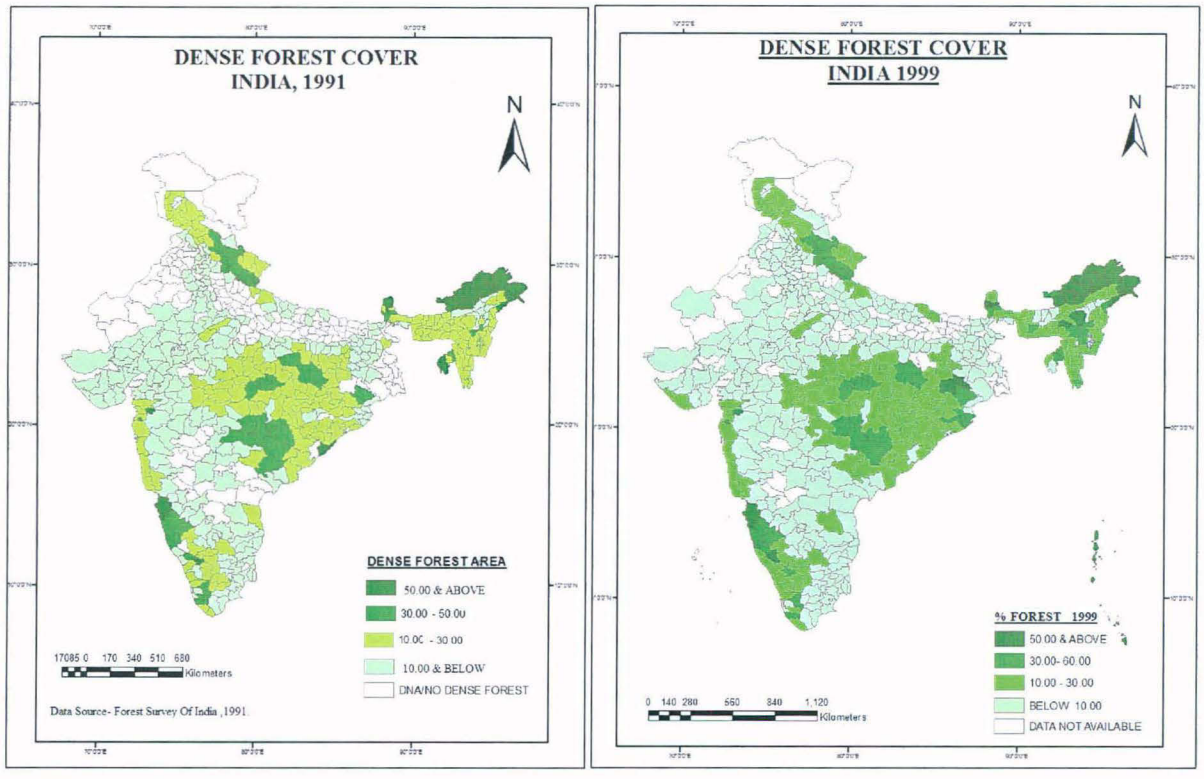
BUXAR	-0.80	SONIPAT	3.00
AMRITSAR	-0.78	KOTTAYAM	2.93
MANDSAUR	-0.78	KUSHINAGAR	2.89
NIMAR WEST	-0.78	SARAN	2.67

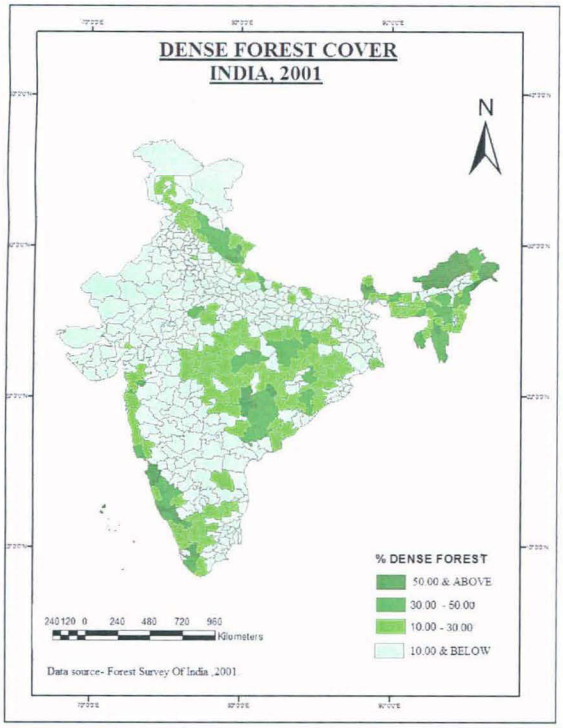
2.5 Distribution of Types of Forest in India at District-Level 1991-09 and 2001-09

Forest survey of India has classified the forest areas in three major parts which is called the dense forest, moderate forest and open forest area. Earlier in 1991 forest report there was three other classification, dense, open and mangrove but in the report of 2003, dense forest area is further classified in two classes, that is dense forest areas and moderate forest but mangrove is merged in dense forest area. These classifications of forest area are mainly based on their canopy size, which has discussed earlier. When we see the distribution of different class of forest areas, then we will find a very minute level study with more accuracy to explain the real character of forest areas. Now the given map will show the distribution of different classes of forest areas in three different period of time 1991, 2001 & 2009.

2.5.1 DISTRIBUTION OF DENSE FOREST

All lands with tree cover (Including mangrove cover) of canopy density between 40% and 70% & above. In the given map below the dense forest are mainly concentrated in Arunachal Pradesh, Himachal Pradesh, Uttaranchal, Western Ghats, Chhattisgarh, Madhya Pradesh, Orissa and Jharkhand. There has been four class showing the distribution of dense forest areas, where the maximum part of the country are covered with the less than 10% cover of dense forest areas in three time period 1991, 1999, 2001 & 2009 (figure 2.16a,2.16b,2.16c 7 2.16d).





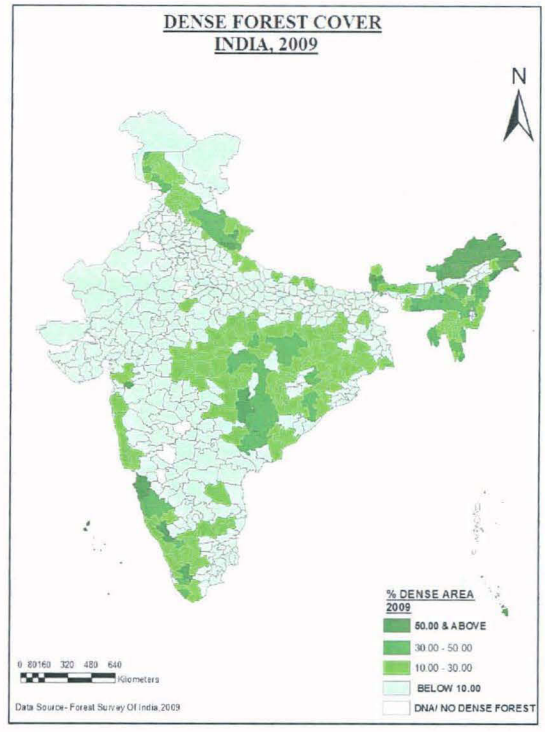


Figure 2.16a, 2.16b & 2.16c showing the forest cover of dense area between 1991 to 2009

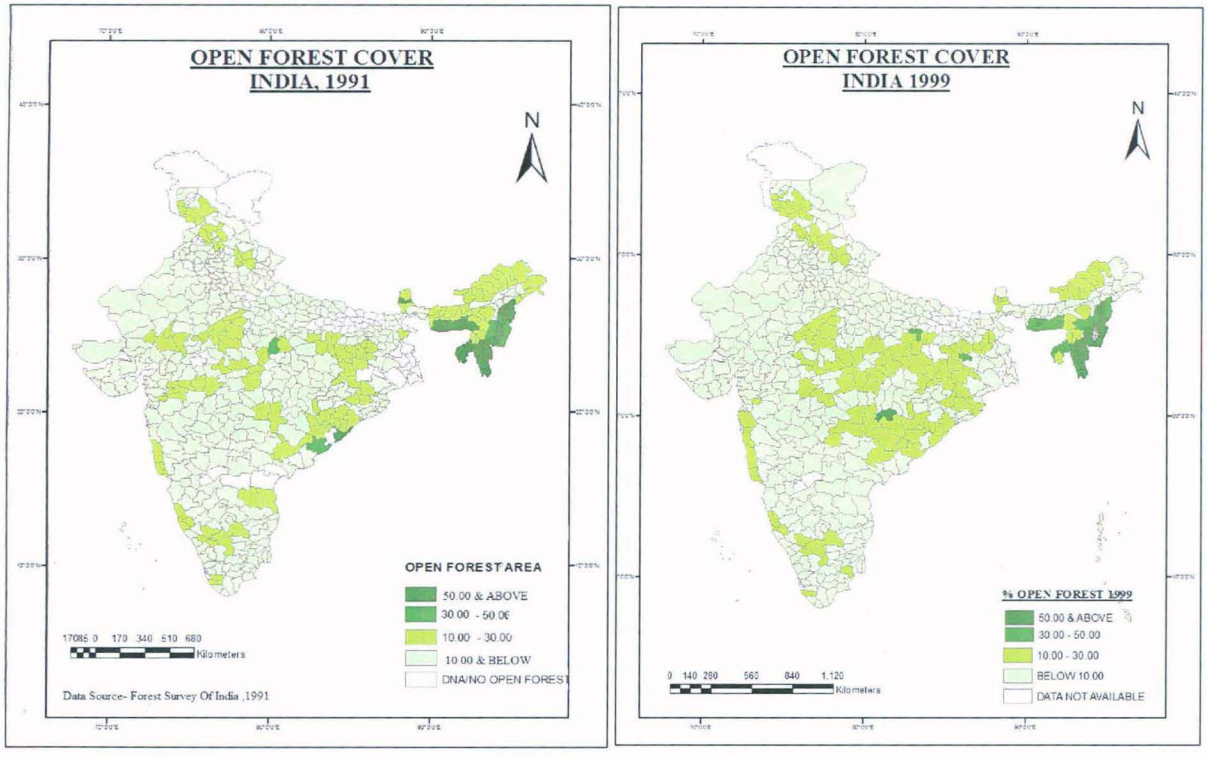
Table 2.10 List of Districts Having Highest & Lowest Cover of Dense Forest Cover (91-09)

DISTRICT	%DENSE91	DISTRICT	%DENSE99	DISTRICT	%DENSE 01	DISTRICT	%DENSE09
KODAGU	79.86	east kameng	90.47	DHAMTARI	94.03	ANDAMANS	76.81
NICOBARS	79.79	NICOBARS	89.68	LAKSHADWEEP	85.91	LOWER SUBANSIRI	75.94
ANDAMANS	79.79	east siang	83.23	CHANGLANG	82.69	PAPUM PARE	73.54
KANNAD UTTAR	71.64	CHANGLANG	82.99	ANDAMANS	80.51	CHANGLANG	71.30
SOUTH SIKKIM	67.21	Kodagu	79.86	NICOBARS	77.89	EAST KAMENG	69.82
UPPER SUBANSIRI	65.13	lower subansiri	77.00	WEST SIANG	75.14	WAYNAD	69.78
EAST KAMENG	65.13	ANDAMANS	75.91	PAPUM PARE	73.17	NICOBARS	67.63
CHANGLANG	65.13	upper siang	73.62	LOWER SUBANSIRI	72.96	WEST SIANG	66.79
TAWANG	65.13	tirap	72.86	EAST KAMENG	69.87	UPPER SUBANSIRI	65.77
PAPUM PARE	65.13	Kannad Uttar	71.66	WEST KAMENG	69.87	SOUTH SIKKIM	61.87
WEST KAMENG	65.13	west siang	70.88	TIRAP	66.55	WEST KAMENG	61.16
LOHIT	65.13	papum pare	67.01	UPPER SUBANSIRI	65.15	UPPER SIANG	60.60
DIBANG VALLEY	65.13	upper subansiri	65.22	EAST SIANG	64.60	EAST SIKKIM	60.06
EAST SIANG	65.13	dibang valley	63.22	WAYNAD	64.20	NAINITAL	59.28
WEST SIANG	65.13	lohit	61.53	UPPER SIANG	64.17	EAST SIANG	59.23
LOWER SUBANSIRI	65.13	KARBI ANGLONG	59.28	THE DANGS	63.68	TIRAP	59.02
TIRAP	65.13	west kameng	57.59	KODAGU	63.58	KODAGU	58.22
UPPER SIANG	65.13	The Dangs	57.21	KANNAD UTTAR	63.18	KANNAD UTTAR	57.92
WEST TRIPURA	60.17	Paschimi Singhbhum	56.69	NAINITAL	62.22	GADCHIROLI	56.40
NILGIRI	59.00	PURBI SINGHBHUM	56.69	EAST SIKKIM	59.85	SOUTH GARO HILLS	55.98
THE DANGS	58.00	South Sikkim	56.13	KOLASIB	56.58	THE DANGS	54.14
NORTH SIKKIM	56.86	East Sikkim	52.52	SOUTH SIKKIM	55.20	LOHIT	52.67
SRIKAKULAM	53.57	West Sikkim	50.94	CHAMPAWAT	55.10	LAKSHADWEEP	52.22
SOUTH TRIPURA	50.96	HARDWAR	46.87	LOHIT	55.04	DIBANG VALLEY	51.39

Table 2.10 shows the maximum concentrated districts of dense forest areas, which mainly situated in the north eastern part of India in all three period of time 1991, 1999, 2001 and 2009.

2.5.2 Distribution of Open Forest

All lands with tree cover (Including mangrove cover) of canopy density between 10% and 40%. Open forest areas are in the natural vegetation cover according to the climatic condition of India.



