

**PATTERNS OF SOCIO-ECONOMIC CHANGE AND THEIR
IMPACTS ON ENVIRONMENT IN NAGALAND WITH
SPECIAL REFERENCE TO ZUNHEBOTO DISTRICT**

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SUBMITTED TO
NAGALAND UNIVERSITY**

**IN PARTIAL FULFILMENT OF REQUIREMENTS FOR THE
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OF
DOCTOR OF PHILOSOPHY
IN
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**BY
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(संसद द्वारा पारित अधिनियम 1989, क्रमांक 35 के अंतर्गत स्थापित केंद्रीय विश्वविद्यालय)

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DECLARATION BY THE CANDIDATE

I, Ms. Avitoli Kinny hereby declare that the subject matter of this thesis is the research work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other university/institute.

This is being submitted to Nagaland University for the award of the degree of Doctor of Philosophy in Geography.

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CERTIFICATE

This is to certify that the thesis entitled “Patterns of Socio-economic Change and their Impacts on Environment in Nagaland with Special Reference to Zunheboto District”, submitted to Nagaland University in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Ph.D.) in the Department of Geography, embodies the original research work carried out by Ms. Avitoli Kinny, Registration Number 478/2012 under my supervision and guidance.

Further, I certify that no part of this thesis has been submitted anywhere for any other research degree. The assistance and help received during the course of study have been duly acknowledged.

Place: Lumami

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Date:

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Dated:

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Chapter I

Introduction

1.1 Introduction

Socio-economic change is inevitable as the humans in their quest for socio-economic and techno-economic existence and perpetuation, could not afford to be static. Challenges from within and outside, including the immediate social and physical environment, have always enthused human societies to be dynamic¹. As the basic law of ecology goes, everything is connected to everything else and that one cannot change just one thing in nature². So also socio-economic change and environment are connected and related to one another. The elements of change could not be ruled out at any stage of human existence and history. As one always observes that one can never step into the same water of a river, so is society where one cannot experience the same phase. To quote J. Donald Hughes in his book 'An Environmental History of the World-Humankind's Changing Role in the Community of Life', "History offers many instances of the importance of ecological processes. Humans have made major changes in their environment. They have had to adapt to the challenges they made, by altering the patterns of their societies, or to disappear. This happened in every historical period and in every part of the inhabited Earth"³. Environment is the source of life on earth and it not only directs but also determines the existence, growth and development of mankind and all its activities.

Man unlike other living beings with his ability to think and through his ingenuity uses tools and technology to influence and change the environment. Though man began to interfere with the natural processes right from the beginning of his sedentary life, the

¹ Mann, R.S. 1994. *Social Change and social Research (An Indian Perspective)*. p 5

² Goudie, A. 2006. *The Human impact on the Natural Environment*. Blackwell Publishing, Australia. p 4

³ Huges, J.D. 2002. *An Environmental History of the World- Humankind's Changing Role in the Community of Life*. Routledge, New York. p 1

impact of man on the environment and its processes assumed greater proportion after industrial revolution in Europe (1860) and then the rest of the world. Man equipped with modern technologies and scientific knowledge has become a very important factor in changing the environment, because various environmental problems can be easily traced to the life styles and development processes of human being⁴. The changes are far too great, too sudden and far reaching enough for the environment to take care of its own. It is, therefore, essential to have a close understanding of the inter-relationship between environment and development for the formulation and implementation of any strategy that safeguards all concerned aspects.

Man's interference with nature, making the surrounding environment susceptible to all sorts of threats is a commonplace everywhere. No segment of the earth is immune from human imprints and their consequences. Alarming sounds are being heard about the outcome of man's increasing and imbalanced interaction with nature. The prevailing environmental issues are being accentuated by the exponential growth of population, particularly in the developing nations in their relentless search for socio-economic well-being.

Since independence, the Government of India has been formulating many plans and developing strategies for rapid overall development of the country and liberating the country from shackles of poverty. But our nation has a long way to go when it comes to developing sustainably. For this, various plans have been made and modified from time

⁴ Sharma, P.D. 2007. *Ecology and Environment*. Rastogi Publication, Meerut. p 352

to time. Emphasis has been given to raise the productivity, to remove poverty, to avoid unemployment problems, etc. In the pace of rapid economic development, we have exploited our natural resources at a rapid rate. It has disturbed the ecological balance and the environment has become human unfriendly. With the process of development, the quality of environment is deteriorating. If such a process will continue, then in near future, we will not get good quality of environment, which is very essential for welfare of the people. This will adversely influence the process of economic growth as well as socio-economic life⁵. North east region of India has unique cultural as well as natural environment composition different from that of the other parts of the country. Hence special developmental package is provided to the region by the central government, but this doesn't seem to bring about much growth in the region.

Nagaland, a tiny and hilly state under Indian Union is no exception. Nagaland in its quest to cope with other parts of the country has been undergoing tremendous socio-economic changes. But these changes are taking place rather haphazardly which in turn is destructive and having a negative impact on the environment. Various development or socio-economic activities are initiated and have been going on in a rapid rate and on a large scale. These changes are proceeding at a sufficient pace to have substantial impact on the natural environments. The results are observed and experienced in the last few decades include soil erosion, environment degradation and exploitation, air pollution, water pollution, loss of biodiversity, global warming, climate change, etc.

Zunheboto District, one of the eleven districts and which is the study area of the present study too faces similar situation like any other districts within the state of Nagaland.

⁵ M. Dashmishra. 2011. *Political Economy of Development and Environmental Degradation in India*. Concept Publishing Company Pvt. Ltd. p 5

Significant impact on the environment is being observed here due to various factors. Unless measures are taken towards the redressal of the problems the future does not look bright for the district.

1.2 Concepts and Definitions

According to Wikipedia, Socio-economics is the social sciences that studies how economic activities affect and are shaped by social processes. In general it analyzes how societies progress, stagnate or regress because of their local or regional economy, or the global economy. The concept of change is wide. The definitions of social change as well as socio-economic change are highly diverse. This is because they are a phenomenon, a process that tends to have diverse dimensions. Social change encompasses any type of transformation in the demographic, structural, cultural or environmental characteristics of a social system. Changes are also brought about as a result of the interaction between living organism and their surroundings, the study of which comes under the discipline of ecology.

Ecology is the study of organisms in relation to the surroundings in which they live. These surroundings are called the environment of the organism⁶. L.B. Slobodkin's view is that 'Ecology studies interactions among organisms and between organisms and their environment in nature and is also concerned with the effects that organisms have on the inanimate environment'⁷. He further adds that the practical problems of ecology are all concerned with changes. Even in the absence of human disturbance, the world goes

⁶ Chapman J. L and Reiss M.J. (2000). Ecology: Principles and Applications. Cambridge University Press. p 2

⁷ Slobodkin.L.B.(2003). *A citizen's Guide to Ecology*. Oxford University Press. p 3

through changes of many kinds and on many scales. Although human activities cannot destroy the global ecosystem, they can change it in ways that will be unpleasant.

The Universal Encyclopedia defines environment as ‘the sum total of all conditions, agencies and influences which affects the development, growth, life and death of an organism, species and race’. According to P.D. Sharma (2012), several socio-economic, cultural and political factors also influence the basic physical, chemical and biological component (and their interactions) of the environment⁸.

Changes in land use and land cover, together with land degradation have adverse impacts on forest resources and biodiversity. Changes in the economy, society and ecology are an integral part of development. Development is defined in Oxford English dictionary as ‘a new stage in a changing situation’. Development literally means an action to become larger or more advanced. But true development would mean achieving a condition where there is no poverty, ignorance, disease or injustice, where each and every man can enjoy and exercise one’s basic rights, and live with a sense of security. A mutually beneficial interaction between human and environment is therefore desired. This is where the concept on Sustainable development comes in.

According to the Brundtland Commission, sustainable development is a pattern of resource use that aims to meet the needs while preserving the environment so that these needs can be met not only in present, but in the indefinite future, which has become the most often-quoted definition of sustainable development as development that meets the

⁸ Sharma P.D. 2012. *Ecology and Environment*. Rastogi Publications. Meerut, India. p 16.

needs of the present without compromising the ability of future generation to meet their own needs.⁹

The concept of social change emerged and stood out as an autonomous body of theory as early as the age of the Enlightenment, with the launch of modern industrialized society models making its debut at the time of the industrial revolution and the political upheavals accompanying the rise of democracy. The theories of social change have drawn the attention of a large number of sociologists, economists, philosophers etc, such as R.K. Comte, Rostow W.W, A.D. Weber, D. Marx K. Durkheim E, etc¹⁰.

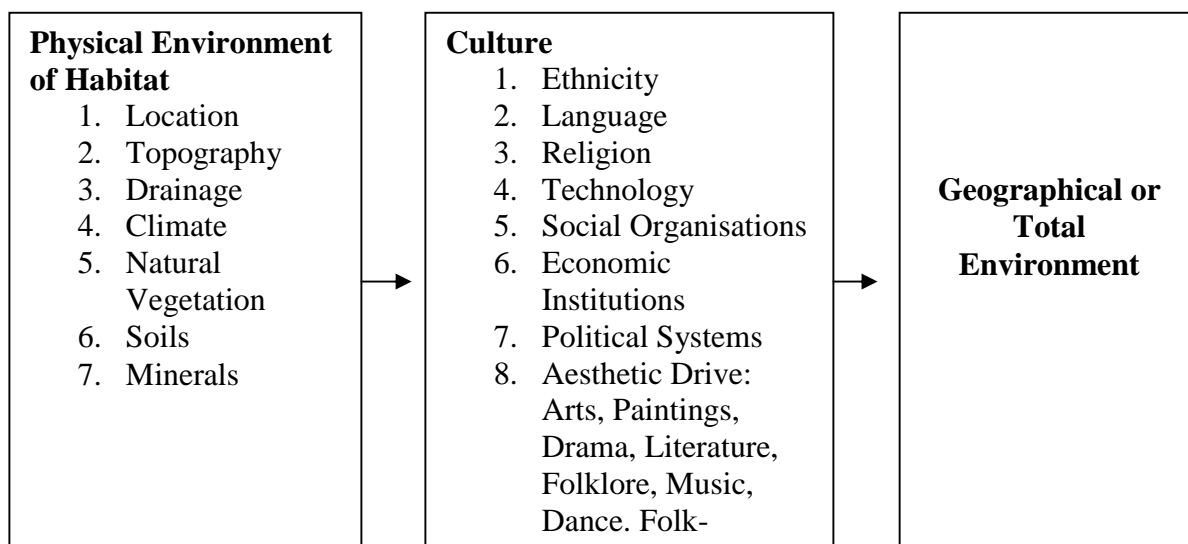
In order to understand the change or dynamics of human-environment relationship one needs to be aware of the concepts and theories of human geography or human ecology. The concept of human ecology was popularized by American geographers who believed in Social Darwinism. The followers opined that a struggle for existence must take place; and those who survived were better fitted to the environment than their competitors. Widely accepted definition of human geography is the study of “man and his adjustment to his natural environment”. Each society or ethnic group use, misuse and underuse its natural resource base according to its cultural stage and technological advancement. The basis of geographical environment can be divided into physical environment of habitat and the cultural component of society. The physical environment encompasses the location, topography, drainage, climate, natural vegetation, soils and minerals. While ethnicity, language, religion technology, social organisation, economy, political system

⁹ M. Dashmishra. (2011). *Political Economy of Development and Environmental Degradation in India*. Concept Publishing Company Pvt. Ltd. p 5

¹⁰ C.N. Morariu and M.D. Ignat. 2011. Social-Economic Theoretical Connections: Theories of Social Change. *Journal of Social Economy*. p 26-27.

and aesthetic drive, composes the cultural aspects. The totality of the two is the foundation of geographical environment (Fig 1.1).

Fig.1.1: Basis of Geographical Environment¹¹



Since the post-Darwinian era, there have been great differences among the geographers about the approach and methodology to be adopted to examine and interpret the man and environment (nature) relationship¹². Determinism or Environmental Determinism and Possibilism are the two main schools of human geography. Determinism or Environmental Determinism is of the view that environment controls the course of human action. The essence of deterministic school of thought is that history, culture, lifestyle are determined by the physical factor of the environment. The determinists consider man as passive agent on whom the environment is the determining factor of human's attitude, decision-making processes and lifestyle. While possibilism, tries to explain man and environment relationship in a different way, where man is an active agent in environment.