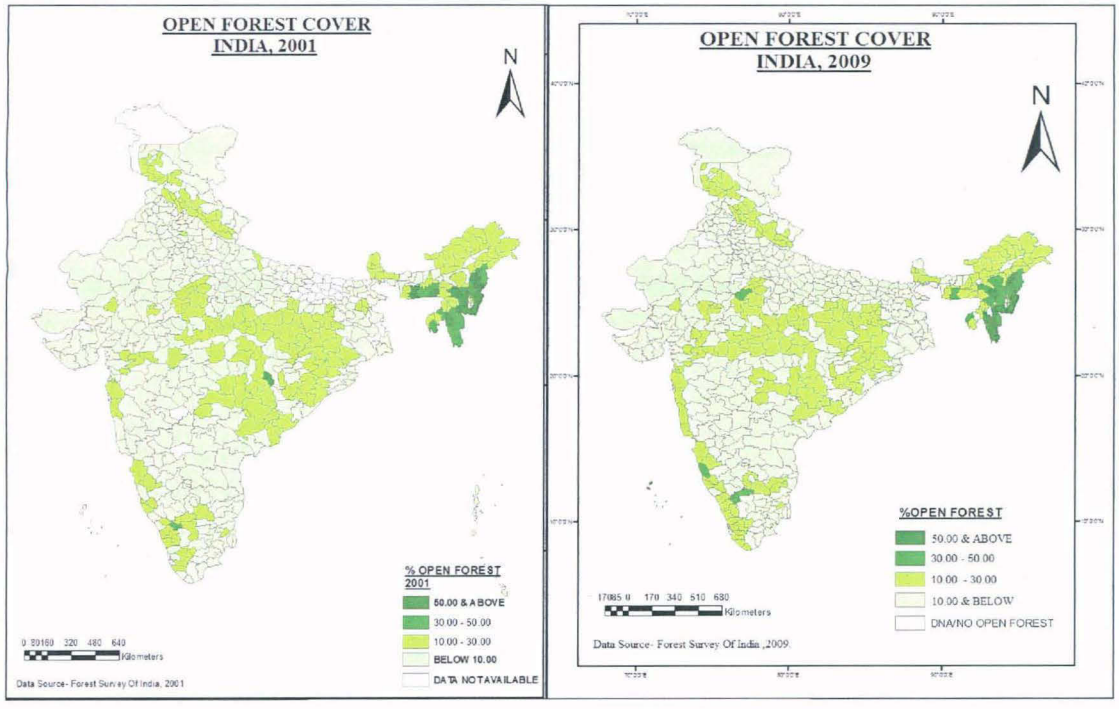


Figure 2.17a, 2.17b & 2.17 c showing the open forest cover between 1991 to 2009

According to the given figure2.17 of open forest cover, the maximum open forest cover is concentrated in the near of the dense forest cover in the states of Jharkhand, Orissa, Madhya Pradesh, Kerala, Andhra Pradesh and north eastern part of India. The open forest class has been classified in four class, where again the maximum region of India comes under the less than 10% of the total forest areas.

Table 2.11 Lists of Districts having Highest & Lowest Open Forest Cover (91-09)

DISTRICTS	%OPEN91	DISTRICTS	%OPEN99	DISTRICTS	%OPEN01	DISTRICTS	%OPEN09
NORTH TRIPURA	95.82	Wokha	73.03	CHURACHANDPUR	64.18	KOLASIB	78.87
SOUTH TRIPURA	91.26	LUNGLEI	72.16	SOUTH GARO HILLS	61.48	MAMIT	70.64
WEST TRIPURA	86.24	Mokokchung	70.59	EAST GARO HILLS	61.48	CHURACHANDPUR	67.13
SOUTH SIKKIM	84.00	Kolasib	70.48	DHAMTARI	59.82	LAWNGTLAI	65.74
ZUNHEBOTO	81.99	Lawngtlai	70.48	MOKOKCHUNG	59.26	AIZAWL	63.72
SRIKAKULAM	79.56	Mamit	70.48	CHANDEL	57.53	CHANDEL	62.33
MOKOKCHUNG	78.33	Saiha	70.48	WOKHA	55.71	LUNGLEI	59.48
PHEK	73.59	Serchhip	70.48	PHEK	55.38	WOKHA	55.41
WOKHA	70.64	AIZAWL	70.48	EAST KHASI HILLS	55.07	UKHRUL	55.11
CHHIMTUIPUI	69.14	CHURACHANDPUR	63.06	UKHRUL	53.15	MOKOKCHUNG	53.07
LUNGLEI	69.14	Zunheboto	62.15	ZUNHEBOTO	51.31	SERCHHIP	52.71
KOLASIB	69.13	CHHIMTUIPUI	60.83	NORTH CACHAR HILLS	51.31	NORTH CACHAR HILLS	52.45
LAWNGTLAI	69.13	CHANDEL	60.31	TAMENGLONG	50.76	SAIHA	50.21
MAMIT	69.13	tamenglong	58.23	MAMIT	50.25	EAST GARO HILLS	49.71
SAIHA	69.13	Phek	56.96	SENAPATI	47.51	UDUPI	47.91
SERCHHIP	69.13	EAST GARO HILLS	56.36	RI BHOI	46.59	CHHIMTUIPUI	47.69
AIZAWL	69.13	Kanker	52.29	TUENSANG	45.22	TAMENGLONG	46.98
CHURACHANDPUR	68.53	UKHRUL	51.63	AIZAWL	44.95	MON	42.55
TUENSANG	67.46	SENAPATI	50.38	LUNGLEI	39.57	ZUNHEBOTO	42.15
EAST SIKKIM	66.04	NORTH CACHAR HILLS	49.96	KOLASIB	39.07	KOHIMA	41.05
MON	64.50	Tuensang	49.91	SERCHHIP	38.78	PHEK	36.97
WEST KHASI HILLS	56.05	West Tripura	49.75	SOUTH TRIPURA	38.56	TUENSANG	36.94
EAST GARO HILLS	56.05	BOKARO	48.83	MON	38.52	DIMAPUR	36.28
RI BHOI	56.04	Mon	47.98	KOHIMA	37.69	SOUTH GARO HILLS	35.37

According to this table2.11, again the maximum districts consisting the highest cover of open forest areas are situated in the north eastern part of India in all four period of time at 1991, 1999, 2001 and 2009.

2.5.3 Distribution of Scrub Area

All forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10 percent. Scrub is not the part of the forest cover, but still it is important to understand the distribution of scrub areas to understand the character of total distribution of vegetation cover in India. The data of scrub area at district wise were available from 2001 report of forest survey.

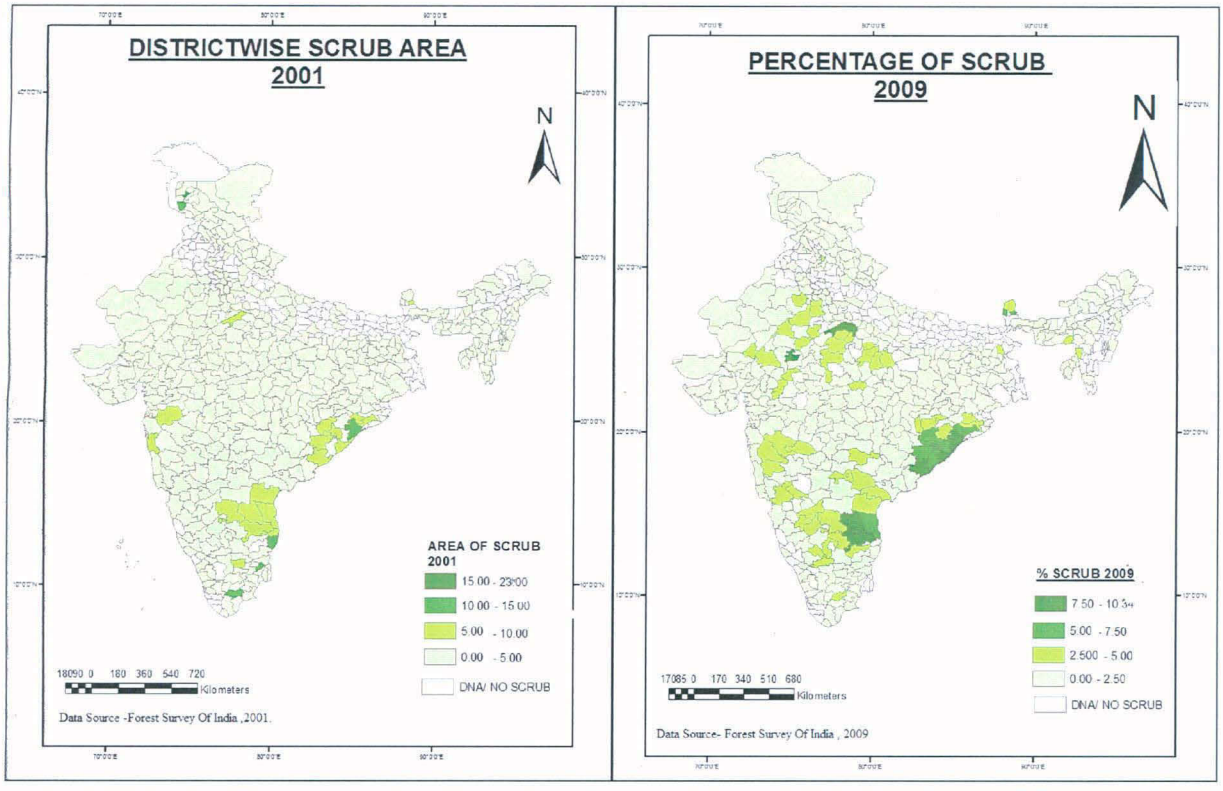


Figure 2.18a & 2.18b showing the scrub area of 2001 & 2009

According to these given figure 2.18, the total scrub areas has been increased during the 2001-2009 and most of them are concentrated in the region of south India (Tamil Nadu, Andhra Pradesh, western Madhya Pradesh and some part of the Karnataka.

2.6 Qualitative Changes in the Forest of India District-Wise

Dense and open forest area are the major classification done by forest survey of India, when we see the change and growth of dense and open forest areas in Indian districts, then we find the very close pictures to analyze the character of forest class distribution. But the other side most of the forest belongs to dense or open forest areas are the exchange of each other, because most of the dense forest cover has further change into the open forest areas and open forest areas has also been change in these dense forest areas. In our earlier studies we found the picture that open forest cover is mainly spread in those regions where dense forest areas are situated.

2.6.1 Growth of Dense Forest Areas

There has been drastic change in the dense forest areas in India during the 1991-2009 at district level, but it is mainly concentrated in those of the region, where there are high dense forest from earlier or after the proper plantation processes. According to the given map below, which shows the growth rate of dense forest areas between "1991-2009" can easily be observed that, during the 1991-1999, maximum part of India has negative growth rate of dense forest cover, but in the districts of Gujarat, western Madhya Pradesh, Tamil Nadu, and Assam & Manipur

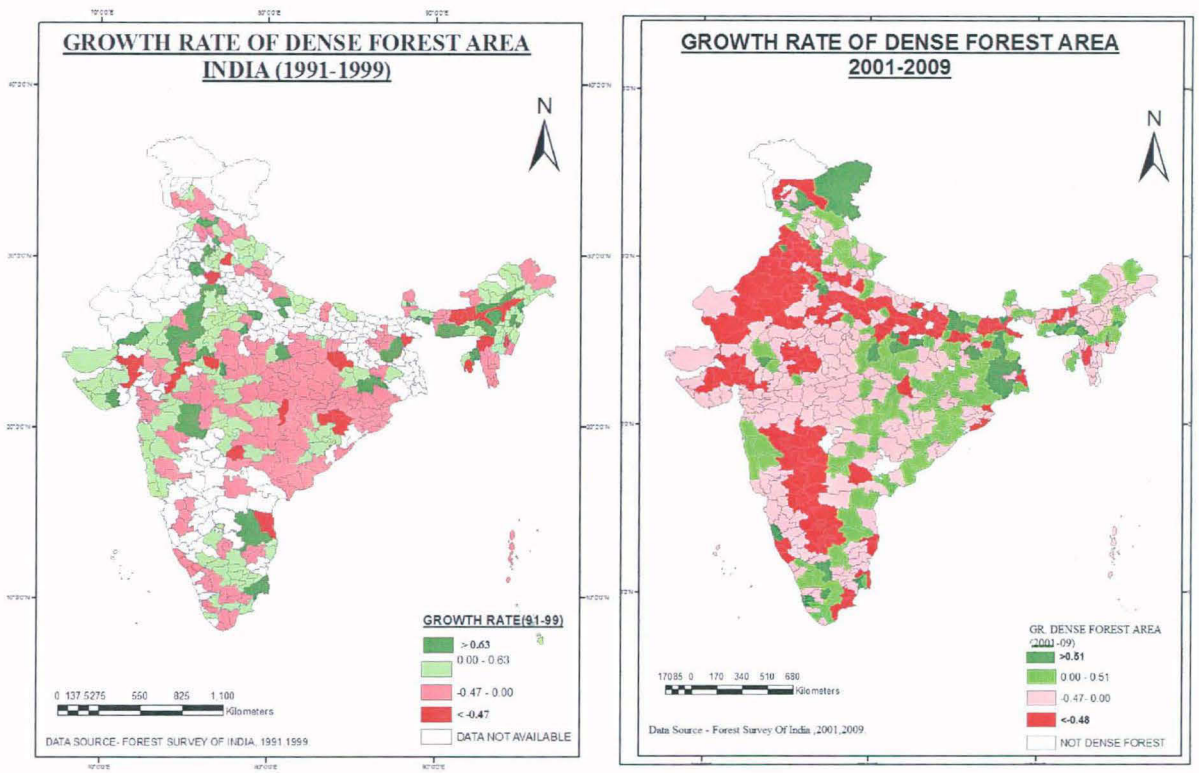


Figure 2.19a and 2.19b showing the total groeth rate of dense forest area between (99-99) & (2001-09).

has positive growth rate of dense forest cover. There are also some districts where dense forest covers are not available, which are mostly from Bihar, Uttar Pradesh and Rajasthan. The highest forest cover in dense forest areas are mainly belongs to the states Tamil Nadu, Gujarat, eastern Rajasthan, west Bengal, Kerala and Tripura.