¹¹ Hussain. M. 2011. *Human Geography*. Rawat Publications. p 3

¹² Hussain. M. 2011. *Human Geography*. Rawat Publications. p16

1.3 Research Methodology

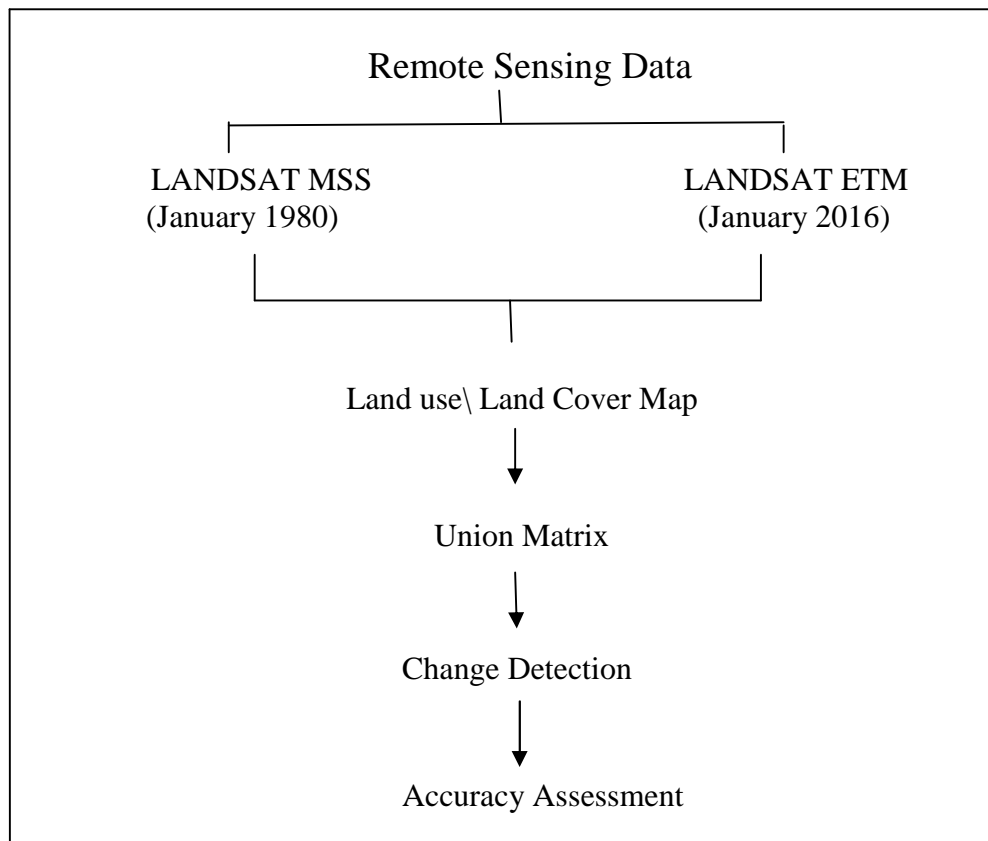
The study is based on both secondary and primary data. Under secondary data are included information collected from different sources such as books, journals, census handbooks, district gazetteer, statistical abstracts, government statistics, newspapers, maps, satellite imageries, toposheets, internet, etc.

In order to understand the intricate relationships between human and environment, their ground realities and also to explore people's perceptions, attitudes and experiences on the socio-economic changes and their impact on environment, most of the data for the present study have been collected through a series of field study, field survey, structured and unstructured interviews, questionnaires, personal observations and formal discussions and they constitute the primary data. Considering the difficulties of covering the entire district random sampling of 20 families from two villages /towns of each 13 circles of Zunheboto district has been taken (Table 1.1 & Fig. 1.3). Apart from the selected villages, one has made the effort to cover many villages and towns as well making visitation, interviews and observations in other 10 other villages. All together, the primary data consist of data collected from 36 villages. While selecting the samples important variables taken into consideration are the number of households. Most of the village or towns with high number of household are selected, keeping in mind that those villages with large number of household will have high population and that the impact on their surrounding environment will be more. No doubt, villages and towns with less household were also selected in order to compare the impact with that of the higher household villages. Moreover, Zunheboto town, being the main cultural and economic center having highest population in the district, is selected for the study. Structured and

formal interviews of the village elders and village council chairman also constitute an important part of the field survey.

Remote sensing and GIS tools have also been used in order to understand and analyze the changes in land use and land cover changes of the study area. Change detection of land use and land cover of time period of 1980 and 2016, is carried out with the help of LISS III and LANDSAT imageries and the maps produced are with the use of GIS tools. Methodology of LULC mapping from satellite data using Arc GIS and ERDAS Imagine softwares on 1:50,000 scales, involves the following steps:

Fig.1.2: Flow chart showing methodology used for LULC mapping



Data product used:

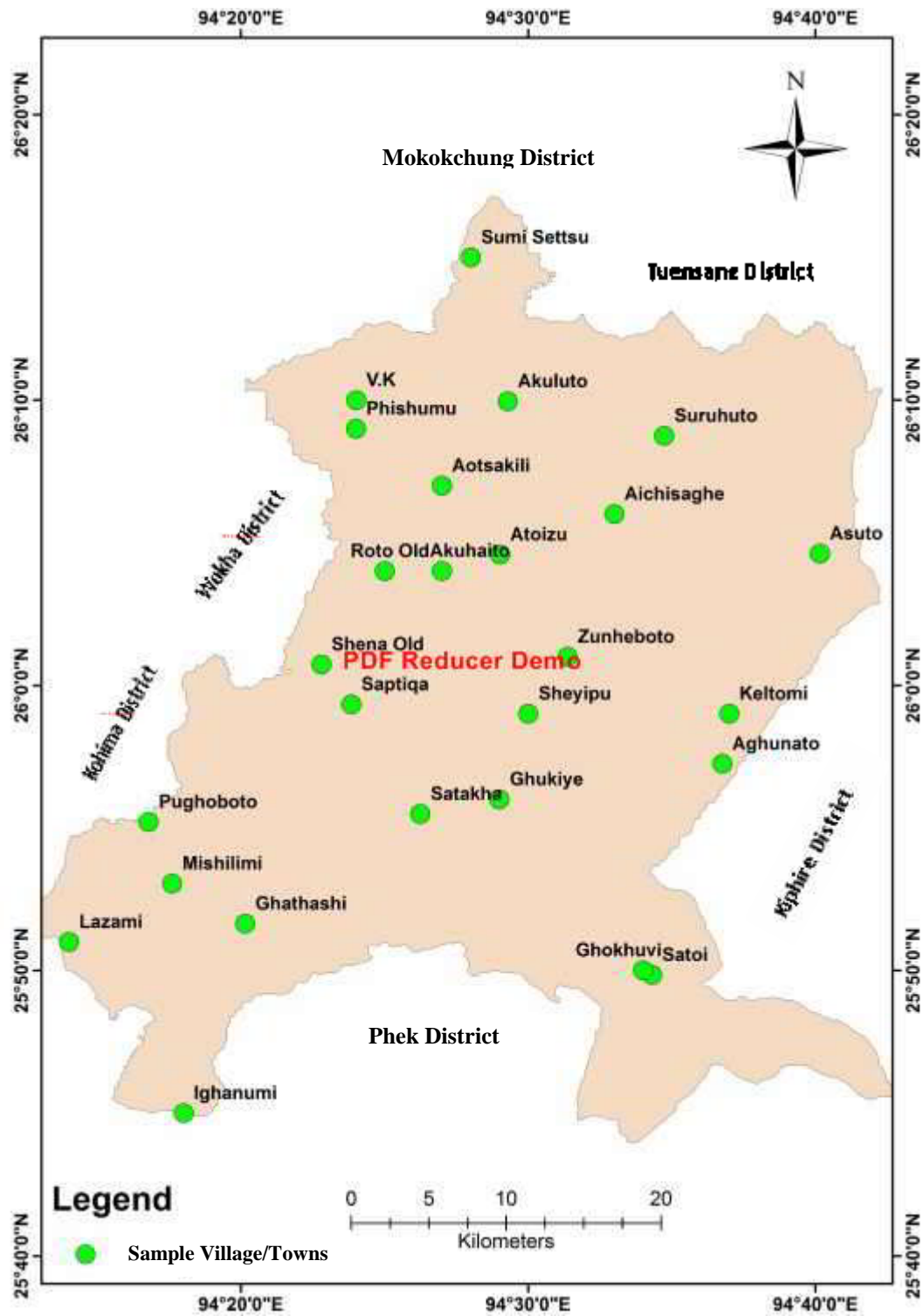
-) Two time period satellite imageries of LANDSAT MSS of 1980 and LANDSAT
 ETM of 2016 downloaded from USGC Earth Explorer.
-) Resolution: 23.5 m.
-) Path :135 and Row :42

Table 1.1: Sample Town/Villages with their Coordinates: Zunheboto District

Sample town/village	Coordinates
Zunheboto	26°01 26 N, 094°31 23 E
V.K town	26°10 58 N,094°24 52 E
Phushumi	26°09 06 N,094°24 47 E
Akuluto	26°10 22 N,094°29 42 E
Sumi Settsu	26°15 27 N,094°28 37 E
Suruhuto	26°05 52 N,094°38 07 E
Aichisaghami	26°06 46 N,094°33 30 E
Asuto	26°05 15 N,094°39 37 E
Satami	26°05 15 N,094°39 37 E
Aghunato	25°57 07 N,094°36 52 E
Keltomi	26°59 24 N,094°37 35 E
Ghukiye	25°55 37 N,094°26 35 E
Sheipu	25°59 24 N,094°30 36 E
Aotsakili	26°07 24 N,094°27 10 E
Atoizu	26°06 20 N,094°30 53 E
Akuhaito	26°04 40 N,094°27 10 E
Rotomi	26°04 33 N,094°25 45 E
Pughoboto	25°55 26 N
Lazami	25°51 22 N,094°14 48 E
Ghathashi	25°51 00 N,094°19 41 E
Ighanumi	25°45 42 N,094°18 42 E
Satakha	25°55 37 N,094°26 35 E
Saptiqa	25°59 26 N,094°23 50 E
Shena Old	26°01 02 N,094°23 19 E
Satoi	25°49 37 N,094°26 35 E
Ghokhuvi	25°50 55 N,094°34 28 E
Mishilimi	25°52 56 N,094°15 39 E

Source: USGC Earth Explorer and field readings

Fig. 1.3: Map showing sample villages and towns: Zunheboto District



1.4 Questionnaire Analysis

Questionnaire having both open and close ended questions was prepared and distributed to the respondent of the selected villages. There are 13 circles in the district; therefore, the questionnaire survey consists of 27 villages and town including Zunheboto town, with 540 respondents.

The respondents include village council chairman, gaonburas, elders, teachers, students, farmers and others including business persons, government employees, etc. Male respondents comprised of 71% and women 29 % (Fig. 1.4). Farmers consist the majority with 38.53%, 24.31% of respondents were teachers, 11.47% students and others 25.68 % (Fig. 1.5).

Fig.1.4: Percentage of Male and Female respondents

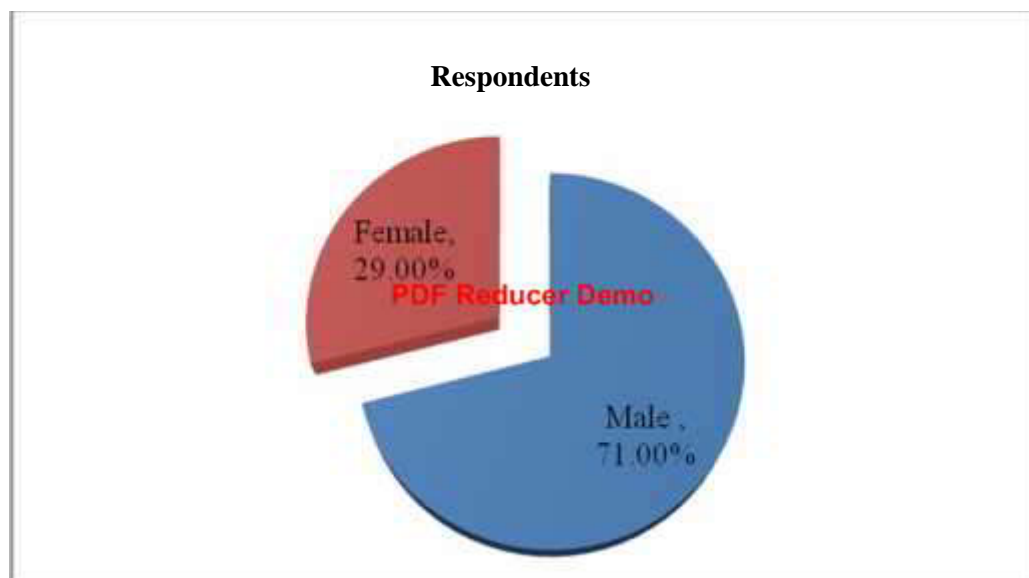
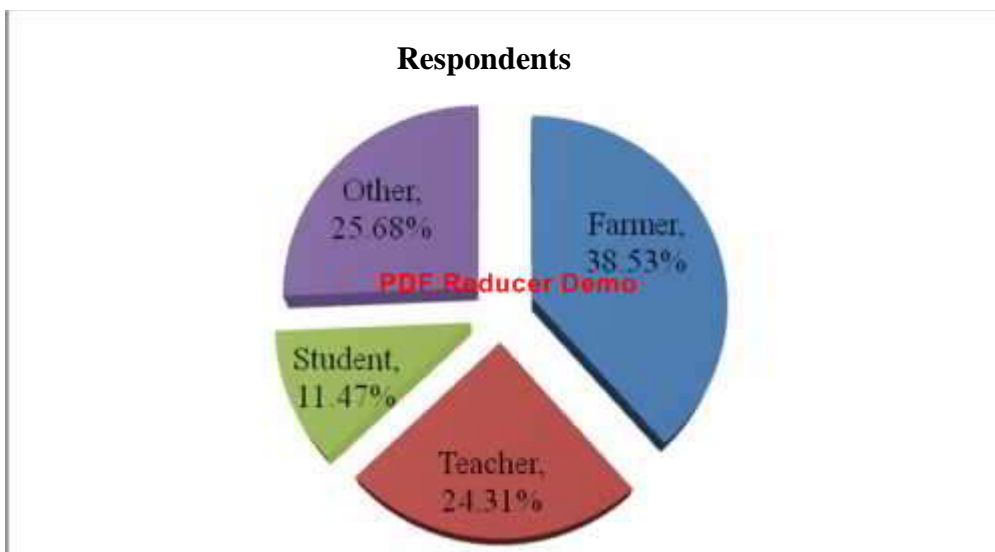
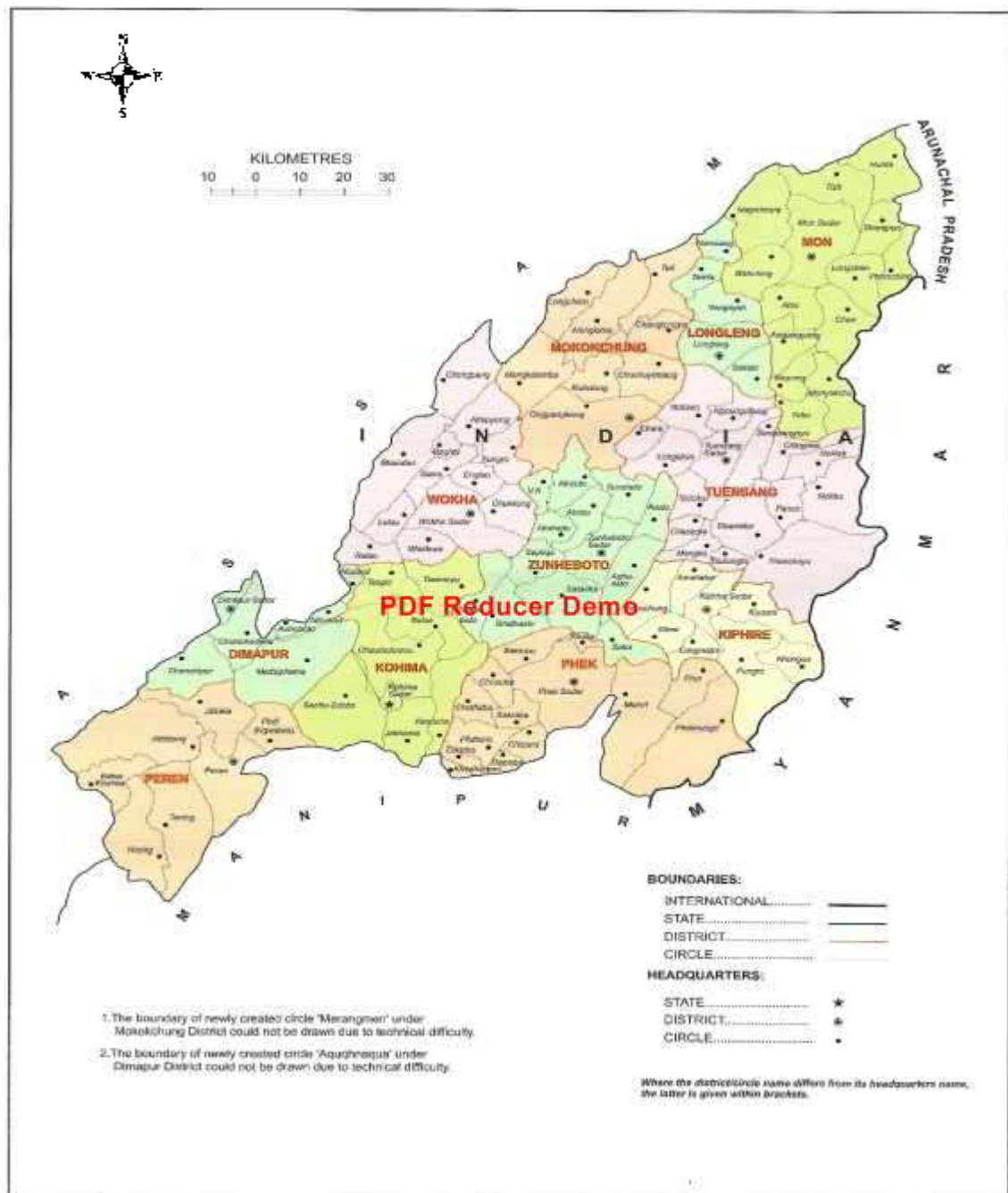


Fig.1.5: Respondents Analysis

1.5 Study Area

Nagaland is a narrow rugged mountainous terrain lying between 25° 60' - 27° 40' N latitude and 93° 20' E and 95° 15' E longitude, on the extreme east of India. The state covers an area of 16,579 sq km in the southern extension of the Himalayas. It is bordered on the north by Arunachal Pradesh, on the west and North West by Assam, on the south by Manipur and on the east by Myanmar (Fig.1.6). It has eleven administration districts, viz; Kohima, Mokokchung, Tuengsang, Zunheboto, Wokha, Mon, Phek, Dimapur, Longlen, Kiphire and Peren, the boundaries of which has been demarcated mostly on traditional tribal territories. According to 2011 census, Nagaland has a total population of 1978502. Agriculture and its allied activities are the main economic activities of Nagaland, though various small scale industries are also coming up these days. The state of Nagaland, composed mainly of tribal population has been undergoing social and economic changes in a rapid and large scale, especially with the coming of the British missionaries and after Indian Independence.

Fig.1.6: Administrative Division (2011): Nagaland



Source: Administrative Atlas, Nagaland, Census of India

Zunheboto district is situated between 94°20'E to 90°95'E longitude and 25°45'N to 26°15' N latitude. It is bounded by Kohima district and Phek district in the South, Wokha district in the West, Mokokchung district and parts of Tuensang district in the East (Fig.1.8). Zunheboto district with an area of 1255sq km and population of 141014 (2011 census) is the traditional homeland of Sumi Naga tribe. The name of the district is given after the name of the plant *Zunhebo (Leucoseptrum cannum)* which grows abundantly in the district. . It has 191 villages, 13 administrative circles, 6 RD blocks (Table 1.2), 1 statutory town and 1 census town. The six RD blocks are further divided into thirteen circles viz: V.K, Akuluto, Suruhuto, Asuto, Aghunato, Zunheboto Sardar, Atoizu, Akuhaito, Pughoboto, Ghathashi, Satakha, Saptiqa and Satoi (Table 1.3). On the basis of climatic condition the district is divided into two regions- the warm as Ghabo and and the cold as Azho.

Table 1.2: RD Blocks, Circles and No. of villages: Zunheboto District

Name of RD Block	Name of Circles	No. of Constituent village	Total No. of villages
1.Zunheboto	Zunheboto Sardar	18	18
2.Suruhuto	Suruhuto Asuto	14 21	35
3.Satakha	Zunheboto Sardar Satakha Saptiqa Satoi	5 20 5 11	41
4.Tokiye	Asuto Aghunato	6 28	34
5.Akuluto	V.K Akuluto Atoizu Akuhaito	9 10 17 5	41
6. Ghathashi	Pughoboto Ghathashi	10 13	23
Total			192(including Satakha Census Town)

Source: District Census Handbook, Census of India 2011.

Table 1.3: Number of villages in Circles: Zunheboto District

Name of Circle	Number of village
1. V.K	9
2. Akuluto	10
3. Suruhuto	14
4. Asuto	27
5. Aghunato	28
6. Zunheboto Sardar	23
7. Atoizu	17
8. Akuhaito	5
9. Pughoboto	10
10. Ghathashi	13
11. Satakha	19
12. Saptiqa	5
13. Satoi	11
Total	191 (Excluding Satakha Census Town)

Source: District Census Handbook, Census of India 2011.

Fig.1.7: Location Map: Zunheboto District

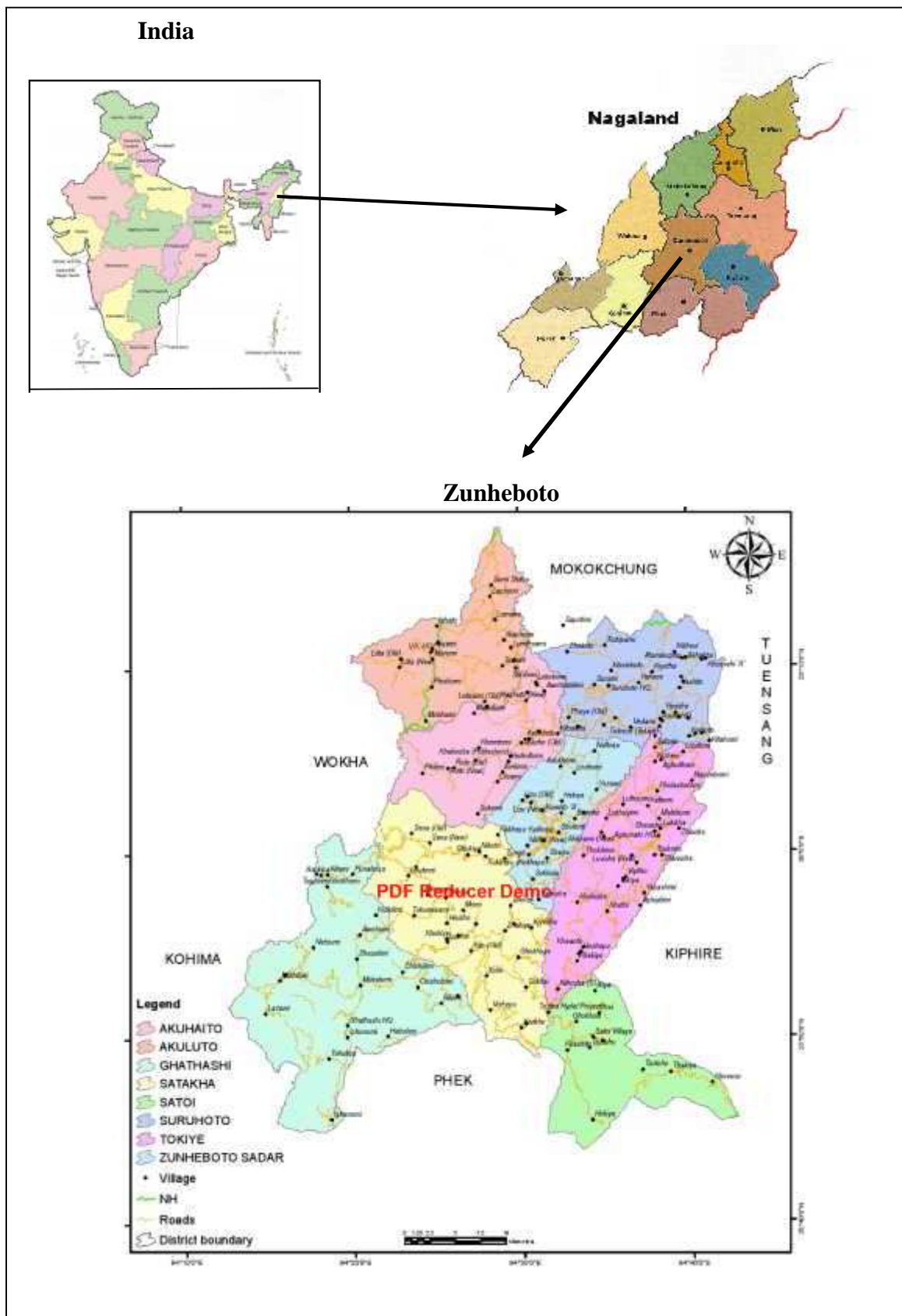
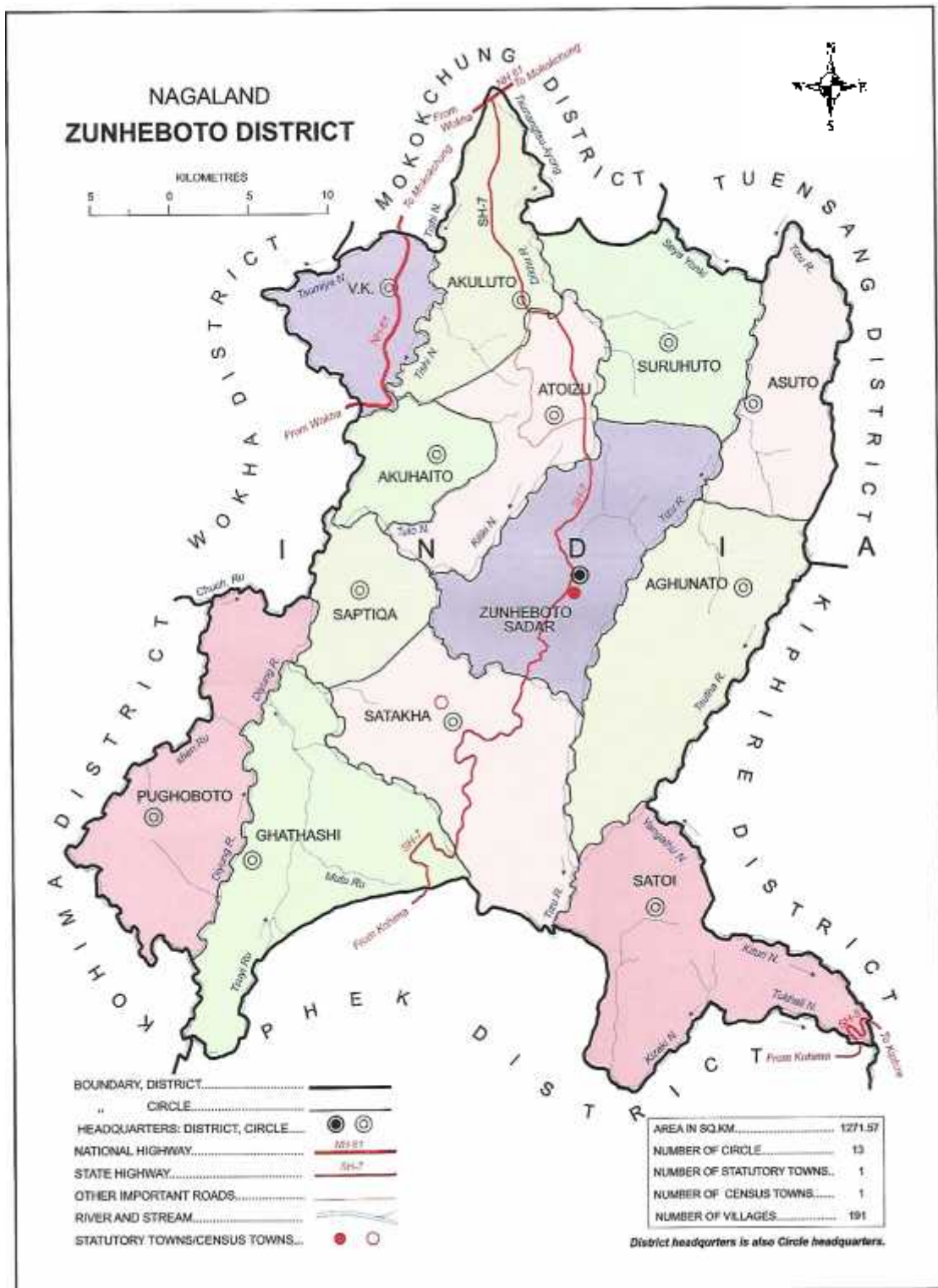