Table 2.12 Lists of Districts Having Highest & Lowest Growth Rate of Dense Forest Cover (1991-2009)

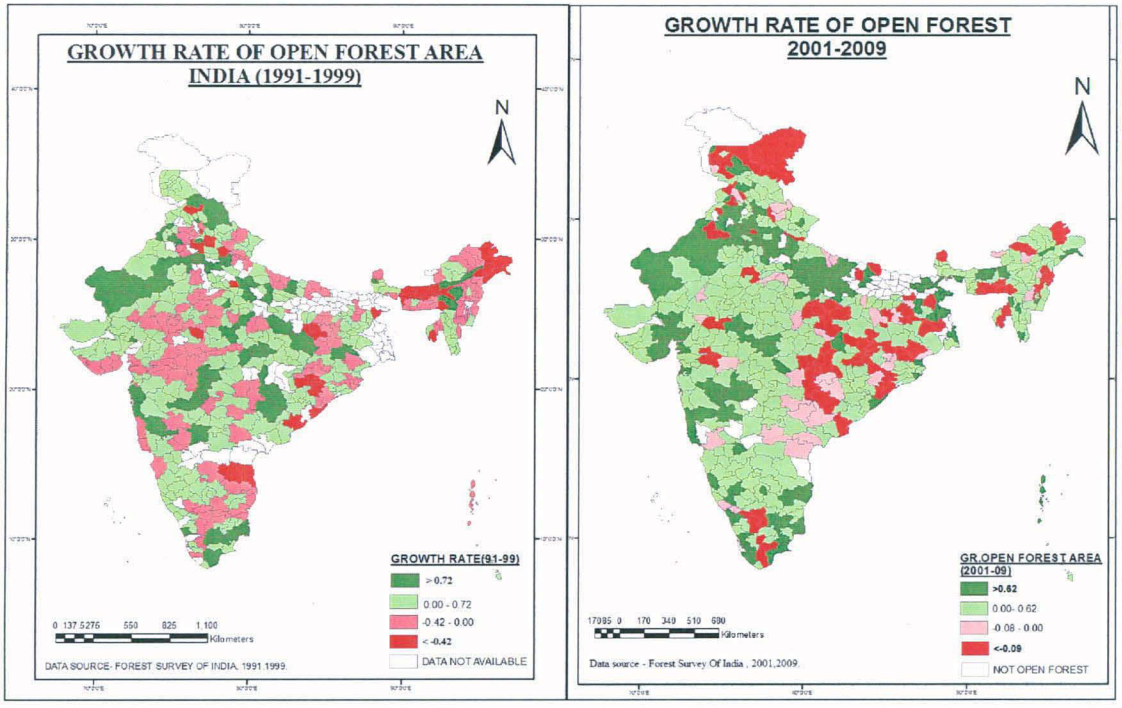
DISTRICTS	GR.DENSE(91-99)	DISTRICTS	GR.DENSE(91-99)	DIST	GR(01-09)	DIST	GR(01-09)
Bhiwani	13.77	KARIMGANJ	-0.58	Sheikhpura	-1.00	Howrah	25.50
Aurangabi	13.33	Saharanpur	-0.58	Diu	-1.00	Muzaffarpur	15.40
JALNA	13.33	BARPETA	-0.62	Gadag	-1.00	Panchkula	9.47
Nagapatti	7.45	NALBARI	-0.62	Bijapur	-1.00	Doda	5.05
Thiruvarui	7.45	KAMRUP	-0.62	LATUR	-1.00	Alappuzha	5.00
Thanjavur	7.45	Ahamdabad	-0.63	BISHNUPUR	-1.00	Chennai	4.00
Faridabad	5.99	Nizamabad	-0.65	Moga	-1.00	Rajauri	3.52
Bhilwara	5.50	Durg	-0.73	Dausa	-1.00	Vaishali	3.35
Paschimi S	5.15	Jhajjar	-0.84	Hanumangarh	-1.00	Purbi Champaran	2.17
PURBI SIN	5.15	Rohtak	-0.84	Karauli	-1.00	Udupi	1.83
Chittoor	4.33	Rajgarh	-0.88	Kannauj	-1.00	Kottayam	1.82
Zunhebot	3.79	Nellore	-0.90	Ballia	-1.00	Thanjavur	1.79
REWARI	3.21	DARRANG	-0.96	Kargil	-1.00	Ladakh	1.56
Gurgaon	3.21	Maldah	-1.00	Ambedkar Nagar	-0.99	Saran	1.53
Datia	3.14	Patan	-1.00	Sirsa	-0.98	Faridkot	1.50
Pudukkoti	3.13	Mehsana	-1.00	Raichur	-0.98	Gurgaon	1.48
Auraiya	3.00	Sonipat	-1.00	Mansa	-0.98	SAHIBGANJ	1.38
Etawah	3.00	gardwa	-1.00	Mainpuri	-0.98	WEST KHASI HILLS	1.38
Lucknow	2.50	Palamu	-1.00	Azamgarh	-0.98	Kaushambi	1.33
Tonk	2.00	Ratlam	-1.00	Barmer	-0.98	Dungarpur	1.32
PAKUR	1.79	IMPHAL EAST	-1.00	Koppal	-0.98	CHANDIGARH	1.30
SAHIBGAN	1.79	BISHNUPUR	-1.00	PANIPAT	-0.98	CHANDIGARH	1.30
DUMKA	1.79	IMPHAL west	-1.00	Sangrur	-0.97	Midinipur	1.24
DEOGHAR	1.79	THOUBAL	-1.00	Hathras	-0.97	PAKUR	1.22

But during the 2001-09, more than 70% districts of India have negative growth rate of forest, which shows the maximum deforestation within densely covered region. Some part of west Bengal, Jharkhand Orissa, Bihar and Jammu & Kashmir has still some positive change in dense forest cover. In this period dense forest has rapidly declined in the Rajasthan, Karnataka, Maharashtra and Uttar Pradesh.

The causes behind these declines in dense forest are the change in the structure of the dense forest areas or technical. Some of them also are affected by the grazing, dependency of forest areas or due to the natural hazards. During 1991-99, the maximum negative growth rate recorded in the north eastern part of India but during 2001-09, maximum negative growth rate has been recorded in the districts of Rajasthan & Uttar Pradesh, those are hanuman Garh, Dausa, and Karauli (table 2.12).

2.6.2 Growth of Open Forest Areas

The growth rates of open forest areas are more important for the study, because the maximum parts of the India are covered with the open forest areas due to its climatic character. But the



Fgure 2.20a and 2.20b showing the growth rate of open forest area between (91-99) & (01-09).

Maximum open forest covers are concentrated around the dense forest area, which also shows the climatic character of Indian regions. Growth rate among the all districts of India during 1991-09 can be explained by the given map above, where the maximum cover of open forest areas has been increased during the 2001-2009. But still the major part of the Jharkhand, Chhattisgarh, Madhya Pradesh and Jammu & Kashmir have been in the negative growth rate and the highest growth rate among open forest cover are in the districts of Rajasthan, Uttar Pradesh, Gujarat, Delhi, Punjab and Haryana as well as Tamil Nadu (figure 2.20).

When we see the overall growth rate of open forest areas the we find that major part but still the part from north eastern part of country, Bihar, Jharkhand, Andhra Pradesh and Jammu & Kashmir have negative growth rate ,other side Rajasthan ,Uttar Pradesh. Kerala, Karnataka, Maharashtra, Gujarat, Delhi, Haryana, Punjab and Assam have highest growth of the open forest.

Table 2.13 Lists of Districts having Highest & Lowest Growth Rate of Open Forest Cover (1991-2009)

DISTRICTS	GR.OPEN(91-99)	DISTRICTS	GR.OPEN(91-99)	DISTRICT	GR01-09	DISTRICT	GR01-09
REWARI	20.44	KAITHAL	-0.64	Dausa	-1.00	Unnao	62.21
Gurgaon	20.44	PANIPAT	-0.64	Hanumangarh	-1.00	Panchkula	59.75
Hardoi	12.00	YAMUNANAGAR	-0.64	Karauli	-1.00	Fatehpur	37.00
Sangli	8.40	Panchkula	-0.64	Kargil	-0.98	Bareilly	36.00
Pudukkottai	7.67	Karnal	-0.64	Pulwama	-0.94	Kanpur Nagar	31.33
Nagapattinam	6.94	CHANGLANG	-0.65	PANIPAT	-0.91	Kushinagar	31.00
Thiruvarur	6.94	Baudh	-0.65	Badgam	-0.88	Aligarh	28.50
Thanjavur	6.94	BALANGIR	-0.65	Lakhisarai	-0.80	Sirsa	25.50
SIDDHARTH NAGAR	6.00	Kandhamal	-0.65	South Garo Hills	-0.76	PONDICHERRY	23.94
Sant Kabir Nagar	6.00	Sonapur	-0.65	Gorakhpur	-0.75	ARARIA	23.67
Basti	6.00	tirap	-0.66	Munger	-0.73	MADHEPURA	19.00
Lahul & Spiti	5.82	Rajgarh	-0.68	Ratlam	-0.69	Kurukshetra	18.00
DHEMAJI	5.40	Bijnor	-0.71	Punch	-0.69	Pratapgarh	16.00
SONITPUR	5.40	Nellore	-0.79	Ladakh	-0.67	KANPUR DEHAT	15.17
Lakhimpur	5.40	TINSUKIA	-0.80	Erode-periyar	-0.64	Udupi	15.17
Jodhpur	5.18	Dibrugarh	-0.80	North Tripura	-0.62	Hisar	13.50
Raibareli	5.00	DARRANG	-0.95	EAST GARO HILLS	-0.53	Ambala	12.50
Mansa	4.75	Maldah	-0.99	SAHIBGANJ	-0.52	Lucknow	12.21
Bhantida	4.75	Daman	-1.00	Dhalai	-0.51	Fatehabad	11.80
Faridabad	4.68	Diu	-1.00	PAKUR	-0.50	24 Pargana North	11.75
Sonipat	4.51	gardwa	-1.00	GODDA	-0.49	Sitapur	11.44
Paschimi Singhbhum	3.85	Palamu	-1.00	Faridkot	-0.46	Shajapur	11.00
PURBI SINGHBHUM	3.85	Mumbai City	-1.00	EAST KHASI HILLS	-0.46	Sultanpur	10.57
Gautam Buddha Nagar	2.67	Mainpuri	-1.00	KODERMA	-0.45	Kottayam	10.20

The above table 2.13 is the list of top twenty districts of India, which has highest and lowest growth rate of open forest cover "between" 1991 to 2009. During 1991-01, the districts from Haryana and Karnataka and north eastern hilly region are highly degraded open forest, while during 2001-09, the districts from Rajasthan and Bihar as well as north eastern region has highest negative growth rate of open forest. In other side during 1991-01, the districts from Assam, Uttar Pradesh, Kerala, and Haryana has high growth rate of open forest areas and it has been in continues during the 2001-2009, again in the states of Haryana, Uttar Pradesh and Bihar, where high growth rate of open forest areas has been calculated.

2.7 Summing Up

The previous decade are the important decades for the study of deforestation activities, because these were the period when several development processes taken place and environment was on focus not only in the national concern but also in international concerns. According to the study

done for forest cover change and its growth rate the overall explanation comes to the positive change among the total forest cover in India, but it was not due to the afforestation processes only but it was the also result of techniques for measuring the forest cover used by the forest survey of India.

During the period of 1991-99, the total forest cover change in India is positive, and when we see the figure we will be able to analyze that most of the Indian districts have high growth rate of forest areas. But it was not continued by those districts in next decade 2001-2009 and most of the districts has negative growth rate of forest cover.

In spite of implementing and launching several policies for the protection of forest areas during 2001-09, growth rate was not controlled, because activities for deforestation was high than the afforestation. There were several industries based on the forest like paper, furniture, mach box and lakhs industries and the demand for these industries increased with the rapid development. Dense and open forests are mostly concentrated in the hilly regions, where rainfalls used to be high and open forest are concentrated around the dense forest areas. North eastern part of India has always been the high forest cover either that is dense or open forest areas, but the most of the forest degradation has taken place in the region of north eastern region , Madhya Pradesh , Chhattisgarh, Jharkhand, Karnataka and Orissa, where the mining & quarrying activities has taken place with the large industrial set up.

On other hand Rajasthan, Bihar, Uttar Pradesh, Kerala, Haryana, Punjab, Assam, Tamil Nadu, Maharashtra and Gujarat are those states which has positive growth rate of forest areas. Because in the certain period of time these states focuses on the protecting the forest cover by implementing some policies which consisted the help of local communities and peoples. Kerala, west Bengal, Uttaranchal and Rajasthan are the major states, which started these policies and got enough success for the forest protection.

CHAPTER 3

THE IMPACT OF DEVELOPMENT PROCESSES ON THE RATE OF DEFORESTATION: A DISTRICT LEVEL STUDY IN INDIA

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3.1 Introduction

In 60 years of post independence period, increases across all India per capita incomes have been accompanied by substantial declines in forest cover. It is concern about the phenomena of global warming and declining biodiversity has led to an increase in attention paid to the link between the disappearance of the world's forests and economic growth. There has been a long debate on the affect and relationship between the forest cover and economic development. A particular focus of this debate has been whether there is an "environmental Kuznets curve" (EKC) for forests, analogous to that found for air and water quality (Grossman and Krueger, 1995), in which afforestation occurs at higher levels of economic prosperity.

The extent of such a relationship is of considerable interest to policy makers: it has been argued on the one hand that policies directed at economic growth such as the promotion of markets and increasing openness to trade will lead eventually to increases in forest cover and on the other that forest cover will continue to decline as economic growth takes place in the absence of policies that directly promote forest growth and conservation (Arrow et al. 1995) But cross-country regressions based on one time period cannot, in any case, necessarily be used to infer that increases in income will eventually lead to an increase in forest cover. Although we are unaware of systematic cross-country studies over multiple periods, there are two prominent within-country examples of a positive relationship between income growth and forest cover at higher levels of income. However, that the proportion of land designated by the Indian government as forest land (Anon 1997; FAO 2001) increased from 12.3 percent in 1951 to over 23 percent in 1999.

India possesses a distinct identity, not only because of its geography, history and culture but also because of the great diversity of its natural ecosystems, which leads to the

third world country and developing country has found the growth in economic recent period of time, where the social structure, cultural bound, population dependency and religious character are quite different from other part of world. In India forest has always been the base of economy and survival for a particular section of society and the people revered forests in India and a large number of religious ceremonies centered on trees and plants. Even today in parts of India the sacred groves exist and are worshipped.

The structure of economic development in India in early stage was totally different in comparison to developed economy. Here most of the population belongs to the agrarian society, when international attention turned to the developing countries in the early 1950s, economists were caught unprepared. They had no readily available conceptual model with which to analyze the economic growth process in these mostly agrarian societies. Many economists reasoned that developing countries would need to follow the same path taken by the world's richer nations in their transformation from agrarian to industrial economies. Development models described this growth process as a series of linear stages through which all countries must pass. In stream of following the development processes natural resources such as forests received little or no attention in these initial models. Instead, development strategies highlighted capital formation and technical progress as the major factors responsible for rising incomes and economic growth. In general, forests were viewed as a source of land to be converted to more productive uses. While they could also be a source of revenue and foreign exchange, forests were seen as relatively unimportant in the struggle to promote sustained economic development." Forest industries other than pulp and paper were considered too small to be significant for industrialization efforts.

On the basis of Centre for Monitoring Indian Economy (CMIE) forest survey of India (FSI 91-99) data , this chapter looks at the impact of development activities on the rate of deforestation in Indian districts during the post economic reform period. This was the period when India adopts the new economic policy for development with the help of industrial growth and other related activities. Generally development activities are linked with the natural resources, like forest, water and mining land. Other side these development activities refers to the other activities which relates to the forest resources like level of urbanization , consumption of electricity, population pressure, increase in roadways connectivity and increase in gross sown area. In the opposite if developed economy the growth of forest area has been related to these development activities, and

we attempt to analyze whether these development processes effect the growth of forest area or not in this given period of time.