Fig: 1.8: Administrative Division (2011): Zunheboto



Source: Administrative Atlas, Nagaland, Census of India

1.6 Statement of the Problem

Environment related issues and concerns are in no way, lesser than other issues as human in quest for development are exploiting natural resources at rapid rate, making the future of the earth bleak. Environment degradation does not segregate the developed or developing countries. These issues affect all sections of population, from global to nation, nation to region, region to state and state to local. Nagaland, in its pursuit to be on equal footing with other parts of the country has been undergoing tremendous socio-economic changes. But these changes are taking place rather haphazardly which in turn are destructive, leaving a trend of negative impact on the environment. Various development or socio-economic activities are initiated and have been going on at a fast rate and on a large scale. The effects of these, observed in the last few decades are soil erosion, environment degradation and exploitation, air pollution, water pollution, loss of biodiversity, global warming, climate change, etc. We usually associate the environmental issue with the line ‘think globally act locally’. Zunheboto district, one of the district and most centrally located one does experienced the adverse impact of development processes and wanton use of natural resources, on environment. Limited suitable land for agriculture activities, etc. all come into play in accentuating the environment related problems in the areas under study. Measures for amelioration are called for at all levels by creating the awareness for proper management of the nature given environment.

1.7 Hypothesis

-) Environmental change is man-made.
-) Humans and human activities are responsible for environmental changes which are more destructive than otherwise.
-) Socio-economic change has a close link with environment.
-) Socio-economic change has impacted environment in Nagaland in general and Zunheboto district in particular.

1.8 Objectives of the study

-) To ascertain the socio-economic and environmental status of Nagaland in general and Zunheboto district in particular.
-) To examine the trends and patterns of socio-economic changes.
-) To analyze the impact of socio-economic changes on the environment.
-) To develop strategies for sustainable socio-economic growth.

1.9 Significance of the Study

Keeping the above in view, the present study endeavors to assess the impact made upon environment through various factors. It takes stock, with the information obtained and available; of the current socio-economic condition of the study area and tries to examine the environmental quality of Nagaland in general and Zunheboto district in particular. While the relationship between development and environment is highlighted, it also attempts to shed light on the non-visionary process of development in the state. The significance of the study further steams from the fact that such a study as this of the area considered for study under the present theme has not been done so far by any scholar. The significance of the study further steams from the fact that such a study as this of the area considered for study under the present theme has not been done so far by any scholar.

1.10 Review of Literature

World community is deeply concerned about various environmental problems such as global warming, sea level change, climate change, acid rain, ozone depletion, desertification, biodiversity loss etc. And the number of books and literatures published relating to them at international, national and regional levels are increasing, particularly in recent decades. So also, the number of scholars and researchers engaged in man-environment relations from different perspectives.

Human activities are linked to and are considered as the chief factor of the above mentioned environmental issues, which the majority of the world community seems to argue and agreed upon. Donald (2002) in his book '*An Environmental History of the World*' gives a concise history, from ancient to modern times, of the interaction between human societies and the other forms of life that inhabit our planet. He is of the opinion that humans throughout their evolutionary history have affected the naturally given environment. In the book '*Resources, Society and Environmental Management*', the authors Gareth Jones and Graham Hollier (1997) express that the extent to which concern for the environment should control the level and extent of economic development has been an issue much discussed by academics and theorists. Development activities carry with them the seeds of environmental damage, assisted and abetted by both needs and greed of man, as stated by Manasranjan Dashmishra (2011) in the book '*Political Economy of Development and Environmental Degradation in India*'. The author believes that the productivity of the economic system, however, depends on the supply and quality of natural and environmental resources. Pollution of air, water, atmosphere and noise is the by-product of economic development, particularly industrialization and urbanization..

In the book '*The Human Impact on the Natural Environment*', Andrew Goudie (2006), maintains that, most of the changes of the past 300 years have been in the hands of humankind, intentionally or otherwise. Our ever-growing role in this continuing metamorphosis has itself been essentially changed. Transformation has escalated through time, and in some instances the scales of damage have shifted from the local and region to the earth as a whole. In line with this idea, S.V.S. Rana (2010) in the book '*Essentials of Ecology and Environmental*' asserts that, by tracing the technological development of Homo sapiens through time, the development of cities and farms has demanded diversification of land use where sound land use planning and conservation practices have turned into successful adjustments of population. Increase in human population, otherwise is paralleled by an increase in the number of extinction of other species. D.K Asthana and Meera Asthana (2006) support this view in their book '*Environment- Problems and Solutions*', saying that the natural systems which sustain mankind are degenerating at a fast rate while human population is rising rapidly. S. Chandra Jain (2005) in the book '*Indigenous Resources for Rural Development- Agricultural Mechanisation and Rural Industrialisation*' says that natural resources are certainly not infinite and a faster industrial growth means more consumption of the natural resources, which, in turn, means that the natural resources are also being exhausted at a faster rate According to Erika Cudworth (2003) the author of the book '*Environment and Society*', at the start of the 21st century, it can be argued that human societies have a greater impact on the environment than ever before. She is of the view that humans have always been dependent upon, and interacted with the natural environment. However, the dramatic social changes of the past three centuries have altered the form of our relationship with non-human nature to the extent that some would see people- planet relations as in a situation of crises. Akiko Domoto, in the

article titled, International environment governance – Its impact on social and human development in the book '*Human Development and the Environment – Challenges for the United Nations in the New Millennium*' (Hans van Ginkel ed. 2003) states that many of the environmental threats we face are global in scope or have the potential to become so. As such, international conventions and other such mechanisms are of vital importance. However, international environmental governance can only be effective if it is integrated into local, national, and regional governance structures which encompass governments as well as civil society and business sector. Solutions need to be based on the understanding that human society and the environment are inter-connected, and that without a sound environment, society cannot function. He, further, argues that the economic governance that exists does little to protect the environment, and arguably do much to destroy it. And so in order to correct the horrifying environmental mistakes human society has made, and to uplift the world's impoverished people to a decent standard of living, he believes that, there is a need for interlinked, holistic approach to governance which puts the environment and people's needs first that will suffice for the coming century. Agreeing with the fact that humanity now can change the environment in a global scale B.S. Biswas (2006) in the book '*Environmental Geography*' affirms that achieving a transition to sustainability will require safeguarding the welfare of biological species and their ecosystem in a rapidly developing world. Shashi Kumar (2002) encourages the importance of biological diversity by stating that the value of biodiversity must be judged by considering the economic, ecological, anthropological, recreational and epistemic benefits derived from it.

Susan Baker (2006) in the book '*Sustainable Development*', expresses that the limits to growth are imposed by the carrying capacity of the planet, especially the ability of the biosphere to absorb the effects of human activities and the fact that the amount of

resources the planet contains. Hence, development has to be structured around the need to adopt lifestyles within the planet's ecological means. The chief focus of Sustainable Development is on society, and its aim is to include environmental considerations in the steering of societal change, especially through changes to the way in which the economy functions. K.S. Rao and K.G. Saxena 1994 the authors of the book '*Sustainable Development and Rehabilitation of Degraded Village Lands in Himalaya*' are of the view that sustainability considerations press for rational and judicious decision making in order to strike a balance of economic, social and environmental goals of development. However, as long as accountability and responsibility are not seriously realised by those who own power, development system, whatever it may be, would not be able to gear the process of sustainable development. And for this they suggest, participatory approach of development- an approach, where people play a significant role in development process. Participation of the villagers is found to be the key element rendering success to rehabilitation and resource management endeavors more than conventional afforestation/reforestation activities and regulation of villagers' right of resource use in common and public lands. They are also of the opinion that, traditional and indigenous knowledge, innovations and practices are of importance for conservation of biological diversity and sustainable use of its components with respect to our biological and intellectual heritage. According to T. Rathakrishnan and et al (2009) in the book '*Traditional Agricultural Practices- Applications and Technical Implementations*' indigenous practices in agriculture are organic in nature. They do not cause any damage to the air, water and soil, mystic to the human beings and are free from causing environmental pollution. These practices are dynamic because they are region specific, depending upon soil type, rainfall, topography etc. and are often modified by the local

farmers. Therefore, indigenous agricultural practices can play a key role in the design of sustainable and eco-friendly agricultural systems, increasing the likelihood that the rural population will accept, develop and maintain innovations and interventions. They also suggest that the modern techniques be integrated with the traditional and indigenous practices, so as to eliminate poverty and result in the prosperity of the country. Vanadana Shiva (2015) a renowned environmental thinker, activist and a tireless crusader for farmer', peasants' and women's rights in her book '*Making Peace with Earth*' enunciates that, conservation- based economic livelihood have kept tribals and forests alive. If they are now poorer, it is not because biodiversity and forest based livelihood do not generate wealth, but because that wealth has been appropriated by outside commercial forces. A. J. Battacharya (2001) in the book '*Community Participation and Sustainable Forest Development Global Perspective*' believes that, development is dependent on the conservation of the environment, and that conservation is dependent on development.

The author of the book '*Ecology and Environment*', Sharma (2007), strongly feels that the global environment problems have substantially increased with time and very little has been done to tackle them. He traces the environmental problems to the life styles and developmental process during the industrial revolution, first followed in the North, and then moving to third world countries, including India. India has seen and experienced a massive development especially after its independence. These development activities have brought about concerned amount of environment degradation. V.S. Ganesamurthy's (2011) '*Environmental Status and Policy in India*', is another noteworthy book. He argues that environment must not be considered as just another sector of national development but rather should form a crucial guiding dimension for plans and

programmes in each sector. This becomes clear only if the concern for environmental protection is understood in its proper context. Ecological compromises the quality of life in the long-run. He further goes on to say that natural and environmental resources are the basis of all economic activities. Economic activities, in turn, affect the quantity and quality of natural and environmental resources. Satendra (2003) asserts that, the hill regions of the country have a unique closed ecosystem, involving various components linked with each other with a very fragile and delicate bond in his book '*Disaster Management in The Hills*'. He is of the view that though this fragility is common feature for all the hill areas of the country but some mountainous eco-systems like Himalayas are extremely sensitive to human interference. Slight disturbance by other factors can disturb the eco-balance easily and this is what has happened during the last few decades. Man for his ever-increasing needs and greed has exploited the Himalayan natural resources beyond the safer limits, resulting into catastrophic consequences.

Nagas like any other tribal groups have a history of living in harmony and close to their natural environment. As stated by Majid Hussain (1988) in his book '*Nagaland-Habitat, Society and Shifting Cultivation*', the Nagas, being pushed into the area of isolation and relative isolation the mode of life of the tribals is still traditional, and less influenced by modernism. They live in close harmony with nature and their economy is largely of subsistence type. The technological development, occupational structure, beliefs, superstition myths and overall gamut of life of the tribals is the direct outcome of their close interaction with natural environment. Though commendable the book discusses only in general the impact of traditional practices on environment. Yet again, Gordon B. Means (2013) in the book '*Tribal Transformation- The Early History of the Naga Hills*',

(edt. by Achilla I. Erdican) propounded that for the Nagas, their economic system, their economic system, their social system, their political system and their religion were highly integrated and interdependent. All aspects of life were very close to nature and based on time-honoured principles of individuals and collective survival in a rather harsh but productive environment. He further asserts that the fundamental characteristics of traditional tribal society in the hill areas were remarkably stable, persistent, and resilient to change. However, over the period of time, Nagas have undergone and undergoing tremendous change in their social, economic and man-environment relation.