There is spatial variation in climatic condition of India, so the major forest concentration varies from place to place. According to the forest survey of Indian district data on their satellite based imagery, the high concentration of forest areas are in hilly part of India, that is western Ghats, north eastern part of country and north Himalaya region as well as Deccan plateaus. We tried to find the role of development processes in the growth of forest cover in different physiographic region of India, Himalaya region, Indo-Gangetic plane, Deccan plateau and Coastal region. The considered indicators of the development which has been further correlated with the rate of deforestation is basically those indicators, which are the major cause behind the removing the forest cover in India.

Forest conversion for agriculture expansion is the most salient signature of human occupation of the earth's land surface. Although population growth and deforestation are significantly associated at the global and regional scales, evidence for population links to deforestation at micro-scales, where people are actually clearing forests is scant. In India the total ***gross sown area*** has increased during 1991-2001 from 115.58 million hectares to 165.16 million hectares, which was the cause of development and mass population pressure. The increase in the gross sown area is the result of cutting forest area at mass level, which was necessary for keeping maintain our development and survive for the mass population. In the major part of our country almost all districts of our country has increased the gross sown area. Gross sown area has increased in those regions only where there was forest cover earlier. The ***number of industries*** established during the post liberalization period, which needs place in the mining & quarrying areas, and those activities leads to the forest cutting. The ***level of urbanization*** increased with the economic development, because new city developed and peoples came to that city for their better life and education and because of that suburb area developed around the metropolitan cities, where there was forest cover earlier. Increase in the ***roadways cover*** is more of the important to see the development level of any country. So with the rapid economic development the total length of the roadways increased and in a localized way, this development process may have led to deforestation, and the incidence of this is likely to be higher in areas having high forest coverA large proportion of rural population in

hilly region forested area are dependent on the forest cover for their shelter, energy for fuel and lightening. That population belongs to the lower section of our society, which also employs in these forest areas. Extending this argument, a high level of ***electrification of village*** is indicative of lows dependence on forest areas. Simultaneously, high density of population would tend to impact growth of forest areas because it in would induce clearing of forest due to high pressure of land for building construction and other human settlement as well as their other needs.

3.2 Relation between Development Indicators and Rate of Deforestation in India

The above development indicators are directly or indirectly related to the removal of forest, we tried to find that in the post reform period has it really affected on the total growth of forest in all district of India. First of all the following given table shows the present condition of development and the rate of deforestation.

Table 3.1 Region Wise Development Indicators Comparing With Growth Rate of Forest Area

PHYSIOGRAPHIC REGION	POP. DENSITY	%URBAN POP.	FOREST GROWTH RATE(91-99)	GROSS SOWN AREA(% OF RA) in sq. km	VILLAGE ELECTRIFIED AMONG 100	ROAD DENSITY (PER 100KM SQ.)
HIMALYAN REGION	114	17.72	0.10	28.60	81.43	49.37
INDO-GANGETIC PLAINS	430	23.74	0.30	95.45	85.97	60.81
SOUTHERN PLATEAU	219	27.54	0.08	58.84	91.35	57.45
COASTAL REGION	1918	34.27	0.15	65.55	94.74	134.88
ALL INDIA	**324**	**25.34**	**0.15**	**62.46**	**88.38**	**64.77**

This above given table 3.1 shows the regional distribution of the different indicator for the development and the rate of deforestation during 1991-2001. The coastal region has highest population density, urban population concentration & road density, but the rate of deforestation is on national level which is 0.15, which is due to its physiographic situation. Because coastal region has always been important for the export and import on port, needs the high density of roadways, which further leads to high population density

as well as urbanization. But in the process of these development activities the total forest growth rate has not been negative, means the total forest cover has been increased during 1991-2001.

In the Indo-Gangetic plains the total forest growth rate is highest (0.30) amongst all regions and gross sown area is also high due to its land fertility & situation. Population density & road density are also high in this region but the population density is high than national average but road density is low than national level. Southern plateau has high electricity & road density but the growth rate of forest area is lowest among all region, which is the result of high level of mining & quarrying activity, because this plateau region are rich in terms of minerals reserve , so industrial activity has taken place in these region. This plateau region also consist the high tribal of population, this are still dependent on the forest for their livelihood and shelter as well as fuel. High urbanization is the result of establishing of new cities around the industrial set- up and mining area. Those mining area has increased at the cost of harming natural resources and removing the forest areas.

Himalayan region has lowest everything due to its relief, but the total forest cover has increased during the 1991-2001, which indicates the good sign for the future of forest cover. This hilly region is still not compatible with more human settlements but in the recent period of time at the name of development activities, losing its natural beauty. Most of the tribal population resident there and those are dependent on the natural resources and contribute in the conserve of forest cover in Himalayan part of India. The regions are suitable for the hydro project, that's why the level of village electrification is high in the Himalayan region.

3.3. District level Relationship between Rate of Deforestation and Index of Development

Before explaining the correlation between rate of deforestation and levels of development, we have seen in earlier table that the growth rate of forest area has been positive during the post reform period in all region of India. But when we see the correlation between these indicators of development with deforestation rate then we find significant positive correlation of rate of deforestation with gross sown area.

Table 3.2 Correlations Between Levels of Development and Growth Rate of Forest (District Level Analysis)						
	growth rate	pop density	percentage _urban	gross sown area	village electrified	Road density
growth rate	1	0.038	0.089	.191**	-0.035	-0.102
pop_density		1	.398**	-0.077	0.082	0.085
percentage _urban			1	0.02	.181**	0.105
gross_sown area				1	.260**	.196**
village_electrified					1	.166**
Road_density						1
**. *Correlation is significant at the 0.01 level (2-tailed).*						

As table 3.2 shows, a significant correlation between gross sown areas and the rate of deforestation explain that the districts in which gross sown areas have higher, the growth rate of forest is low. Those other indicators of the development population density urban population and village electrification are not significantly associated with the growth rate of forest area. It shows that the increase or decrease in the total growth of the forest areas are not affected from these excluded indicators in the districts of India.

Table 3.3 Model Summary of Regression Development Indicators Determining Growth Rate of Forest									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.191[a]	0.037	0.033	0.3377	0.037	11.379	1	300	0.001
2	.238[b]	0.057	0.051	0.3346	0.02	6.426	1	299	0.012
a. Predictors: (Constant), gross sown area									
b. Predictors: (Constant), gross sown area, Road density									

Table 3.4 Regression Coefficients[a] :Development Indicators and Growth Rate of Forest

Model		Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
		B	Std. Error	Beta	T	Sig.	Lower Bound	Upper Bound
1	(Constant)	0.033	0.039		0.837	0.403	-0.044	0.11
	gross sown area	0.002	0.001	0.191	3.373	0.001	0.001	0.003
2	(Constant)	0.074	0.042		1.761	0.079	-0.009	0.158
	gross sown area	0.002	0.001	0.22	3.834	0	0.001	0.003
	Road_density	0	0	-0.145	-2.535	0.012	-0.002	0

a. Dependent Variable: growth rate

Road density is also negatively correlated with the growth rate of forest area in all India. It shows that high density of road is related with the low growth of forest cover.

Table 3.5 Regression Analysis: Rate of Deforestation and Index of Development (in all India)

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.026[a]	0.001	-0.003	0.3439	0.001	0.198	1	300	0.657

a. Predictors: (Constant), REGR factor score 1 for analysis 1

The given table 3.5 shows the regression between the growth rate of forest area and the index of development during 1991-2001 periods. That shows the positive but insignificant relation.

3.4 Regional Level Analyses of Development Indictors and Rate of Deforestation (Regional Level Study)

The previous section explain the relationship between the growth rate of forest area with the levels of development in all districts of India, which result shows the not any relationship between the index of development and the growth rate of forest area. now we want to see in my further study the relationship between levels of development and growth rate of forest in the different physiographic region of India, which has been divided in four major region, Himalayan region, Indo-Gagetic plane, Southern Plateau and coastal part of India.

3.4.1 Himalayan Region

The Himalayan region, it is more popular for their natural landscape and resource, which also consist the major diversity in the forest cover and thousands of species of flora and fauna thrive in the region. With the development process during the post economic period, Himalayan region are more important because most of the economic activities have been taken place in the Himalayan region, especially in the north eastern part of India. With few exceptions most of this forest has been cut for commercial lumber or agricultural land.

In the Middle Himalayas at elevations between 1520 and 3660 m (between 5000 and 12,000 ft) natural vegetation consists of many species of pine, oak, rhododendron, poplar, walnut, and larch. Most of this area has been deforested; forest cover remains only in inaccessible areas and on steep slopes. Below the timber line the Great Himalayas contains valuable forests of spruce, fir, cypress, juniper, and birch. Alpine vegetation occupies higher parts of the Great Himalayas just below the snow line and includes shrubs, rhododendrons, mosses, lichens, and wildflowers such as blue poppies and edelweiss. These areas are used for grazing in summer by the highland people of the Great Himalayas.

Animals such as tigers, leopards, rhinoceroses, and many varieties of deer once inhabited the forested areas of the Sub-Himalayan foothills and the Tarai plain. As a result of deforestation the habitat of most of the wildlife has been destroyed. They are now restricted to special protected areas such as the Jaldapara and Kaziranga sanctuaries in India and the Chitawan preserve in Nepal. There are few animals in the Middle Himalayas because of extensive deforestation. In the Great Himalayas musk deer, wild

goats, sheep, wolves, and snow leopards are found. The existence of the Yeti has been reported by highland Sherpa in Nepal but has eluded discovery by several expeditions. So now it is very important to see the impact of development processes on the growth rate of forest area in the Himalayan region.

Table 3.6 Showing the Correlations between Levels of Development and Growth Rate of Forest Area in Himalayan

	growth rate	pop.density	percentage_urban	gross_sown area	village_electrified	Road_density
growth rate	1	0.119	-0.044	-0.084	-.272*	-0.028
pop.density		1	0.074	.322**	.383**	.476**
percentage_urban			1	-0.172	-0.041	-0.16
gross_sown area				1	.542**	0.186
village_electrified					1	.437**
Road_density						1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

In the given table 3.6, only village electrification are significantly correlate with the growth rate of the forest area, which explains that having the highest village electrification will leads to the low growth rate of forest areas in Himalayan region. Himalayan region are mainly electrified by the hydro projects and more of the hydro projects in Himalayan regions are cause of more deforestation. Percentage urban, gross sown area, population densities are correlated but insignificant.

Table 3.7 Model Summary of Regression of Development Indicators Determining Growth Rate of Forest Area in Himalayan Region

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.272[a]	0.074	0.059	0.218697	0.074	4.962	1	62	0.03
2	.364[b]	0.133	0.104	0.21339	0.059	4.122	1	61	0.047

a. Predictors: (Constant), village_electrified

b. Predictors: (Constant), village_electrified, pop.density

Finally we can say that these indicators of development are correlated but not at significant level, that's shows the less impact of development on growth of forest except village electrification, there is probably a spurious relationship.

Table 3.8 Regression Coefficients[a] : Development and Growth Rate of Forest Area in Himalayan Region

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.336	0.112		3.014	0.004
	village_electrified	-0.003	0.001	-0.272	-2.228	0.03
2	(Constant)	0.368	0.11		3.345	0.001
	village_electrified	-0.004	0.001	-0.373	-2.887	0.005
	pop.density	0.001	0	0.262	2.03	0.047

a. Dependent Variable: growth rate

In the Himalayan region most of the villages are electrified due to the easily availability of electricity, so the people are mostly dependent on the electricity for the fuel and lightening at home, but still village electrification are negatively correlated with the growth rate of forest in the Himalaya region.. In the recent period the local peoples have been very aware for conserving and protecting the forest and government are also helping those people. That's why highly dense and concentrated forest cover areas are increasing with the development process, but still it's low in comparison to the other physiographic region of India. Himalayan regions are high concentrated forest regions, but still there is still a less impact on forest cover, but in the north eastern region of india is more affected by the development process.

Table 3.9 Regression Analysis: Rate of Deforestation and Index of Development (Himalayan Region)

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.202[a]	0.041	0.025	0.222579	0.041	2.647	1	62	0.109
a. Predictors: (Constant), REGR factor score 1 for analysis 1									

Given table 3.9 shows the regression between growth rate of forest areas and index of development in Himalayan region, where the adjusted R square value is very low, which is only 0.025.

3.4.2 INDO- GANGETIC PLAIN

In the northern part of India, where the large and extend part are the covered by plain has always been important for its diverse culture and linguistic diversity. The Indo-Gangetic plains, also known as the Great Plains are large alluvial plains dominated by three main rivers, the Indus, Ganges, and Brahmaputra. They run parallel to the Himalayas, from Jammu and Kashmir in the west to Assam in the east, and drain most of northern and eastern India.

In the history of India, the whole northern plain was covered by the forest areas, but with the high population pressure, it needs more land for agricultural activity and gradually it loosed the major part forest cover area. This region is mainly popular for agricultural activities and high population density. So the entire plain areas have very less forest cover, and what was available earlier has been removed for the agricultural need and other constructional activities. The previous decade has been very important for all over the country, because entire country has been influenced by the development activities.

So it will be very important to see the study on the relationship between growth rate of forest area and levels of development. That can be further explained by the tables 3.10 to 3.12.

Table 3.10 Correlations Coefficients between Levels of Development and Growth Rate of Forest Area inI Gangetic Plains

	growth rate	Pop density	Percentage urban	Gross sown area	Village electrified	Road density
growth rate	1	0.154	0.031	0.219	0.078	.279*
pop.density		1	0.089	0.217	.349**	.243*
percentage_urban			1	0.145	-0.034	-0.047
gross_sown area				1	.283*	0.183
village_electrified					1	0.167
Road_density						1
*. Correlation is significant at the 0.05 level (2-tailed).						
**. Correlation is significant at the 0.01 level (2-tailed).						

In the given table 3.10, all given development indicators are positively correlated with the growth rate of forest area, but no one is significant except road density. Here densities of roadways are positively significant in relation with the growth rate of forest in the indo- Gangetic plain areas. It shows that forest growth has increased with the increase in roadway density during the 1991-2001. In the post reform period the whole Gangetic plain is dominated for the agricultural production. But the other activities also taken place related to the industrial set-up and major constructional work, which was relatively less than the plateau region.

Table 3.11 Model Summary

Indicators of Development Determining Growth Rate of Forest Area in Indo-Gangetic Plains

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.279[a]	0.078	0.066	3.13E+02	0.078	6.511	1	77	0.013

a. Predictors: (Constant), Road_density

The value of adjusted R square value is 0.066, which explain the relationship between growth rate of forest and roadways density. The districts which having relatively higher road density also have high growth rate of forest area. In the indo gangetic plain, there is less concentration of forest area and other side development activities did not taken place heavily, so it's found the spurious relation. Most of the development has been placed in the non forested areas in the plain.