M. Horam (1988) in the book '*Nagas Old Ways and New Trends*' views that the later part of 19th century was the most interesting period in Naga history, because of the two reasons; first, because it witness the invasion of Naga territory by the British between 1853-1876. Secondly, the period of Christian missionary; in Nagaland is of special interest because of the incident to Christianize the Nagas. Though the book focuses on the evangelisation among the Nagas with the mention of their culture and social ethos including the natural setting of theirs, nothing much is reflected on how the environment is affected by their activities at that point of time or era. According to the author of the book '*British Policy and Administration in Nagaland 1881-1947*', Piketo Sema (1991), the colonial cultural policy in Naga Hills was guided by the zeal to preserve traditional culture rather than to promote change in it. However, he felt that, although the British government took certain measures to restrict and modify certain native cultural practices, its direct role affected peripheral cultural aspects of the Nagas. The real agencies which brought about considerable socio-political changes were indirect agencies which functioned under the explicit protection of the Government i.e. Christianity and

education. *'The Traditional Tribal Worldwide and Modernity'* by Wati (1995), gives an overview of tribal, their traditions, religion, origin etc. from primitive to the present modern society. He explains how the rises of the modern science and technology, introduction of a new political structure, modernization under Christianity, etc. have affected the tribal society, their concepts and ideologies. The author further discusses the influence of modernity on the creation i.e. the natural environment. According to L. Imsutoshi Jamir (2000), the author of the book *'Communication in Action- The Pattern of Naga Cultural Shift'*, the money economy has played a role of sharp edged knife in slicing out class in Naga society. Along with the comfortable living, cultured and refined living, money economy has brought about materialism, individualism that gradually brought about materialism, individualism that gradually led to class system in Naga society. The author feels that the Naga society is not free from the cultural threat, the behaviors and values of the modern youth, their lifestyle and thinking are continuously changing towards western values and life style. Arkong Ao (2004) in the article 'Change and Continuity in Naga Customary Law' in the book *'Naga Society- Continuity and Change'* (N. Venuh etd.) feels that the Nagas have intoxicated with the new lease and atmosphere of life, free from fear of warfare, and have realised the fruit of new religion, education and administration and have begun to discard the irrelevant old practices. He however feels that, as the saying goes "old habits die hard" large majority of the customary practice still persist even in the absence of codification till date. As a matter of fact, some of the Naga customary laws have been strengthened and protected by enacting laws such as (a) Rule of administration of Justice and Police in Naga Hills District Act, 1937 (b) Setting up of Dobashi's court and Tribal court(c) Nine Points Agreement with His Excellency the Governor of Assam and NNC 1946 (d) Article 371A of the

constitution of India (e) 16 points memorandum of 1960 (f) The Nagaland Jhum Act, 1970 and (g) The Nagaland Village Council Act, 1979. Wati Aier (1997) in the article 'Nagas at Present' of the book *'From Darkness to Light'* (Nagaland Baptist Church Council), says economic corruption, stagnation and the deflation of natural resources, especially forest products, have given way to a mood of general pessimism and disillusionment in many arenas. The withering away of dependence by the Nagas on community and the historical heritage, is in part, due to the sudden social changes occurring from primal ethos to rapid modernisation without a tinge of intellectual rebirth, albeit, not necessarily corresponding to the Renaissance in Europe. Thus, modernisation has resulted in eroding of the past among younger generation of Nagas coupled with generation gap, thus making the chasm unbridgeable between the past and present. He adds that when the past is disconnected from the present the future is dim. *'Rural Development in Nagaland'* (Lanunungsang, 1993) is one of the first-rate sociological and ethnographic account of economic and political life in Nagaland where he argues that a meaningful rural development will not be possible without structural changes in the land relation. The author further examines the issues of rural development in a tribal environment and provides some possible solutions to the problem. Even though the book covers area under Dimapur district, it is helpful in understanding the man-land relationship of different Naga tribes and their socio-economic status. But the author does not deal with man-environment relation. According to A. Shimray (2007) in his book *'Ecology and Economics Systems- a Case of the Naga Community'*, says the Naga society needs critical examination in the context of the present changing social and economic system. He is of the opinion that the relationships between economic system and human activities in respect to ecological parameters, has to be taken seriously, since the

relationship among the various ecological parameters is also eventually changing with the transition in social and economic system. The book deals mostly on the Thankhul Nagas and therefore has little relevance to the present study.

B. K Tiwari and et.al. (2013) in the paper 'Institutional arrangement and typology of community forests of Meghalaya, Mizoram and Nagaland of North-East India' in the '*Journal of Forestry Research*' writes that the hill regions of northeast India, predominantly inhabited by tribal communities, have a long tradition of community-based forest management. They further asserts that these community based regulations and management practices have been in existence for many centuries and certainly long before the introduction of modern forest management in India in 1876. According to A. Nshoga (2009), author of the book '*Traditional Naga Village System and its Transformation*', forest was the essential economic life of the Nagas. The utilisation of land and forest is the customary rights and privileges of the Nagas. Forest provides them the building materials for dwelling houses, raw materials for their handicrafts and all the food provisions acquired from the forest is at their disposal. Alphonsus D Souza (2001) also endorses the above idea saying that the tribal protects forests because for the tribal and many other forest dwellers, their forests are essential for their very survival, in the book '*Traditional Systems of Forest Conservation in North East India- The Angami Tribe*'. The author however observes and worries that in recent times, under the pressure of various factors such as commercialisation, the tribals have often become destroyers of the very forests which they had preserved for centuries. Yet another author Pushpanjoti Deori (2005) writes that, nature is the only master to the Nagas; the forest offers countless ways of getting food and the choices of what work to do each day, everyman is

his own boss affirms, in the book '*Environmental History of Naga Hills 1881-1947*'. The author says that the Nagas, like any other tribal people, have enjoyed freedom to use the forests and hunt its animals and this has given them a conviction which remains even today deep in their hearts that the forest belongs to them. Until about the middle of the nineteenth century things had continued to be same, thereafter, people from outside began to move into forests and conditions began to change. Lanusashi Longkumer and Toshimenla Jamir (2012) in the book '*Status of Adivasis/ Indigenous Peoples Land Series-6*' states that the socio-cultural lives of the tribal/indigenous peoples which is so closely linked to the ecological system of forest, water and land is presently fast eroding and many find themselves completely hapless as a result of development-induced resource base destruction. This is attributed to the modernisation which has a great impact on the traditional community life of the Nagas. Much of the books on the Nagaland or Nagas gives an understanding of quite a lot about Naga society or cultural bearings but has very little or no explanation of human impact of these changes on environment.

Literature on Zunheboto district or the people living in the district is scarce. The Sema Nagas by J.H Hutton (1968), compiled between 1915 and 1920 is one of the first written materials about the Sumi Nagas which then were called Sema Naga. The Sema Nagas described in the book are the present Sumi Nagas residing in Zunheboto district, some of whom gradually migrated to other parts of Nagaland. Though, the relation between the Sumis and their natural environment cannot be found in the book, it has documented quite a rich source on the domestic, social and cultural life of the Sumi Nagas. The Sumi Nagas have experienced and undergone tremendous change since then. He in his second

edition of the book says “since the first edition of this volume was published in 1922 the Sema Naga tribe has undergone a very complete change”. According to Avitoli G. Zhimo (2011) in the paper ‘Culture, Identity and Change- The case of the Sumi of Nagaland’ in the journal of *‘Indian Anthropologist’*, the Sumi society at present, especially the youth, are at crossroads, encountering contradictory values of tradition and market-centered globalization. They are making effort to cling to their roots but at the same time avail of the opportunities of the market. The paper is valuable in terms of understanding the social and cultural change but the study is based on anthropologist perspective and has not mention of the change relating to environment.

The history of man-environment relation has seen a dramatic scenario which has been dynamic with human beings learning to adapt to the natural environment and then further goes on to exploit and modify their surroundings according to their needs. It is, indeed, a global phenomenon. Environmental issues being faced by people all around can be cited as mindless misuse of the environment and the resource more based on greed than on need. The concerns relating to man-induced destruction of environment are found to be occupying the centre-stage of various forums, both national and international. But the relationship cannot be termed as one sided. It is rather a two-way relation where human impacts environment and vice versa. One can come to such conclusions on reviewing literatures pertaining to patterns of socio economic change and their impact on environment. The implications of socio-economic change on environment are being observed and experienced in Nagaland but in-depth study on this subject has not been done by any research scholar from geographical perspective. Literature review reveals that there has been no systematic and scientific study of the proposed topic in Nagaland

and particularly in Zunheboto district. Based on the work cited above the present work makes an effort to study the man-environment nexus and the resultant scenario, particularly in Zunheboto district, Nagaland.

Chapter 2

Geographical Framework and Socio-economic Status: Zunheboto District, Nagaland

2.1 Introduction

In order to know the patterns and impacts, one has to first understand the status of socio-economy and environment in the study area. The indicators taken into consideration are physical attributes like physiography, climate, geology, soil, forest resource, water resource and social, economic and demographic features such as economy, agriculture, land holding system, education, public amenities, connectivity and development processes. Brief status of these indicators are discussed in this chapter.

2.2 Physical Setting

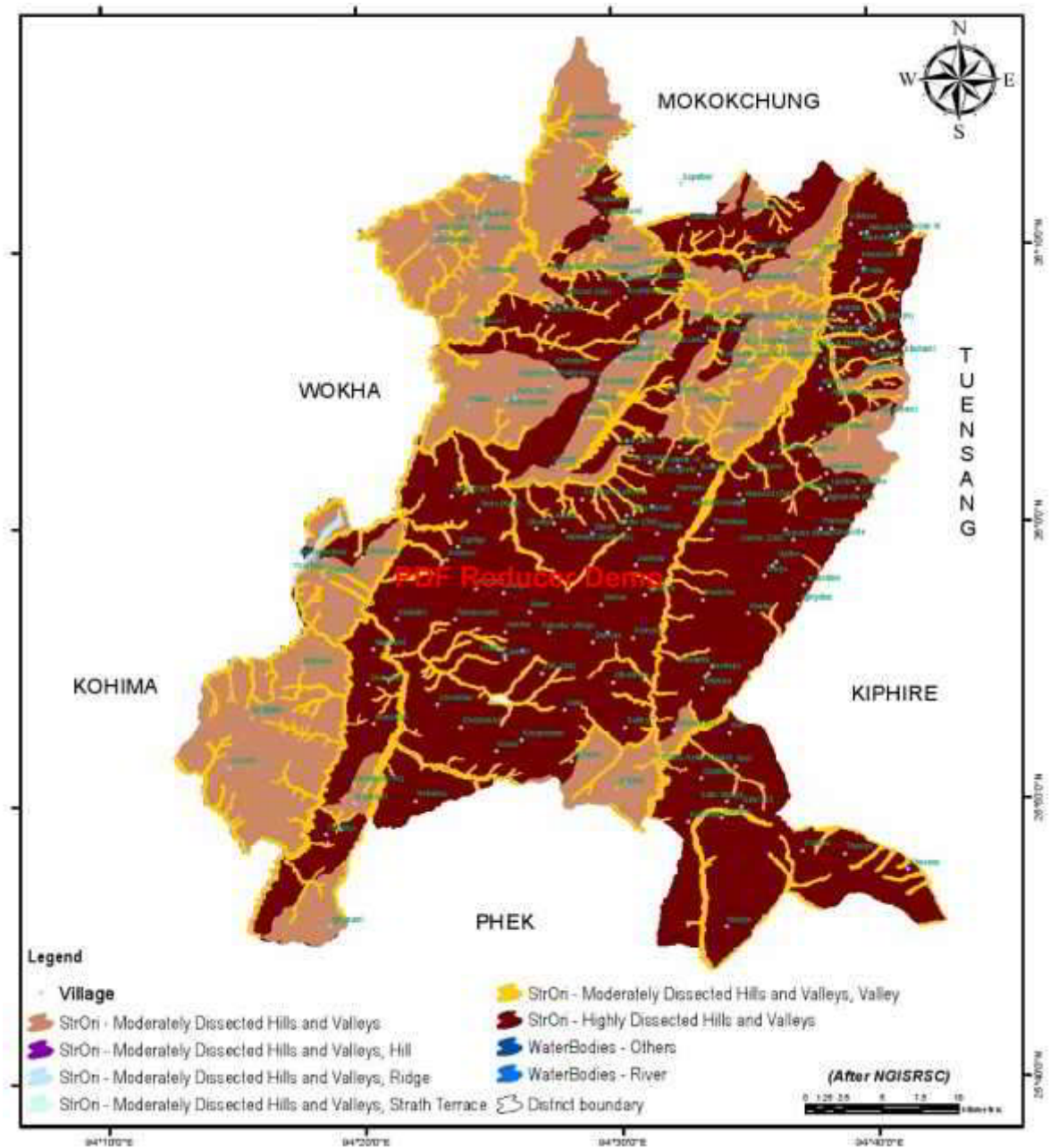
The topography of Nagaland is much dissected, full of hill ranges, which break into a wide chaos of spurs and ridges. The terrain is mountainous covered by rich and varied biodiversity of flora and fauna¹³. Nagaland is a largely mountainous state. The Naga Hills rise up from the Brahmaputra Valley in Assam and extend about 2,000 feet, while rising further to the southeast to points as high as 6,000 feet. Mount Saramati at an elevation of 12,552 above sea-level is the state's highest peak, and serves as the point where the Naga Hills merge with the Patkai Range in Myanmar¹⁴. Apart from a few hundred sq. km of plains in Dimapur and in the foothill zones, the entire state is covered with mountain ranges varying in height from 600 m to 3000m above sea level. It has a sub-tropical monsoon climate with variations from tropical to temperate conditions. The state records a heavy rainfall with average rainfall varying between 200mm to 2500mm (approx). These climatic conditions and altitudinal variations coupled with varied flora and fauna generate a very unique biodiversity in Nagaland.