Table 3.12 Regression Coefficients[a]: Levels of Development and Growth Rate of Forest Area in Indo Gangetic Plains

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	229.673	86.149	.	2.666	0.009	58.129	401.217
	Road_density	3.298	1.293	0.279	2.552	0.013	0.724	5.872

a. Dependent Variable: growth rate

Table 3.13 Regression Analysis: Rate of Deforestation and Index of Development (Indo-Gangetic plains)

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.057[a]	0.003	-0.01	0.455667	0.003	0.255	1	77	0.615
a. Predictors: (Constant), REGR factor score 1 for analysis 1									

The above table 3.13 shows the regression coefficient between growth of forest and index of development in the indo Gangetic plain. The adjusted R square value is -0.01, it explains the negative correlation at only 1 percent level.

3.4.3 Southern Plateau

In the southern part of the peninsula south of the Indo-Gangetic Plain, the Deccan Plateau can be considered the cultural and historical heart of India, defining the subcontinent. The maximum share of Indian forest cover are situated in the plateau region of India, so the change in the forest cover in plateau region effect the entire vegetation cover of country. The eco-region represents a large area of tall, tropical dry forests in the southern Deccan Plateau, on the leeward side of the Western Ghats Mountain Range. It extends across the southern Indian states of Karnataka and Tamil Nadu. The eco-region's links to the ancient, southern circumpolar continent, Gondwanaland, are evident in the biotic links to Africa and Madagascar (Meher-Homji 1989). The Vindhya Range marks the margins of the southern reaching peninsula and the Indo-Gangetic Plain. Over 300 million people live in the greater area of the Deccan Plateau. Sustainable resources such as forests and water are under increasing pressure. Deforested areas are being replanted with extensive monoculture that will further deplete the diversity of the ecosystem.

So it has been more interesting to see the relation between growth rate of forest area and levels of development in this region. This region is reach in the mineral resources, so the major industrial activities has been taken place in this region and several new cities establish in post reform period, population increased, urban population

increased. In Table 3.14, we attempt to explain the relationship between deforestation and development.

Table 3.14 Correlations between Levels of Development and Growth Rate of Forest Area in Southern Plateau Region

	Growth rate	Pop density	Percentage urban	Gross sown area	Village electrified	Road density
growth rate	1	0.019	0.075	.259**	0.099	-0.073
pop.density		1	.594**	0.022	0.144	.261**
percentage_urban			1	-0.034	0.031	.196*
gross_sown area				1	.287**	-0.064
village_electrified					1	0.015
Road_density						1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

In the given table 3.14 the growth rate of forest area are positively correlated with all development indicators except road density, where high road density leads to the low growth of forest area in the plateau region. But the positively significant relationship is with the gross sown area, which explain that the district which having the high gross sown area, has also the high growth rate of forest area. In the plateau region, most of the region are covered with the forest and gross sown area also increased in the region of non forested area. But other sides the policies for protecting the forest area are linked with the other development activities. Major reforestation process taken place, many forested areas declared as sanctuary & national parks. Due to the high population growth people also inclined to increase the gross sown area, but not at the cost of forest.

Table 3.15 Model Summary

Indicators of Development Determining the Growth Rate of Forest Area in Southern Plateau Region

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.259[a]	0.067	0.06	0.268108	0.067	8.942	1	124	0.003

a. Predictors: (Constant), gross_sown area

In this model summary table 3.15, the adjusted R square is only 0.06, means explain the only 6 percent of relation between the growth rate of forest area and gross sown area.

Table 3.16 Regression Coefficients[a] of Levels of Development and Growth Rate of Forest Area in Southern Plateau

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.128	0.074		-1.735	0.085
	gross_sown area	0.004	0.001	0.259	2.99	0.003
a. Dependent Variable: growth rate						

Table 3.17 Regression Analysis: Growth of Forest Area and Index of Development (Southern Plateau Region)

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.170[a]	0.029	0.021	0.273552	0.029	3.704	1	124	0.057
a. Predictors: (Constant), REGR factor score 1 for analysis 1									

This above table 3.17 shows the relation between growth rate of forest area and index of development, which did not found any relation between these two. And the R square value is 0.029, which explain the only 2 percent accuracy and relation.

3.4.4 Coastal Region

India has one of the longest coastlines in all over the world, which is also important for their bio diversity and dense forest cover. Western and Eastern Ghats consist the major part of forest cover in India, which is the result of its favorable climatic condition. In the history of India, the coastal region has always been dominated and disturbed by the foreign colonial country, which was due to its reach natural resources in terms of herbal, spices, fruits and woods for the major constructional work like, railway track, industrial activities and furniture. Western Ghats are spread in the states of Kerala, Maharashtra,

Karnataka and Goa, that is highly reach in the forest cover, because of high rainfall in all over India.

In the recent period of development, the coastal areas has been centre of activity, because it location near to the coast area, which is the centre for exporting and importing goods and materials interstate and inter country. Table 3.18 presents correlations between development variables and deforestation.

Table 3.18 Correlations of Levels of Development and Growth Rate of Forest Area in Coastal Region

	Ggrowth rate	Pop density	Percentage urban	Gross sown area	Village electrified	Road density
growth rate	1	-0.078	-0.294	-.426*	0.122	-0.235
pop.density		1	.695**	-.395*	0.141	-0.076
percentage_urban			1	-0.18	0.309	-0.064
gross_sown area				1	-0.19	.576**
village_electrified					1	0.037
Road_density						1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

In the given table 3.18, population density, gross sown area, percentage urban population and roadways density are the negatively correlated with the growth of the forest cover, it shows that the districts having the high population density, gross sown area, urban population and high roadways density will leads to the low growth rate of forest cover in the region of coastal are of India.. But other side the village electrification of the region is positively correlated with the forest cover areas, that shows the districts having the high level of village electrification will leads to the high growth rate of forest areas. The only negative significant correlation is with the gross sown area of the land, that explains the districts having the highest gross sown area, will have the low growth rate of forest area. This is as per our hypothesis that if there is a pressure to expand agricultural land, land under forest would undergo a change in terms of land-use.

Table 3.19 Model Summary

Indicators of Development Determining the Growth Rate of Forest Area in Coastal Region

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.426[a]	0.182	0.155	8.52E+00	0.182	6.875	1	31	0.013
2	.569[b]	0.324	0.279	7.88E+00	0.142	6.302	1	30	0.018

a. Predictors: (Constant), gross_sown area

b. Predictors: (Constant), gross_sown area, percentage_urban

Table 3.20 Regression Coefficients[a] of Levels of Development and Growth Rate of Forest Area in Coastal Region

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.747	3.198		3.048	.005
	gross_sown area	-.120	.046	-.426	-2.622	.013
2	(Constant)	15.450	3.727		4.145	.000
	gross_sown area	-.139	.043	-.495	-3.242	.003
	percentage_urban	-.140	.056	-.383	-2.510	.018

a. Dependent Variable: growth rate

Table 3.21 Regression Analysis: Rate of Deforestation and Index of Development (Coastal Region)

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.296[a]	0.088	0.058	9.00E+00	0.088	2.976	1	31	0.094
a. Predictors: (Constant), REGR factor score 1 for analysis 1									

Table 3.21 shows the relation between growth rate of forest area and index of development, which did not found any relation between these two. And the R square value is 0.058, which explain the only 5 percent accuracy and relation.

3.5 SUMMING UP

The general explanation says that the continuous economic development leads to the growth of the forest cover in any state of the world, that apply in the developed economy,

but a country like India, which has just started their development process. So that is very important to see the explanation in the relationship between the growth rate of forest and levels of development.

In the districts of India development is still not made strong impact on the growth rate of forest area, but the gross sown area, population density and urban population are positively correlated with the growth rate of forest but village electrified and road way density are negatively correlated with the forest growth rate, but only gross sown area are significantly positive correlated. In most of the cases the growth of the gross sown area causes the decline of forest, but in the plateau region gross sown area are positively correlated with the growth of forest area, that is the result of systematic development process and better policy implication.

In the regional level study, the results of relation between these are quite different from the overall relation explanation. Where in the Himalayan region, the all development indicators are negatively correlated with growth rate of forest except population density and village electrified is only at significant level, but in the region of Indo-Gangetic plain all development indicators are positively correlated and road density is significant.

In the region of southern plateau area the all development indicators are positively correlated except roadways density, where gross sown areas are at significant level. It shows that the districts in the plateau region which has high gross sown area will leads to the high growth rate of forest area. But the coastal region has totally different picture of the relation, where all indicators are negatively correlated except village electrified. The positive change in the development indicators leads to the low growth rate of forest area in coastal region. In the coastal region only gross sown are significantly but negative correlated with the growth of forest area which is totally opposite to the relation in the plateau region. Having the high growth in the gross sown area will leads to the deforestation activities. Coastal regions are rich in the forest cover and hilly in character, so the development process and agricultural activities has taken place at the cost of forest cover.

Chapter 4

EMPLOYMENT IN FORESTRY RELATED POVERTY DRIVEN AND GROWTH DRIVEN SECTORS: A REGIONAL LEVEL ANALYSIS

Chapter 4

EMPLOYMENT IN FORESTRY RELATED POVERTY DRIVEN AND GROWTH DRIVEN SECTORS: A REGIONAL LEVEL ANALYSIS

4.1 Introduction

On the basis of National Sample Survey (NSS) data, this chapter looks at the patterns of rural casual employment in the recent period of time after post economic reform. Generally each and every section of workforce, and most of the sectors of economy, witnessed an increase in employment in this period. But countries like India, where a large number of populations are still dependent in the forest cover for their livelihood and their ceremony. In this chapter we attempt to analyze employment in two broad forestry sectors, poverty induced and growth induced, and look at firstly the trends in these sectors and secondly their relationship with deforestation. n the NSS the person engaged in the forestry and related activities are not engaged in the logging activities only but also in the afforestation or reforestation, gathering materials from forest and logging activities.

As per NSS definition, a person engaged in others form or non- form enterprises (both household and non-household) and is getting wage in return for his work according to terms of daily or periodic work contract is a casual labour. Usually in the rural areas, a type of labourers, that can be seen who normally engage themselves in public and private works both activities, sponsored by the government and by a group of people in forestry related activities. People are engaged in the several activities in forest related activities, like *gathering* the materials from the forest for their basic need and livelihood are woods for fuel, seeds, fruits, tendu leaves and several forest products. Gathering of other wild growing forest materials (balata and other rubber-like gums; cork; lack, resins and balsams; vegetable hair and eel grass; acorns and horse-chestnuts; mosses etc.) including fuel/fire wood.

Reforestation is the other process , where peoples are engaged in the forest related services and involve in the generating the more forest cover, Growing of standing timber:

planting, replanting, transplanting, thinning and conserving of forests and timber tracts, operation of tree nurseries. Timber cruising, timber evaluation, fire fighting and forest management including afforestation and re-forestation is the other sector, where people are involved. The other major activity in the forest is the logging, which is major activity to effect the total growth of forest and present cover of forest. The activities under the *logging*, where people are involve are the transport of logs in association with logging chiefly within the forest and logging camps and loggers primarily engaged in felling timber and producing wood in the rough such as pit props, split poles, pickets, hewn railway ties or fuel wood. For any study that aims to analyze employment issue in India, it is important to look at process of Casualisation. Increase in incidence of Casualisation suggests that people are getting lower quality of work (Sahu, 2003).

The present chapter studies the increasing level of employment in rural workforce at all India level, with a particular reference to the forestry and related sector. It also looks upon recent scenario of employment at regional level in forestry related activities. Further this chapter analyzes the share of employment in the forestry and related activities at the regional level, it also see the different others activities under the forestry and related works, like gathering of woods, leaves, fruits and seeds , logging activities and related services and afforestation or reforestation process. To analyze the distribution and share of different activities under forestry and related activities at the regional level, only the usual principle status workers have been considered because of most of the finer details under this category.

4.2 Employment under the Forestry, Logging and Related Service Activities

The activities under the forestry and related activities have been divided in six sector of employment on the basis of its nature in the forest related activities. People are engaged in several activities in the forest areas, but the purpose engaged for varies to a large extent. This nature of engaging in the forest area gives the two major ideas to explain the employment in forestry. India considered as a poor country, and major population of poor people belongs to the tribal, who are still living around the forest areas. Dense forested areas are dense in those regions, where climatic condition is in the favor of growing the forest and trees and these regions are mostly resident by the tribal population of India. In

the history of India tribal population of India has always been dependent on the forest cover for their livelihood, shelter and wood. Now the criteria and course of their dependency is changing but the major populations of tribal group are dependent or engaged in the forestry area.

Table 4.1 State Wise Total Employment in Different Activities in Forestry, Logging & Related Activities

State Name	% forestry workers to total rural workers	% Workers in Reforestation to total in forestry workers	% Workers in gathering to total in forestry workers	% Workers in logging to total in forestry workers
Jammu & Kashmir	0.12	50.49	0.00	49.51
Himachal Pradesh	0.54	44.84	8.84	46.32
Punjab	0.14	0.00	0.00	100.00
Chandigarh	0.00	0.00	0.00	0.00
Uttaranchal	0.60	57.94	42.06	0.00
Haryana	0.19	3.28	0.00	96.72
Delhi	0.00	0.00	0.00	0.00
Rajasthan	0.25	61.87	28.80	9.32
Uttar Pradesh	0.07	34.88	37.84	27.28
Bihar	0.11	0.00	99.48	0.52
Sikkim	0.19	100.00	0.00	0.00
Arunachal Pradesh	0.05	77.14	0.00	22.86
Nagaland	0.29	66.04	0.00	33.96
Manipur	0.00	0.00	0.00	0.00
Mizoram	0.19	92.13	7.87	0.00
Tripura	0.61	32.34	67.45	0.21
Meghalaya	0.23	82.83	0.00	17.17
Assam	0.24	0.00	98.52	1.48
West Bengal	0.14	0.00	59.92	40.08
Jharkhand	0.27	0.00	100.00	0.00
Orissa	0.59	0.00	73.57	26.43
Chhattisgarh	0.25	54.17	38.54	7.29
Madhya Pradesh	0.08	14.77	82.16	3.07
Gujrat	0.28	4.30	95.70	0.00
Daman & Diu	0.00	0.00	0.00	0.00
Dadra & Nagar Haveli	0.00	0.00	0.00	0.00
Maharastra	0.20	3.66	79.47	16.87
Andhra Pardesh	0.18	6.62	82.40	10.99

Karnataka	0.11	39.09	57.29	3.61
Goa	0.03	0.00	0.00	100.00
Lakshadweep	0.00	0.00	0.00	0.00
Kerala	0.36	1.63	0.00	98.37
Tamil Nadu	0.51	0.00	57.27	42.73
Pondicheri	0.00	0.00	0.00	0.00
Andaman & Nicober	5.15	82.49	0.00	17.51
total	0.21 to total rural employment	14.81% to the total employment under forestry	60.48% to the total employment under forestry	24.72% to the total employment under forestry

Source : nsso 64th round(2007-08)

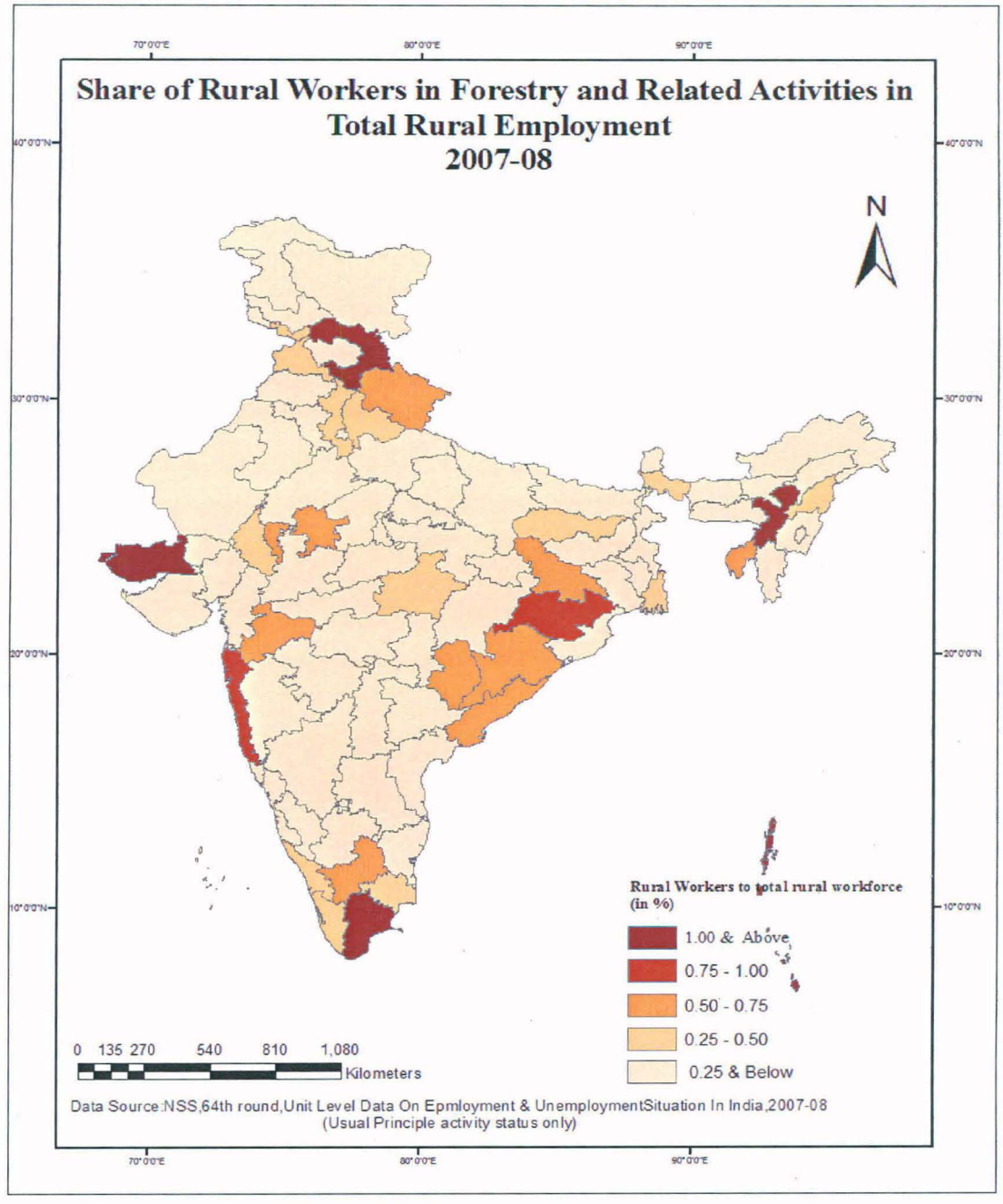
As table 4.1 shows the share of total employment in the rural workforce under forest and related activities at state level that shows the engaged workforce in different sectors of the forestry and related activities. Most of the workforces are employed in the gathering process (60.48% to the total forestry employment). If we see the state wise share of workforce in the different sectors under forestry employment, then we find that Punjab is only the state where the people are engaged in the logging activities, except all other activities of reforestation and gathering, it is because of its nature of agriculture. But the states like Uttarakhand , Sikkim , Mizoram , Gujarat are those states, where the people are not involve in the logging activities, but they are involve in the gathering and reforestation process, it means in these states the employed workforce under forestry sectors are not the responsible for the logging activities.

In the states of Bihar, Assam, Jharkhand, Orissa, and Goa, no employment in the process of afforestation and reforestation activities. Kerala, Meghalaya, Nagaland, Arunachal Pradesh, Haryana, Jammu & Kashmir are the states, workforce are not engaged in the gathering wild growing forest materials including fuel/fire wood. But other side, in Jharkhand total workforce are engaged in the gathering activities, that's why it is important for the collecting woods and several other products from forest and lac is the example, whether the more than 80% lac is collected from the state of Jharkhand.

4.2.1 Employment in the Rural Forestry and Related Activities to the Total Rural Workforce in India; Regional Analysis

A regional level analysis has been carried out to examine the spatial pattern of employment in the forestry sector. Figure no. 4.1 shows the regional pattern of share of workforce in forestry and related activities in the total rural workforces.

Figure 4.1 Employments in Rural Forestry and Related Activities



According to the given map the maximum share of rural workforce in the forest and related activities are in the region of Trans Himalayan & Southern Himachal Pradesh, Kachh Pradesh of Gujarat , Southern Tamil Nadu and Chachar plains of Assam, where more than 1 % of total rural workforce sample engaged in the forestry and related

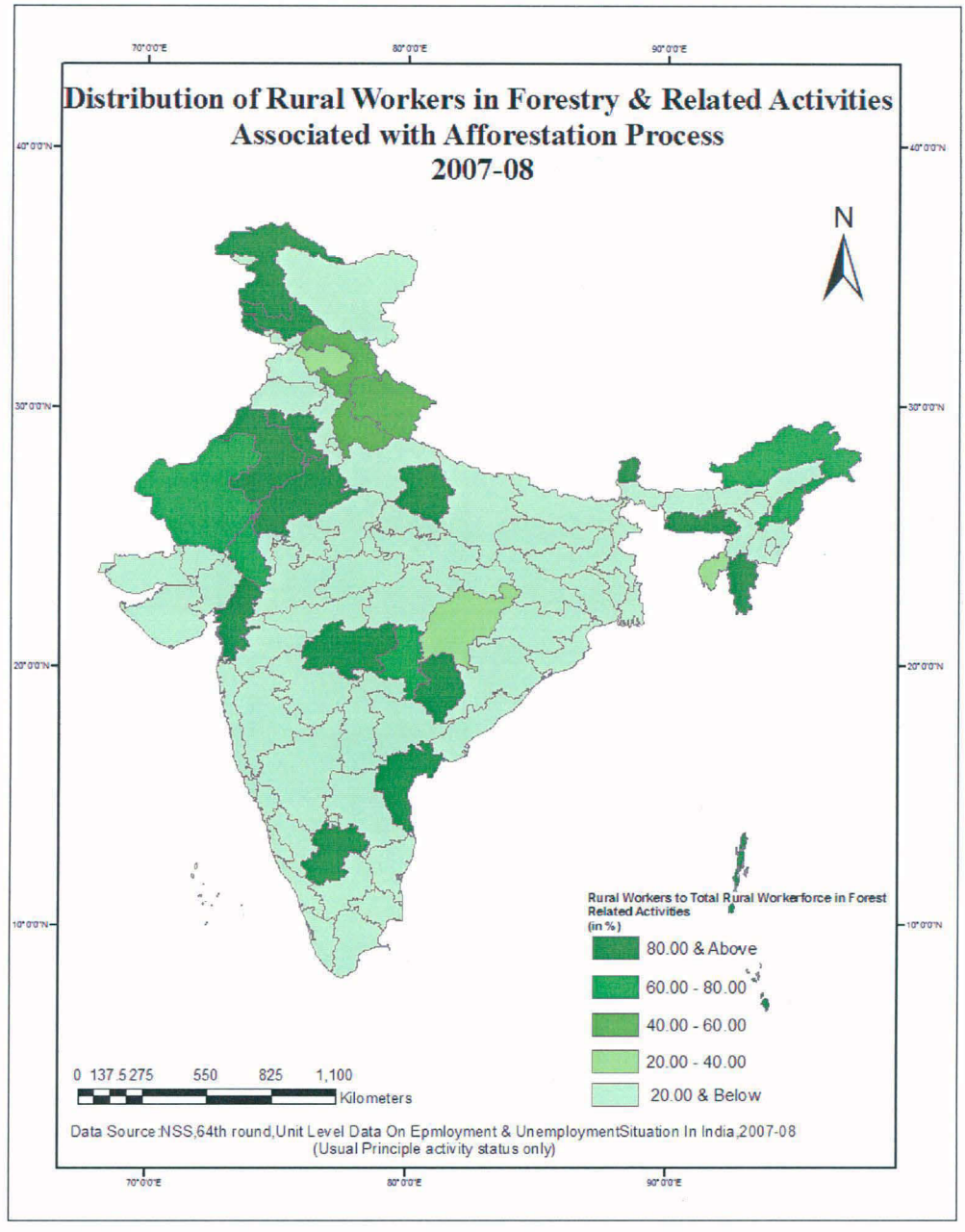
activities. The reason behind this engagement in the forestry activities in these region is due to the relatively large extent of forested area In the Kachh region of Gujarat, that is naturally undeveloped region due to its unfertile soil and alkaline land, people also have fewer options outside of forestry based activities. The whole region of Assam is mainly known for the agriculture production except Chachar plain, because it is hill in the nature. Again the extent of forest cover is very large in Himachal Pradesh and this explains the large share of workers in the forestry sector.

The other important region, where people are involved in the forestry and related services is high are Western Maharashtra , Uttarakhand, Eastern Orissa, Tripura , North Western Tamil Nadu and north western Madhya Pradesh. But the major part of India has low workforce participation in rural areas in forestry and related activities, which less than 0.25% of total rural workforce of India, that shows that the total number of rural workforce are still has very less participation in forestry based employment in the major part of India.

4.2.2 Employment in the Forest Management Including Afforestation and Re-Forestation to the Total Workforce in Forestry and Related Services

In the recent period of new economic pattern, the role of forest is changing , so people are not involve only in the removing and logging the forest area, but also participating in the reforestation and afforestation activities. Under the forestry and related activities growing of standing timber: planting, replanting, transplanting, thinning and conserving of forests and timber tracts, operation of tree nurseries and other forestry service activities considered. In the forestry service activities timber cruising, timber evaluation, fire fighting and forest management including afforestation and re-forestation are included.

Figure 4.2 Distributions of Rural Workers in Reforestation Activities



The above figure 4.2 shows the distribution of rural workers in forestry and related activities associated with afforestation or reforestation process to the total rural employment in the forestry and related activities. Here there are some regions, where

more than 80% of total rural workforces in forestry related activities are involve in the reforestation activities, those regions are Sikkim, Mizoram, Meghalaya, and southern upper Ganga plain in up, eastern & western Rajasthan, southern Gujarat, coastal Andhra Pradesh, southern Chhattisgarh, Nilgiri hill in Tamil Nadu and mountainous Kashmir. A large part of the country, the most of the workforce are involve in the other activities related to forest rather than a process of reforestation and afoorestation, which is less than 20 percent of total employment involve in the forestry and related activities.

The total area of forest is increasing due to the process of reforestation in most of the region with the help of local people and government institution. In the state of Uttarakhand, Rajasthan, west Bengal , Gujarat, Madhya Pradesh, Kerala and Maharashtra has launched the several schemes for conserving , protecting & growing the new trees plants with the help of local people, that's why the employment in the regions of this states are high under process of reforestation. India has been implementing large-scale afforestation/ reforestation since 1980 under social forestry, Joint Forest Management, silvi-pasture, farm forestry and agro-forestry programmes, covering over 30 mha. This may have reduced pressure on the forests.

In the appendage of development process, the major workforces are attracting towards the mining, constructional and machinery works, which is forcing the cause of deforestation in country that will be explained later. The projections for area under forest as well as area afforested are based on current trends or what is generally termed the 'current trend scenario'. The current trend scenario is based on the past, current and short-term afforestation plans. The projections exclude the tree cover component as reported in 2001 and 2003 by the FSI (Rajiv Kumar, 2008).