¹³ http://www.nagenvis.nic.in/Database/nagaland_923.aspx

¹⁴ <http://www.newworldencyclopedia.org/entry/Nagaland>

Zunheboto occupies the central part of the state. Its physiographic layout trending from east to west is well connected with the hills of the other districts, and has tremendous influence on the settlement pattern and socio-economic life of the people. Like any other hilly districts of the state, it is characterized by dissected hills and valleys with variety of relief features, drainage systems, soil types and vegetation cover (Fig. 2.1). The hills vary from 450 to 2500 metres and most people live between 1500 - 2000 metres altitude. The altitude of the district Headquarters (Zunheboto Town) is 1874.22 metres above sea level. Two distinct physiographic divisions in the district are- The Eastern Zunheboto and The Western Zunheboto. The Eastern Zunheboto which is higher altitudinally attains a maximum height of about 2500m. The Western Zunheboto, lower than the Eastern Zunheboto is also marked by hilly ranges and thick vegetation and attains a maximum height of about 1800m.

Fig.2.1: Geomorphology map: Zunheboto



Source: Nagaland GIS and Remote Sensing Centre, Planning and Coordination Department, Government of Nagaland.

2.3 Climate

Nagaland has a largely monsoon climate with high humidity levels. Annual rainfall averages around 70–100 inches (1,800–2,500 mm), concentrated in the months of May to September. Temperatures range from 70 °F (21 °C) to 104 °F (40 °C). In winter, temperatures do not generally drop below 39 °F (4 °C), but frost is common at high elevations. The state enjoys a salubrious climate. Summer is the shortest season in the state that lasts for only a few months. The temperature during the summer season remains between 16 °C (61 °F) to 31 °C (88 °F). Winter makes an early arrival and bitter cold and dry weather strikes certain regions of the state. The maximum average temperature recorded in the winter season is 24 °C (75 °F). Strong northwest winds blow across the state during the months of February and March¹⁵.

The Köppen Climate Classification System is the most widely used system for classifying the world's climates. Its categories are based on the annual and monthly averages of temperature and precipitation. The Köppen system recognizes five major climatic types; each type is designated by a capital letter.

A - Tropical Moist Climates: all months have average temperatures above 18° Celsius.

B - Dry Climates: with deficient precipitation during most of the year.

C - Moist Mid-latitude Climates with Mild Winters.

D - Moist Mid-Latitude Climates with Cold Winters.

E - Polar Climates: with extremely cold winters and summers.¹⁶

Nagaland has three different climates and dominated by Cwa. (Table2.1)

¹⁵ <https://en.wikipedia.org/wiki/Nagaland>

¹⁶ https://www.academia.edu/9885796/climate_w_koppen

Table 2.1: Climate classification of Nagaland

Classification	Koppen-Geiger	District
Humid subtropical climate (monsoon)	Cwa	Kohima, Mon, Longleng
Subtropical highland oceanic climate	Cwb	Tuensang, Zunheboto
Humid subtropical climate	Cfa	Dimapur

Source: <https://en.climate-data.org/region/787/>

Owing to the high altitude, Zunheboto enjoys a monsoon climate almost throughout the year. Winters are very cold but summers moderately warm. December and January are the coldest part of the season at about 6°-8°C (Table 2.2). The hottest season is experienced from the month of May to July (Table 2.2). The average rainfall is about 2000 mm. It falls for nine months in a year, heaviest contribution being in July and August. The climate here is classified as Cwb by the Köppen-Geiger system (Table 2.1)

Table 2.2: Annual mean maximum, minimum and average temperature: Zunheboto District

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Annual mean max. Temp.	18.64 135	20.0 637	22.77 178	24.13 304	25.27 622	25.70 357	25.56 035	25.89 874	25.81 313	25.04 196	22.47 422	19.6 957
Annual mean min. temp.	6.42 3565	8.51 2783	11.4 6648	14.1 3965	16.6 5091	18.9 5978	19.3 6139	19.3 3157	18.7 0491	16.3 4026	11.9 3804	8.34 0435
Annual mean avg. temp	12.51 7695	14.2 7295	17.10 0304	19.11 904	20.94 6478	22.31 2521	22.43 7826	22.59 3652	22.24 8695	20.67 0956	17.18 6652	14.0 0495

Source: http://www.indiawaterportal.org/met_data

2.4 Water Resource

Spatial and seasonal availability of surface and ground water is highly responsive to the monsoon climate and physiography of the state. The average annual rainfall in Nagaland is 2500mm. There are 4 major river systems in the state- Dhansari, Dikhu, Doyang and Tizu. Though data on consumption of water is not available, it is estimated that the agriculture sector uses the maximum amount of water (50%) followed by the domestic sector (35%) and industry (15%).¹⁷ Most of the drinking water supply systems in the state depend on surface sources such as streams, rivulets, springs and ponds, which are monsoon fed. The volume of water discharge of such sources vary widely from season to season, depending on the frequency and intensity of rainfall, which is indicated by vastly diminished discharge during the non-monsoon periods leading to drinking water scarcity in many towns and villages.¹⁸ The district under study, face the water resources situation similar to the one prevalent in the state. Rivers, streams, springs, etc. are the main source of water, the volume of which is determined by seasons. The rapid destruction of forest by logging, jhum cultivation and other human activities has lead to depletion of water in the source. The major rivers of Nagaland are Doyang, Dikhu, Dhansiri, Tizu, Tsurong, Nanung, Tsurang or Disai, Tsumok, Menung, Dzu, Langlong, Zunki, Likimro, Lanye, Dzuza and Manglu. All these rivers are dendritic in nature. Of the rivers, Dhansiri, Doyang and Dikhu flow westward into the Brahmaputra. The Tizu River, on the other hand, flows towards east and joins the Chindwin River in Burma¹⁹. Among these rivers Doyang has the largest catchment area with 3283 sq km followed by Dikhu, Tizu, Dhansari and Zunki. Barak and Milak has the least catchment area (Table 2.3).

¹⁷ State of Environment Nagaland 2005, Nagaland Pollution Control Board

¹⁸ Sustainability of Drinking Water System in Hilly Areas – Unique Problems and the Need of Finding Solutions, Office of the Chief Engineer, Public Health Engineering Department, Nagaland, Kohima

¹⁹ <http://www.nagalandpost.com/SundayPost/ArticleShow.aspx?sid=UzEwMDAwMDc2Nw%3D%3D>

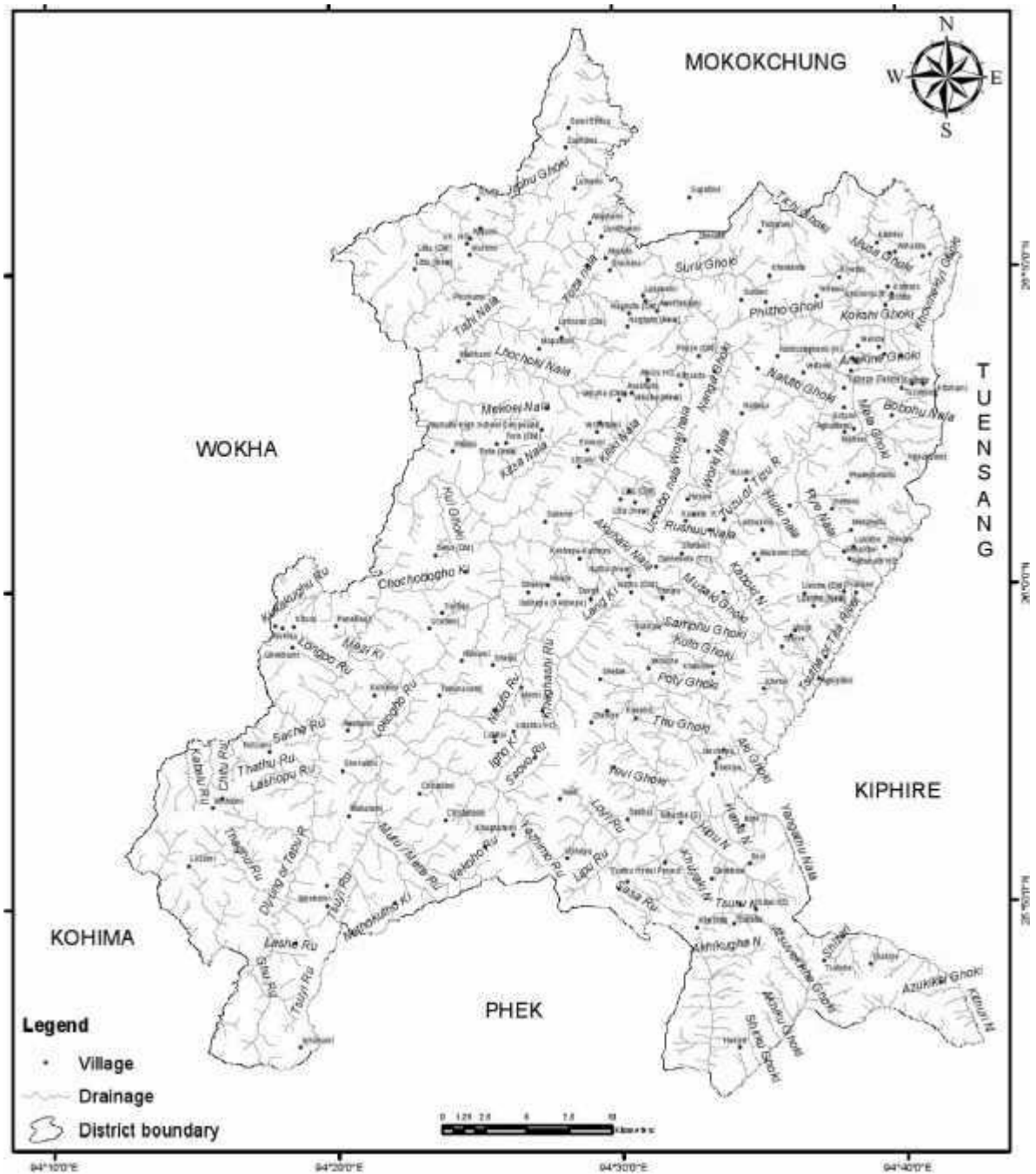
Table 2.3: Major Drainage Systems: Nagaland

River	Length(Km)	Catchment area (sqkm)
Zungki	80	2060
Tizu	203	2760
Milak	67	845
Doyang	167	3283
Dikhu	171	2996
Dhansiri	241	2262
Barak	53	809

Source: Nagaland GIS and Remote Sensing Centre, Planning and Coordination Department, Government of Nagaland.

The important rivers of Zunheboto district are- Doyang, Dikhu, Tizu and Tsutha river (Fig.2.2) .Doyang river originating in Japfu passes through west part of the district and joins Dhansiri in Assam. Doyang passing through the district is known by Tapu Ghoki. Dikhu which is known as Nanga Ghoki in the district originates in Nalto hills and drains across Mokochung and Longlen districts joining the mighty Brahmaputra river in Assam. Tizu river originating in Tuensang district flows down towards south crossing at the centre of Zunheboto district. Tsutha river also known as Tita river, originating in North East of Zunheboto drains easternmost part of the district and joins Tizu below Nihoshe village and joins Chindwin in Myanmar.

Fig.2.2: Drainage map: Zunheboto

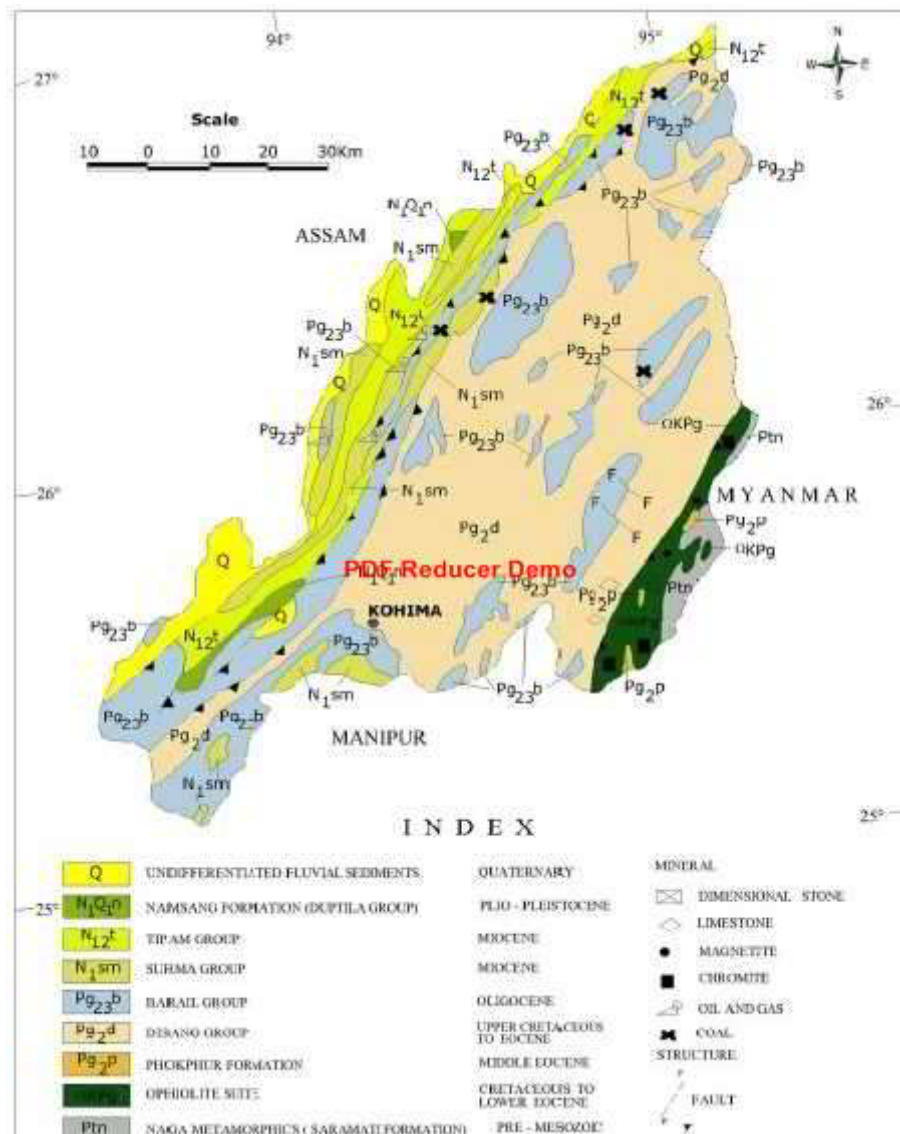


Source: Nagaland GIS and Remote Sensing Centre, Planning and Coordination Department, Government of Nagaland.