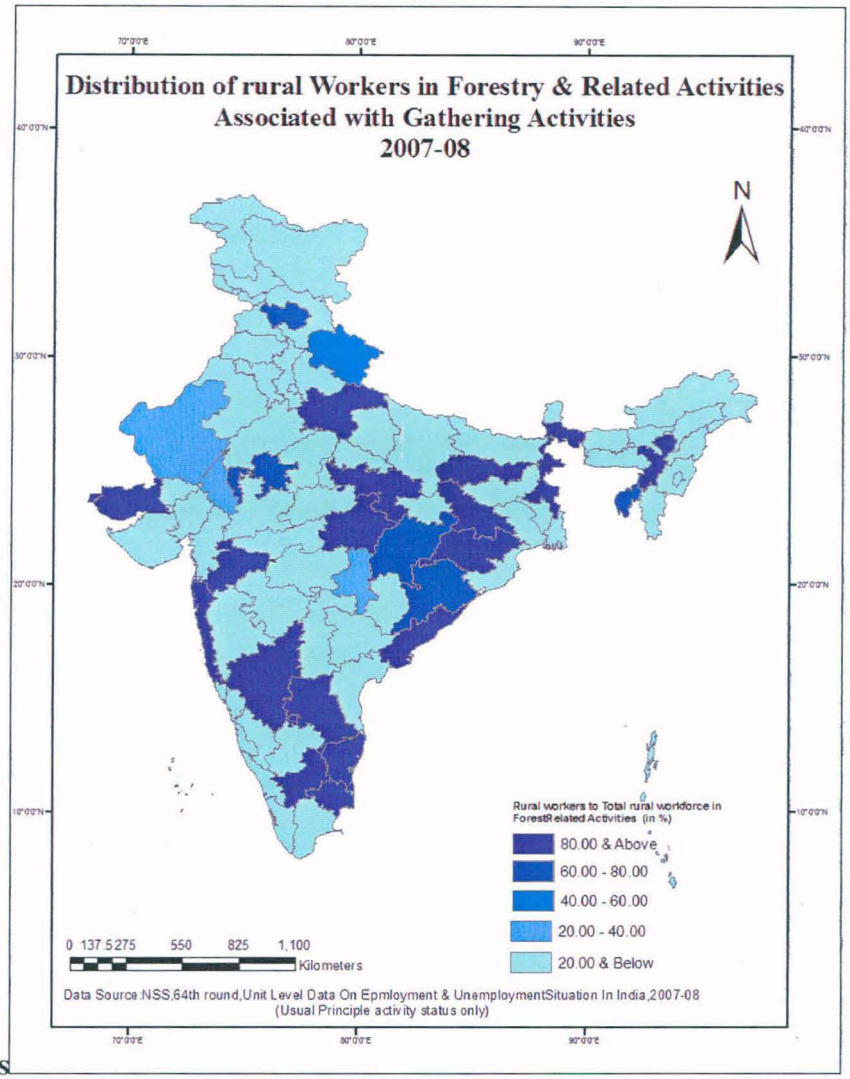
4.2.3 Employment in the Gathering of Other Wild Growing Forest Materials Including Fuel/Fire Wood to the Total Workforce in Forestry and Related Services

Whereas 70 per cent of India's population lives in rural areas, for tribal this is as high as 90 percent. It is well established that most tribal live in forested regions, and their economy is heavily based on gathering from forests. In all about 100 million people living in and around forests derive at least part of their livelihood from collection and marketing of non-timber forest products. These provide subsistence and farm inputs, such

as fuel, food, medicines, fruits, manure, and fodder. The collection of NTFPs is a source of cash income, especially during the slack seasons. The issue of rights and access to NTFPs and incomes from NTFPs is of great importance to the sustenance and livelihoods for forest dwellers.

So far the entire thrust of forestry has been towards growing timber, which results in the removal of all the material which could serve gathering needs. This calls for a modification of the existing silvicultural practices, not so much to achieve high forest as to restore to the forests an admixture in which a sensible balanced level of vegetation would be available to meet the gathering needs. (N.C. Suxena, 2008). In new economic development scenario, the items of collection from forest are being commercialized and the total number of workforce is decreasing with respect of time, which can be seen by this given picture.

Figure 4.3 Distributions of Rural Workers in Gathering



Process

As figure 4.3 shows the region wise distribution of the rural workforce engaged in the gathering materials and other items from the forest to the total rural workforce in forestry and related activities. The region , which conserve the high forest cover in the country, the total employment under gathering process are high, like north west Jharkhand, western Orissa, coastal Maharashtra, Tamil Nadu, inner Karnataka, ,hilly west Bengal, middle Uttar Pradesh, Kachh region in Gujarat, , Chhattisgarh , Madhya Pradesh, and Chachar plains in Assam. In these region more than 80 percent people are involve in the gathering activities to the total rural workforce in the forestry and related activities. The reason behind the involvement of large number of people in gathering are the tribal

population, these regions consist the high concentration of tribal population and tribal population are dependent on the forest for their livelihood, but they don't harm the forest area because of its life line. The several economic policies came to the welfare of tribal of people in the forestry areas, where they can use the forest for their daily needs like grazing, collecting woods, fruits, leaves, seeds and getting shelter.

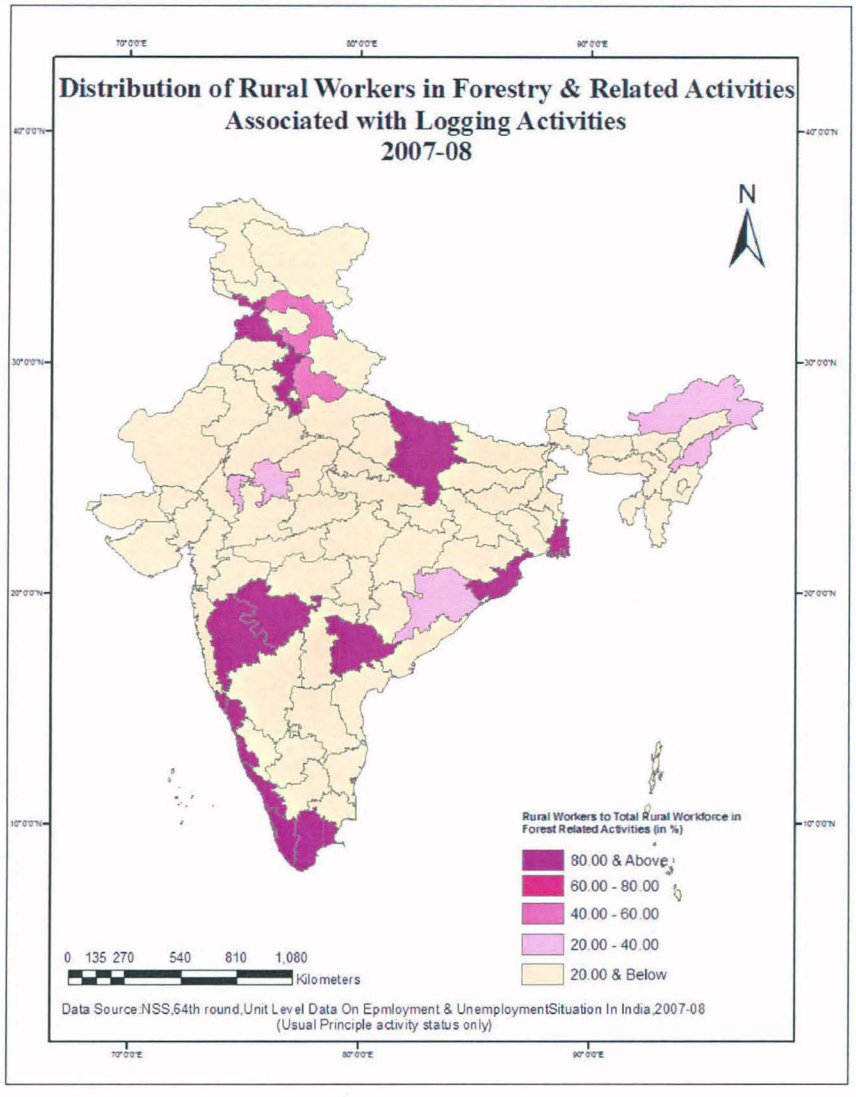
But the peoples in the Himalayan regions, middle plateau region and western part of country have very less share of employment in the gathering process, because of the less cover of forest and its nature of production, whereas Uttarakhand, western Himachal Pradesh are those regions in Himalayan region, where peoples are involve in the gathering process because of high population pressure.

4.2.4 Employment in the Logging Service Activities to the Total Workforce in Forestry and Related Services

Logging is the more important for study in the region of forest cover areas, because that is the major reason behind the deforestation activities in India. Deforestation began thousands of years ago for building ships and houses. A large number of forest areas have been cleared for plantations, agriculture, pasture, mining, or urban development. Today forests cover only half of the area they did when agriculture began 11,000 years ago. This earlier loss of 50% of the Earth's forests is sufficient, in itself, to severely disrupt the global carbon cycle. "God has cared for these trees, saved them from drought, disease, avalanches, and a thousand tempests and floods. But he cannot save them from fools"- John Muir.

Removing forests (and their natural functions) causes many serious problems, like Loss of trees makes global warming worse, Impact on Ecosystems, Loss of Species, and Harm to Water. The cause of logging process in India is substitution of forests by other activities (agriculture, cattle-raising, tree plantations, shrimp farming, etc.), logging, mining, oil exploitation, and construction of large hydroelectric dams (which result in the flooding of extensive areas of forest). The employment involve in the logging activities does not show the cutting of the forest only but also the centre of activities. At the name of development mass level of forest areas are removing and people are getting involve.

Figure 4.4 Distributions of Rural Workers in Logging Activities



In the given figure 4.4, the total distribution of employment in the logging activities to the total rural population in forestry related activities is shown. That shows 80 percent of total population of the region are involve in the logging activities in the certain region like, eastern Uttar Pradesh, coastal Orissa, Kerala, Arunachal Pradesh, southern Tamil Nadu, Punjab, Haryana, north Andhra Pradesh and eastern Maharashtra. And remaining parts of the country's people are less employed in the logging activities. It is because of the major constructional work, industrial set- up and mining &quarrying activities in these regions. Deforestation is driven by a wide range of social and economic forces, but underlying them all is the relentless march of *human population growth* and

the exponentially rising demand for land and forest products such growth generates. These demands are not going to slacken in the decades ahead; indeed, they will only expand. Slowing down tropical deforestation, much less halting it will therefore entail bucking powerful and inexorably growing forces. It is in this stark light that the prospects for conserving tropical forests must be considered."

4.3 Relation between Forest Growth Rate and Employment under Forest Related Activities

In the previous section, we have seen the total change and growth of the forest areas among districts if India, but when we see the total growth rate of forest area in the region of India, we have some different picture of its change.

Table 4.2 Region-wise Growth Rate of Forest in India (2001-09)

NSSO Region	Growth rate	NSSO Region	Growth rate
J&K: Mountainous	0.28	Orissa: Coastal	-0.07
J&K: Outer Hills	-0.34	Orissa: Southern	0.02
J&K: Jhelum Valley	-0.51	Orissa: Northern	-0.01
J&K: Ladakh	-0.68	Chhattisgarh: Northern	0.00
Himachal Pradesh: Central	-0.03	Chhattisgarh: Mahanadi Basin	-0.19
Himachal Pradesh: Trans Himalayan & Southern	-0.02	Chhattisgarh: Southern	-0.04
Punjab: Northern	-0.13	MP: Vindhya	-0.06
Punjab: Southern	-0.67	MP: Central	-0.01
Chandigarh	0.99	MP: Malwa	-0.15
Uttaranchal	0.02	MP: South	-0.27
Haryana: Eastern	-0.02	MP: South Western	-0.28
Haryana: Western	-0.35	MP: Northern	-0.05
Delhi district	1.41	Gujarat: South-eastern	-0.26
Rajasthan: Western	-0.01	Gujarat: Northern Plains	-0.27
Rajasthan: North-eastern	-0.04	Gujarat: Dry areas	-0.12
Rajasthan: Southern	-0.08	Gujarat: Kachchh	0.14
Rajasthan: South-eastern	-0.15	Gujarat: Saurashtra	0.06
Rajasthan: Northern	-0.31	Daman & Diu	-0.09
UP: Northern Upper Ganga Plains	-0.02	Dadra & Nagar Haveli	-0.04
UP: Central	0.30	Maharashtra: Coastal	0.32

UP: Eastern	0.12	Maharashtra: Inland Western	0.16
UP: Southern	0.05	Maharashtra: Inland Northern	-0.54
UP: Southern Upper Ganga Plains	-0.02	Maharashtra: Inland Central	-0.14
Bihar: Northern	0.65	Maharashtra: Inland Eastern	-0.02
Bihar: Central	-0.31	Maharashtra: Eastern	-0.01
Sikkim	0.05	Andhra: Coastal Northern	0.04
Arunachal Pradesh	0.14	Andhra: Coastal Southern	0.00
Nagaland	-0.02	Andhra: Inland North Western	0.01
Manipur: Plains	0.45	Andhra: Inland North Eastern	-0.02
Manipur: Hills	0.01	Andhra: Inland Southern	0.03
Mizoram	-0.25	Karnataka: Coastal and Ghats	-0.02
Tripura	-0.01	Karnataka: Inland Eastern	0.03
Meghalaya	-0.01	Karnataka: Inland Southern	-0.34
Assam: Plains Eastern	0.06	Karnataka: Inland Northern	-0.39
Assam: Plains Western	-0.14	Goa	0.03
Assam: Cachar Plain	-0.04	Lakshadweep	-0.04
Assam: Central Brahmaputra Plains	-0.47	Kerala: Northern	-0.18
West Bengal: Himalayan	0.07	Kerala: Southern	0.10
West Bengal: Eastern Plains	0.65	Tamil Nadu: Coastal Northern	0.08
West Bengal: Southern Plains	0.05	Tamil Nadu: Coastal	0.12
West Bengal Central Plains	1.16	Tamil Nadu: Southern	0.03
West Bengal: Western Plains	0.44	Tamil Nadu: Inland	0.01
Jharkhand: Ranchi Plateau	0.10	Pondicherry	0.23
Jharkhand: Hazaribagh Plateau	-0.29	A & N Islands	-0.04

Data source; FSI, 2001, 09

The above table 4.2 shows the growth rate of forest area at regional level between 2001-2009, which explain that maximum regions in India has been recorded the negative growth rate of forest area during this period and most of the regions are situated in the hill area & high forest concentration. The region situated in the Kerala, Tamil Nadu, Andhra Pradesh, west Bengal, Uttar Pradesh and Uttaranchal has got the positive growth rate of forest area during this period but in the states region of north eastern part, Maharashtra, Madhya Pradesh, Rajasthan and Gujarat has negative growth of forest area.

The total employment under the forestry related activities has been explained earlier, but here we want to see the relation of growth rate of forest area and the total employment under the forestry related activities, that can be seen by the correlation

method between growth rate of forest area (2001-09) & share of employment under forestry related activities to the total rural workforce in India.

4.3.1 Correlation between Employment under Forestry and Related Activities and Growth of Forest

Table 4.3 Correlation between Share of Employment in Forestry and Growth Rate Of Forest

	Growth rate	%total in nsso
Growth rate	1	0.016
%total in nsso	0.016	1

Table 4.3 shows the correlation between growth rate of forest and employment under forestry that shows the insignificant but positive correlation, it means the regions having the high growth rate of forest area will have high involvement of employment under the forestry related activities. But when we see the relation between the different activities under the forestry and growth rate of forest area, then result can be different.

Table 4.4 Model Summary of Regression of Employment in Forestry and Growth Rate of Forest

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.016[a]	0	-0.011	0.322537	0	0.021	1	87	0.884

a. Predictors: (Constant), %total in nsso

Table 4.5 Coefficients[a] of Regression of Employment in Forestry and Growth Rate of Forest

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-0.004	0.036		-0.117	0.907	-0.077	0.068
	%total in nsso	0.005	0.036	0.016	0.146	0.884	-0.066	0.076

a. Dependent Variable: Growth rate

The value of r square is zero, which shows the relationship is insignificant. It means growth rate of forest is not determined by the employment under the forestry related activities.