2.5 Geology and Soil

The landform of the districts of Nagaland is marked by a series of sub-parallel hill ranges running in a north-east to south-west direction raising one another towards east with intervening valleys, which at times are fairly wide. The hills are comprised of young rocks of tertiary sequence (Fig. 2.3).

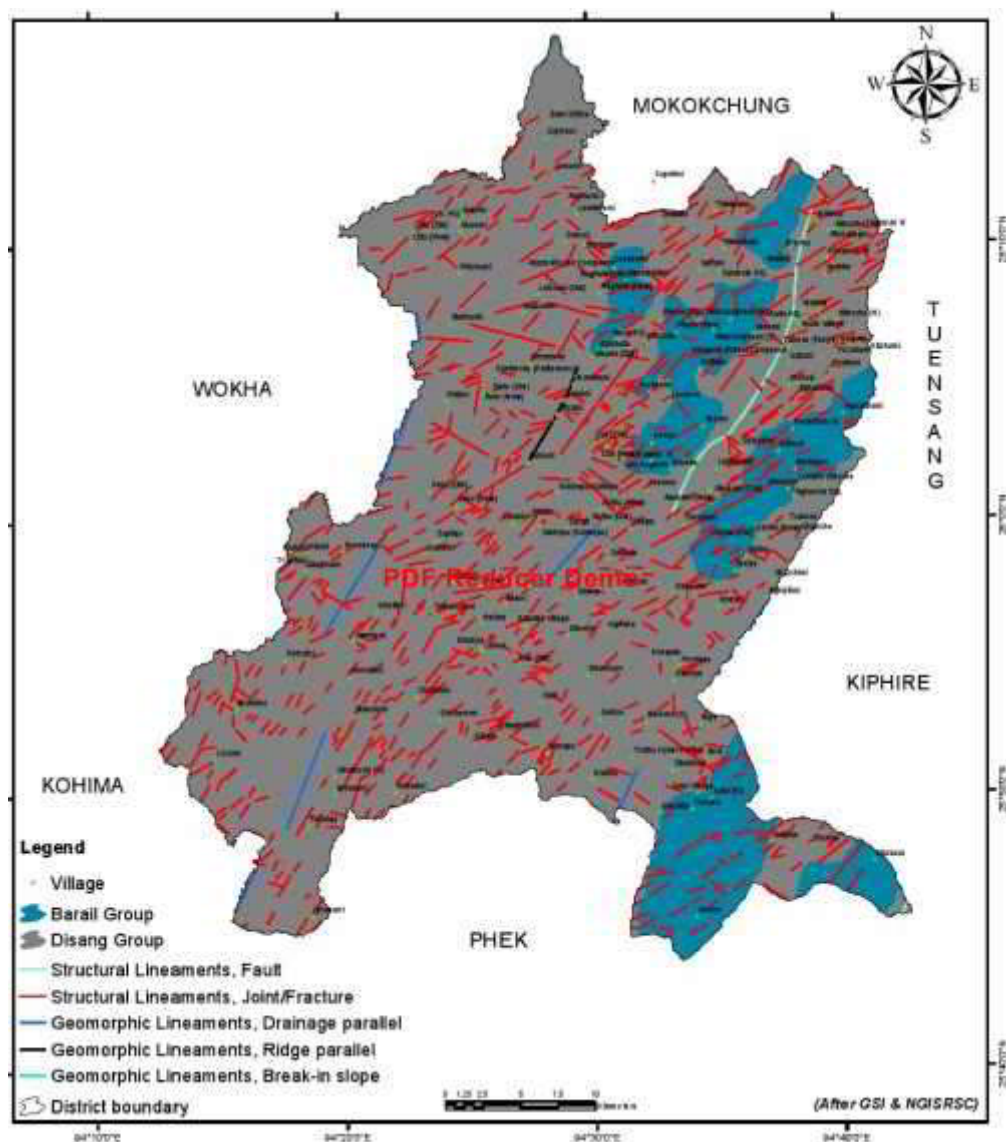
Fig.2.3: Geology map: Nagaland



Source: Geological Survey of India

The rock formation of Zunheboto district belongs to the rock sequences of the disang group of lower and middle eocene age, the barail group of upper eocene and oligocene age, the surma and the tipam groups of miocene age and the namsang beds of miopliocene age. The age of the oldest formation i.e. disang, occurring in Zunheboto is approximately of 54 million years (Fig. 2.4).

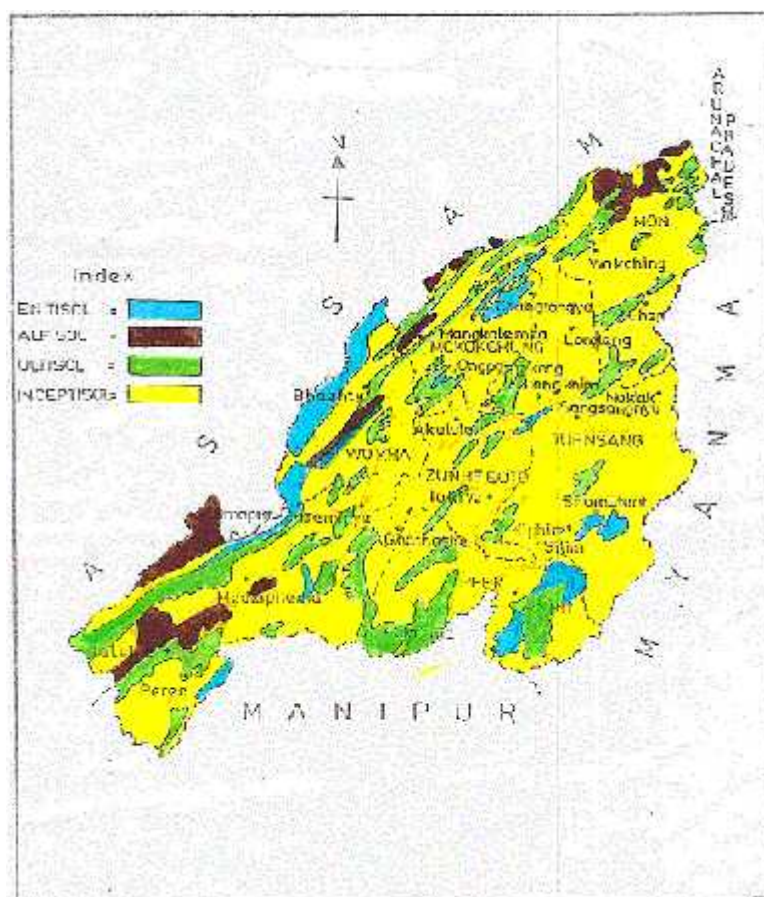
Fig.2.4: Geology: Zunheboto



Source: Nagaland GIS and Remote Sensing Centre, Planning and Coordination Department, Government of Nagaland.

Based on the report of the Soil Survey Wing of Soil and Water Conservation, Nagaland, the soils of Nagaland belongs to 4 orders, 7 sub-orders, 10 great groups, 14 sub groups and 72 soil families. The 4 orders found in Nagaland are :Alfisols, Entisols, Inceptisols and Ultisols(Fig. 2.5). Inceptisols dominate the soils of the State with 66% followed by Ultisols 23.8%, Entisols 7.3% and Alfisols 2.9% of the total 16.6 million Ha. of the State Geographical Area²⁰.Almost all the soils of the Zunheboto district belong to the alluvial soil, forest soil (organic) pertaining to moolisol, non-laterised soil and soils of high altitudes belonging to order spodosals.

Fig.2.5: Types of Soil: Nagaland



Source: Dept. of Soil and Water Conservation, Nagaland

²⁰ Directorate of Soil & Water Conservation, Govt. of Nagaland

The soil of the Naga Hills is generally red-laterite superficially covered by loamy soil that can be distinguished as red soil, grey-brown soil, black-grass land, sandy soil, silty soil and clayey soil. Soils in Nagaland are, on the whole, of coarse to medium texture and low cation exchange capacity and moderately acidic in reaction. Soils of Tuensang district are low in organic carbon (available nitrogen) available phosphorous and available potassium. Soils of Kohima, Mokokchung, Phek and Wokha districts are high in organic carbon and low in phosphorous. Soils of Mon and Zunheboto districts have medium available nitrogen and the later has medium available phosphorus. Soils of Kohima, Phek, Wokha and Zunheboto districts are medium in available potassium and soils of the districts are low in it²¹.

2.6 Forest Resources

Nagaland is endowed with a variety of forest types on account of its unique geographic location and physiographic terrain. Forest plays an important role in the socio-economic activity of the State as a whole and Zunheboto district in particular. The people in the rural areas are mostly engaged in weaving, handicrafts, blacksmith and other small village industries. Weavers and artisans who forage the forest in search of wood, dyes and other resources that are utilized to curve out fine work of art and weave colourful clothes. Fine storage baskets, wicker, drinking vessels and containers are woven by craftsman whose skills have been inherited from generation of skilled craftsman. As indicated in Table 2.4, there are different types of forest found in Nagaland.

According to the Indian State of Forest Report (2013), the state has forest cover of 13, 04 sq km (Table 2.5). The area under open forest is higher (4,449 sq km) than that of

²¹ Kolay. A.K. (2007). *Soil Genisis, Classsification Survey and Evaluation Volume 2*. Atlantic Publishers & Distributors (P)Ltd.p 506

moderate dense forest (3,337 sq km) and the least is very dense forest (1,161 sq km).

Distribution of forest cover in the state is shown in Fig 2.6.

Table 2.4: Forest types: Nagaland

Forest Type	Percentage
Tropical Moist Deciduous Forest	57.49‰
Tropical Semi-evergreen Forest	6.77‰
Sub-tropical broadleaved Hill Forest	15.56‰
Sub-tropical Pine Forest	7.49‰
Montane Wet-Temperate Forest	12.69‰

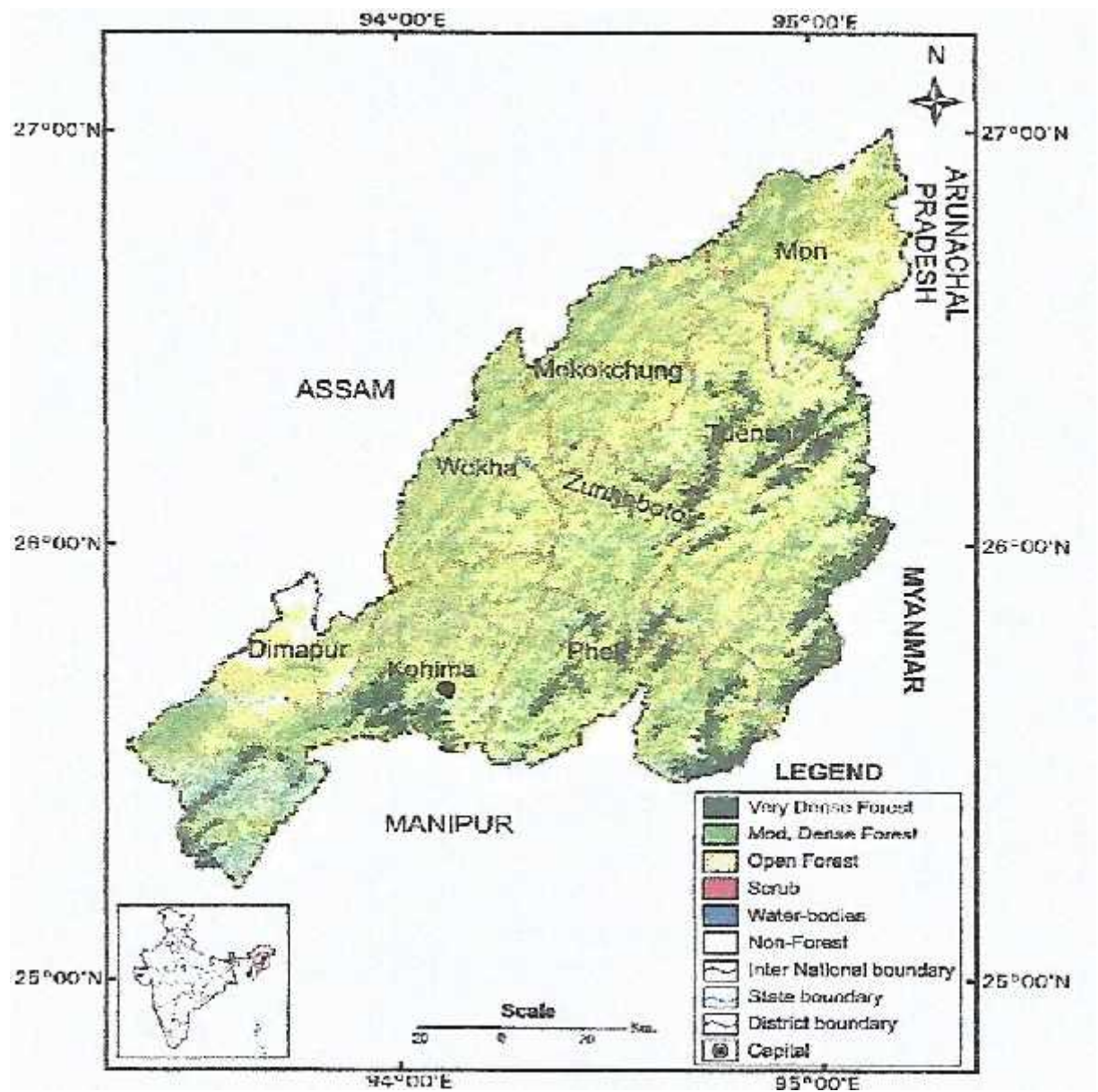
Source: Champion & Seth's Classification system

Table 2.5: Status: Nagaland Forest (2013)

Forest Cover within Green Wash	
Very Dense Forest	1,161 sq km
Moderately Dense Forest	3,337 sq km
Open Forest	4,449 sq km
Sub Total	8,947 sq km
Forest Cover outside Green Wash	
Very Dense Forest	137 sq km
Moderately Dense Forest	1,399 sq km
Open Forest	2,561 sq km
Sub Total	4,097 sq km
Total Forest Cover	13,044 sq km
Tree Covert	372 sq km
Total Forest & Tree Cover	13,416 sq km
Per capital Forest & Tree Cover	0.678 ha
Of State's Geographical Area	80.92%
Of India's Forest & Tree Cover	1.70%

Source: India State of Forest Report 2013

Fig.2.6: Forest cover: Nagaland



Source: India State of Forest Report 2013

Zunheboto has a total forest cover of 985 sq km. which accounts for 78.49 % of the district's total geographical area. The district too has larger forest area under open forest with 515 sq km and very dense forest the least with 85 sq km (Table 2.6).