Table 4.6 Correlation between Share of Employment in Different Activities under Forestry and Growth Rate of Forest

	Growth rate	reforestation	gathering	logging
Growth rate	1	-0.193	-0.022	0.003
reforestation		1	-.284**	-0.199
gathering			1	-.263*
logging				1
**. Correlation is significant at the 0.01 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

Table 4.4 indicates the correlation between the employments under different activities related to the forestry activities and the growth rate of forest area, which indicts, there are not any significant relations between these activities with the growth rate of forest area. In spite of having the insignificant relation, it shows that the growth rates of forest are negatively correlated with the reforestation and gathering but positively related with the people involved in the logging activities , it means the positive growth of forest areas will leads to the lower share of employment under reforestation & gathering but higher in logging activities.

Table 4.7 Model Summary of Regression of Employment in Different Activities Under Forestry and Growth Rate of Forest

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.220[a]	0.048	0.014	0.32021	0.048	1.421	3	84	0.242
a. Predictors: (Constant), logging, reforestation, gathering									

Table 4.7 shows the regression value of relation between the employment under different activities under forestry and growth rate of forest, where the value of R square is 0.048, which shows the insignificant relation.

4.3.1 Correlation between the Employments under the Different Activities of Forestry Activities and Growth Rate of Forest Area at Physiographic Region Level

In the four major physiographic regions of India the total employment involved under the different activities of forestry are varied from region to region, where the Himalayan region has high concentration of those peoples employed in logging and gathering but in the plain regions peoples mainly involved in the reforestation process. In the Plateau region and coastal region most of the people are employment under the logging activities and gathering activities as discussed in the earlier chapter. Now our purpose is to find out the significant relation among the different activities of forestry employment and growth of forest area in all physiographic regions.

As Table 4.8 shows the relation between the employment under different activities and growth of forest are insignificantly correlated, where reforestation is negative and gathering & logging are positively correlated at insignificant level in the region of Himalayan.

Table 4.8 Correlations between Employment in Forestry & Forest Growth in Himalayan

	Growth rate	reforestation	gathering	logging
Growth rate	1	-0.288	0.135	0.355
reforestation		1	-0.383	-0.091
gathering			1	-0.247
logging				1

Table 4.9 Model Summary of Regression of Employment in Forestry & Forest Growth in Himalayan

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.459[a]	0.21	0.013	0.277532	0.21	1.066	3	12	0.4

a. Predictors: (Constant), logging, reforestation, gathering

In the Himalayan region the employment under forestry are positively correlated with the growth of forest area, where the value of R square is 0.21, which shows the insignificant relation in table 4.9. Again in the region of northern plain the growth of forest areas are insignificantly but negatively correlated with the employment, where the R square vale is -0.099.

In the region of southern plateau again the employment under forestry are insignificantly correlated with the growth of forest , where the employment under logging are positively correlated but gathering & reforestation are positively correlated. The value of R square in among these relation in the plateau region of India are 0.085 at insignificant level. There are only region in India, where the relation among the employment under different activities of forest area are significantly correlated with the forest growth rate that is coastal region. In the coastal region of India employment under reforestation and logging activities are insignificant negatively correlated with the growth of forest area but the employment under gathering process are positively significant correlated with growth rate of forest area, which explain that the having growth in the forest area will leads to the growth in the employment under gathering process in the coastal region (table 4.10).

Table 4.10 Correlations between Employment in Forestry & Forest Growth in Coastal Region

	Growth rate	reforestation	gathering	logging
Growth rate	1	-0.148	.551*	-0.362
reforestation		1	-0.239	-0.217
gathering			1	-0.445
logging				1

*. Correlation is significant at the 0.05 level (2-tailed).

It shows that the most of the people in the coastal region are involve in the gathering process of forestry activities due to the nature of forest, because in the region of Kerala, Karnataka and Tamil Nadu there are plantation agriculture in the forest area, where the different types of spices, fruits and commercial crops are produced and people are involved there.

Table 4.11 Model Summary of Regression Employment in Forestry & Forest Growth in Coastal Region									
				Std. Error of the Estimate	Change Statistics				
Model	R	R Square	Adjusted R Square		R Square Change	F Change	df1	df2	Sig. F Change
1	.571[a]	0.326	0.142	0.11612	0.326	1.77	3	11	0.211
a. Predictors: (Constant), logging, reforestation, gathering									

In table 4.11 the value of R square is 0.326, which explains the positive significant correlation between employment and growth of forest area in the coastal region.

4.4 SUMMING UP

The employment under the forestry and related activities is more relevant in the terms explaining the spatial participation of workforce in different category under the reforestation, gathering materials and logging process in the forest area. in the result of our study of employment in forestry related activities shows the high involvement of workforce under reforestation process in the western part of country, like Rajasthan, Gujarat, Delhi, Punjab, Haryana, Uttaranchal, Uttar Pradesh, Arunachal Pradesh and Himachal Pradesh, but the major workforce in the southern regions are mostly involve in the process gathering materials and logging activities. Plateau region of India has the highest cover to the country, so any kind of constructional work , industrial activity and population pressure leads to the removing of forest. The present study also found that the relationship between rate of forest growth and share of employment under the forestry related activities are positive but insignificant, means the region having the high growth rate of forest area will have high employment but no significance.

The people involved under the gathering activities in the forest area are dependent on the forest cover and those belong to the tribal population, for which history and culture are linked with the growth and future of forest. Their survival depends upon the forest with a long period of time, so they don't dare to harm the forest area, rather it use for their livelihood. But the people involved in the logging and related activities are more

important, because they harm the forest cover after being involved in logging activities. Reforestation and afforestation process will take place with the respect of eco-development process, where it needs more attention to protecting the forest with the help of local people and community.

At regional level analysis, employment under forestry related activities are insignificantly correlated with the growth of the forest areas except in the coastal region of India. In the coastal region of India, the people employed in the gathering process activities under forestry related activities are positive and significantly correlated with the growth of the forest growth. It shows that, having the high employment under gathering process will leads to the high growth of the forest cover in the coastal region of India. I other side employment under logging & reforestation are negatively correlated but insignificant.

Chapter 5

SUMMARY AND CONCLUSIONS

Chapter 5

SUMMARY AND CONCLUSIONS

The post reform period can be divided in two parts for better explanation of my studies done on the growth, distribution and change in forest area in states and districts of india,1991-99 and 2001-09. In both of the period, the total growth of the forest area has accelerated in India and its states, but the pattern of its growth and its spatial character is different. The reason behind the variation of forest area across time is not only due to the usual reasons of exploitation and afforestation, but also due to the FSI adopting new methodologies to measuring the forest cover. FSI measured the total forest cover on their satellite imagery based data for measuring the total natural vegetation cover, used the R: F 1:50000 in the period of 1991-99, but R: F 1:250000 in the period of 2001-09. It also included the TOF (tree outside forest areas) in the total forest cover in the year of 2001-09. The districts which accelerated the total forest cover were sharper among those districts, where forest cover was already low. However, broadly, it can be concluded that forest resource has been increasing since the initiation of economic reform period. That is due to the both reasons, either it is actual change in the forest cover in some of the regions and methodological change in some of the regions. In the 2001 state forest report, FSI used the high resolution to identify the forest cover and also include the TOF (trees outside forest on road side, canal side & boundary of the farming field. In some of the state there was actual change in the forest cover, like Delhi, Kerala, Rajasthan and West Bengal.

During 1990's what emerged from the analysis was that regions having high concentration of forest resources in the country actually experienced a negative growth of the forest cover. This included states like Madhya Pradesh including Chhattisgarh, Bihar including Jharkhand, Andhra Pradesh, Tamil Nadu and north-eastern part except Arunachal Pradesh & Tripura. On the other hand, states with low base level forest resource like Rajasthan and Haryana experienced accelerated growth of forest compared to other states of India. But in the period of 2001-09, the pattern changed somewhat and

states like Gujarat, Rajasthan, western Madhya Pradesh, Punjab, Jammu & Kashmir, Karnataka, Arunachal Pradesh, Assam, Nagaland and Tripura were all had negative growth rates. In this period, Kerala and coastal parts of the Maharashtra are those regions, which had highest growth rate of forest areas during this period. In terms of quality of forest resource,

The better resources are concentrated in the Himalayan region, Western Ghats, north eastern Deccan plateau and north eastern part of India. When we see the qualitative growth of forest areas in India the districts of India, the it has been observed that , the dense and open forest areas are also concentrated around those districts , where dense forest cover are high (what does this mean? rewrite). In 1990's the dense forest accelerated in many districts of Rajasthan, Gujarat, Tamil Nadu, Assam, Arunachal Pradesh, and Haryana but there was a decline in quality in a majority of the districts of Madhya Pradesh, Chhattisgarh, Andhra Pradesh and Karnataka. In the period "between" 2001-09, the districts situated in the Rajasthan, inner Karnataka & Maharashtra, Punjab, Uttar Pradesh and coastal Tamil Nadu had a negative growth rate of dense forest area. This means the overall growth rate of dense forest area follows the trend of total forest growth rate. The districts in which growth of forest area declined during 1991-99 are the relatively poor districts and most of the tribal populations are living there, which are dependent on the forest cover for their livelihood and survival of life. These are also the districts which are rich in mines and natural resources. In the early stage of post reform period, government promoted the industrial set up in these regions an effect of which is directly observable in the trend of deforestation.

When we see the growth of open forest areas after post reform period, a new picture emerged, because the districts which experienced a deceleration of dense forest area had corresponding acceleration in the open forest area during both decades, except some parts of the Chhattisgarh, Orissa and Jharkhand. The districts, which were covered with the dense forest area, are now changed into the open forest cover due to more human interference in these forest regions. The process of this transformation in the forest region is only not affecting the natural vegetation, which create the natural unbalance but also had an impact on the employment of local peoples with their shelter. It has been

experienced in the forest dominated areas, that tribal peoples are not only the responsible for removing the forest cover rather than new constructional work and acquiring more agricultural land, which goes to the land lords and corporate business.

The states, like Rajasthan, Kerala, Maharashtra, Haryana, Uttaranchal and West Bengal, Andhra Pradesh, Karnataka and Tamil Nadu are that state that has experienced a positive growth of forest during last two decades. This probably can be attributed to the implementation of several schemes and programmes to protecting the forest areas with help of local people called community forest management and not due to stopping the development activities. In Uttarakhand people there are local efforts of protecting forest areas and protest against removing them for different types of constructional activities are not uncommon. One of the objectives of the study was to examine the impact of different development activities on the total forest cover or growth rate of forest in the districts of India. The certain kind of development activities affect the forest cover area, like industrial set up, mining & quarrying activities, urbanization, constructional activities, spreading of roadways, logging factories, gross cropped area, population density etc. in the liberalized period there is found some rapid growth in these activities, because government gave more relaxation to the industries globalised it for attracting more investment, which further leads to the more exploitation of the natural resources. In the stream of exploiting more natural resources, total forest cover has been avoided. In that case the growth of forest cover decelerated in the highly dense forest areas.

Broadly, no clear picture emerges with respect to development and deforestation. At the regional levels, however, some indicators validate the hypothesis that development causes deforestation. For example, % of villages electrified has a negative relationship with growth of forest area in some of the regions. On the other hand, general power consumptions, the trend of which is primarily driven by urban consumptions remain insignificant. This indicates that intensive rural development till now has led to deforestation. In particular, the coastal areas seem to be vulnerable with respect to the development processes, probably because of lack of availability of land in comparison to the population settled in these areas.

From region level and individual data analysis, an attempt has been made to understand the share of employment under forestry related activities and also see the distribution of different kind of processes under these activities. Total workforce involved in forestry activities can be divided in three categories on the basis of their nature of work, which is afforestation or reforestation, gathering process and logging process.

One of the objectives of the study was to understand whether employment under rural forestry, logging and related activities is distress driven or growth driven in India. We conclude that the most of the employment are concentrated under forestry related activities in the regions of Gujarat, Orissa, Himachal Pradesh, Tamil Nadu, Maharashtra and Assam states. Where as in the states of Rajasthan, Uttaranchal, Uttaranchal, Himachal Pradesh, Uttar Pradesh, Maharashtra, Arunachal Pradesh and Meghalaya, largest participation of workforce are under reforestation activities during 2007-08. The people employed in the gathering process are mostly concentrated in the southern plateau regions, where forest cover are high, and it is because of that most of the tribal population are concentrated in these regions of Orissa, Jharkhand, Chhattisgarh, Andhra Pradesh, Karnataka, coastal Maharashtra, and Tamil Nadu. The economies of most tribal population are based on the collection woods, leaves, fruits and medicine from the forest areas. Loggings are the major activities in the forest regions, because it is important to study at point of the total growth of forest areas in the regions of India. The peoples involve in the logging activities actually affect the growth of forest area in those regions, those regions are situated in the states of eastern Uttar Pradesh, Kerala, southern Tamil Nadu, inner Maharashtra, coastal Orissa, Arunachal Pradesh, Himachal Pradesh, Punjab, some part of Haryana, coastal Karnataka and Andhra Pradesh. The people being involve in these region in the logging activities with the different kind of activities of logging , logging camps and loggers primarily engaged in felling timber and producing wood in the rough such as pit props, split poles, pickets, hewn railway ties or fuel wood, transport of logs in association with logging chiefly within the forest.

After examining the relationship between the levels of development and growth of forest, we can conclude that though generalizations cannot be made, some regions like the coastal zones of India is particularly vulnerable with respect to the kind of

development processes that are being carried out there. It is also to be noted that many of the districts in this zone are the ones where we see a concentration of employment based on logging and related activities. Thus policies that are specifically geared to districts falling in the coastal zone needs to be worked on. The recent world scenario assessed that with the growth of development the total cover of forest area increased, but a country like India has not achieved that stage, where development can made a positive impact on the growth of forest areas. The overall forest cover seen in previous decades are not the result of total actual growth of forest areas but that is the result of adopting new methodology by Forest Survey of India for measuring the forest cover. Our work also shows that the highly dense forest area has recorded the negative growth rate of forest areas in previous decade due to major activities of affecting the forest. In the coastal region of India, the employment under gathering of forest areas are positive & significantly correlated with the growth of the forest, that is due to the nature of reforestation for the commercial purpose.

It is very difficult to say that the development processes are responsible for the deforestation. Because I found in my study that the there are several regions, where development process has taken place rapidly but still there is high growth of forest areas. So the policy for the preserving forest should focus on the nature of development, which provides the positive mechanism for environment. High population growth has always blamed for the removal of forest , but the study done by me and several authors did not find any specific reasons that says that the population are responsible for negative growth of forest, especially in the tribal populated area. So the policy must recommends that the people dependent on the forest area should be authorized to live, exploit & sheltered in the forest areas.

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