Table 2.6: Forest cover (2013): Zunheboto

Year	Very dense forest	Moderate dense forest	Open Forest	Total Forest cover	% of Geographical area	Change
2013	85	385	515	985	78.49	-53

Source: India State of Forest Report 2013

2.6.1 Flora and Fauna

About one-sixth of Nagaland is covered by tropical and sub-tropical evergreen forests including palms, bamboo and rattan as well as timber and mahogany forests. While some forest areas have been cleared for jhum cultivation, many scrub forests, high grass, reeds; secondary dogs, pangolins, porcupines, elephants, leopards, bears, many species of monkeys, sambar, harts, oxen, and buffaloes thrive across the state's forests. The great Indian hornbill is one of the most famous birds found in the state. Blyth's tragopan, a vulnerable species of pheasant, is the state bird of Nagaland. It is sighted in Mount Japfü and Dzükou Valley of Kohima district, Satoi range in Zunheboto district and Pfütsero in Phek district. Of the mere 2500 tragopans sighted in the world, Dzükou valley is the natural habitat of more than 1,000 tragopan. Rhododendron is the state flower. The state has at least four species which is endemic to the state. Mithun (a semi domesticated gaur) found only in the north-eastern states of India, is the state animal of Nagaland and has been adopted as the official seal of the Government of Nagaland. It is ritually the most valued species in the state. To conserve and protect this animal in the

northeast, the National Research Centre on Mithun (NRCM) was established by the Indian Council of Agricultural Research (ICAR) in 1988²².

The forest in Zunheboto consists of both deciduous and evergreen forests. Evergreen forest is found up to the altitude of 1000m and mixed deciduous and evergreen forest above 1000m. Some of the important trees found in this district are- champa, bonsum, gamari, sam, simul, hollock, walnut, etc. Besides these trees, numerous numbers of wild herbs and scrubs of medicinal, ornamental, fodder importance are found. And some of the fauna found are- grey jungle fowl, common peafowl, common green pigeon, black bear, bubo bubo, deer, wild boar, wolf, python and other snakes, tortoise etc and numerous fish species. Ghosu Bird Sanctuary is situated in Ghukiye village, 8 km away from Zunheboto District headquarters and it provides habitat to more than twenty species of endangered avifauna. Migratory birds can be sighted in the month of June to September²³. This bird sanctuary is maintained by the village community with the support from the neighboring villages prohibiting hunting and poaching in this area.

Besides fauna, these sanctuary houses rich flora too, with varieties of exotic and medicinal orchids, rhododendrons, and ginseng etc.

2.7 Demographic Characteristics of Nagaland and Zunheboto District

The first official Nagaland Statehood Census was conducted in the year 1961. Prior to this, Nagaland, which was formerly known as the Naga Hills District, was under the administrative jurisdiction of the Government of Assam and hence, all Census operations were conducted under this area. The entire administrative area was then divided into 3

²² <https://en.wikipedia.org/wiki/Nagaland>

²³ Kinny. A and Lanusosang L. Exploring the potentials of ecotourism and sustainable development in Nagaland India, International Journal of Applied Research, 2016; 2(9): 156-160.

districts, namely, Kohima, Mokokchung and Tuensang. During the period 1971-81, four more districts were created by the State Government under its notification no. APA.15/12/71 dated 19.12.73. They are Phek, Wokha, Zunheboto and Mon. Dimapur was later added to the number of districts in 1997. Thereafter, three more new Districts were formed in the State in the year 2003 viz. Longleng, Kiphire and Peren. On account of these administrative changes, the State has a total of 11 Districts in 2011 Census²⁴.

According to 2011 census, Nagaland has a total population of 1980602, (Fig.2.7) comprising of 1025702 males and 954895 female. The population of Nagaland was 1990036 in 2001, showing a negative decadal growth of -0.47(Table 2.7). It is to be noted that controversies loam around the 2001 census, which saw an abnormal growth in population in the state recording the country's highest decadal population growth with 64.41%. The State government had rejected the state's 2001 census describing it as exaggeration. Rejecting the 2001 census, the State government found out that most of the villages recorded exaggerated figures to get more funds allocated from the government for various rural development schemes²⁵. The growth rate of population in the State shows a highly inconsistent pattern compared to 2001 census. Mon, Mokokchung, Zunheboto, Longleng and Kiphire districts have shown a decline in growth rate. While, Wokha, Dimapur, Phek, Tuensang, Kohima and Peren districts have shown decadal increase in population.

²⁴ DISTRICT CENSUS HANDBOOK- Zunheboto District, Census of India, 2011

²⁵ <http://www.thehindu.com/news/national/other-states/Nagaland-records-negative-growth-in-decadal-population/article14666718.ece>

Table 2.7: District-wise distribution of Population and Decadal growth rate

State/ District	Population			Decadal Growth Rate in %	
	1991	2001	2011	1991-2001	2001-2011
NAGALAND	1209546	1990036	1980602	64.53	-0.47
Mon	149699	260652	250671	70.12	-3.83
Mokokchung	158379	232085	193171	46.54	-16.77
Zunheboto	96218	154598	141014	60.01	-8.79
Wokha	82612	161223	166239	95.16	3.11
Dimapur	-	308174	379769	86.13	23.23
Phek	102156	148195	163294	45.07	10.19
Tuensang	232906	186003	196801	69.2	5.81
Longleng	-	121581	50593	79.58	-58.39
Kiphire	-	106591	74033	95.64	-30.54
Kohima	387581	220168	270063	32.88	22.66
Peren	-	90766	94954	60.62	4.61

Source: Census of India 2001 & 2011

According to 2011 census Zunheboto district has the population of 141014 (Table 2.8). Population of the district increased by 60.01% in 2001 declined by -8.79% in 2011, the absolute figure of decrease being 13,584 (Table 2.7). The Circles showing increase in population are Aghunato, Saptiqa and Asuto Circles. Except for the three mentioned circles all other circles have negative growth rate. Pughoboto circle has the highest decline in its total population (Table 2.9). Table 2.8 gives the general population characteristics of Zunheboto district. We can observe from the above discussions that

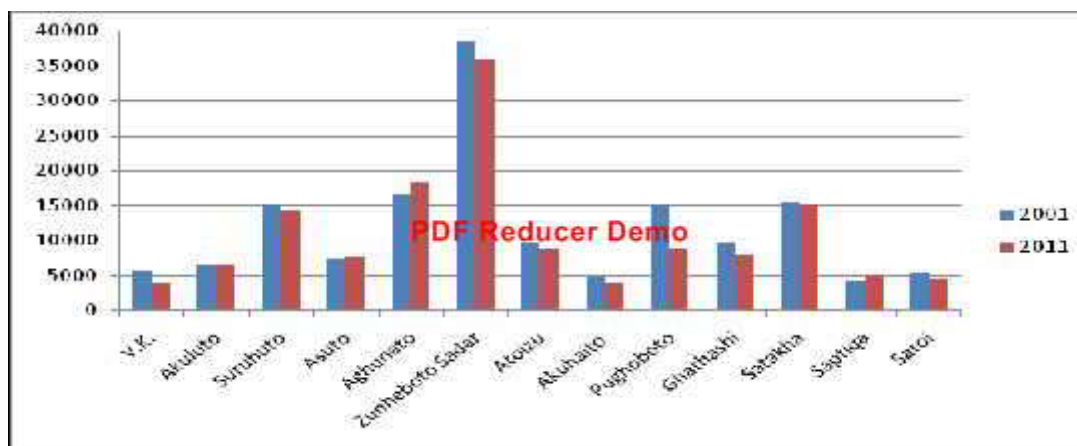
Zunheboto is showing a rather negative growth in population growth rate. The reason can be due to the migration of the denizens to the low-lying areas of Nagaland like Dimapur, which has shown an increase in decadal population growth.

Table 2.8: General Population Characteristics: Zunheboto District.

	Parameters	Zunheboto
1	Total Population	141,014
2	Population Density(per sq.km)	112
3	Decadal Growth rate	-8.79
4	Percentage of Rural Population	80.42
5	Percentage of Urbanization	19.58
6	Literacy rate	86.26
7	Sex ratio(Per 1000)	981

Source: Census of India 2011.

Fig.2.7: Population (2001 and 2011): Zunheboto District



Source: Census of India 2011.

Table 2.9: Decadal change in population (2011): Zunheboto District

District/Circle	T/R/U	2001	2011	Decadal Change
Zunheboto	Total	154598	141014	-8.79
	Rural	131517	113409	-13.77
	Urban	23081	27605	19.60
V.K	Total	5635	3922	-30.40
	Rural	5635	3922	-30.40
	Urban	-	-	-
Akuluto	Total	6665	6594	-1.07
	Rural	6665	6594	-1.07
	Urban	-	-	-
Suruhuto	Total	15303	14241	-6.94
	Rural	15303	14241	-6.94
	Urban	-	-	-
Asuto	Total	7445	7601	2.10
	Rural	7445	7601	2.10
	Urban	-	-	-
Aghunato	Total	16713	8764	9.68
	Rural	16713	8764	9.68
	Urban	-	-	-
Zunheboto Sardar	Total	38569	35951	-6.79
	Rural	15488	13323	-13.98
	Urban	23081	22628	-1.96
Atoizu	Total	9782	8764	-10.41
	Rural	9782	8764	-10.41
	Urban	-	-	-
Akuhaito	Total	4678	3873	-17.21
	Rural	4678	3873	-17.21
	Urban	-	-	-
Pughoboto	Total	15088	8941	-40.74
	Rural	15088	8941	-40.74
	Urban	-	-	-
Ghathashi	Total	9547	7956	-16.66
	Rural	9547	7956	-16.66
	Urban	-	-	-
Satakha	Total	15454	15116	-2.19
	Rural	15454	10139	-34.39
	Urban	-	4977	-
Saptiqa	Total	4395	5177	17.79
	Rural	4395	5177	17.79
	Urban	-	-	-
Satoi	Total	5324	4547	-14.59
	Rural	5324	4547	-14.59
	Urban	-	-	-

Source: Census of India 2011

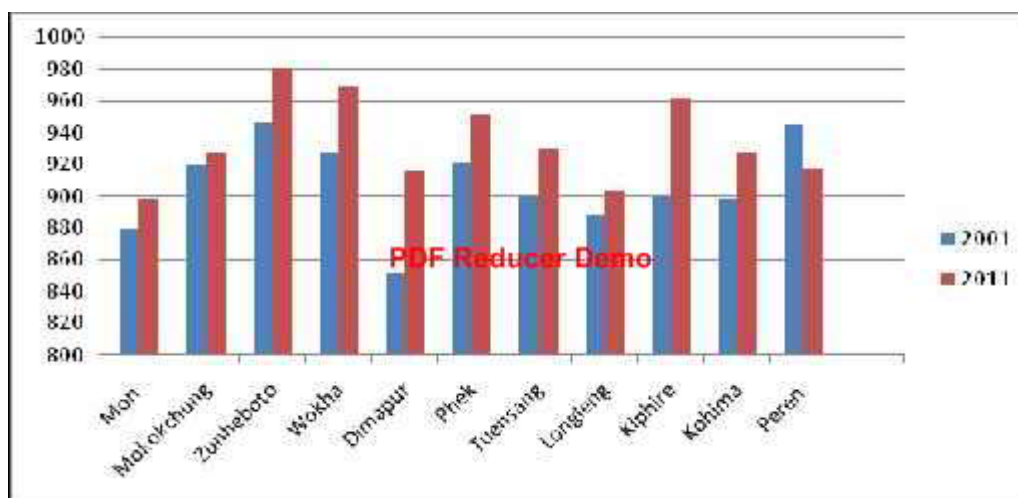
2.7.1 Sex Ratio

In Nagaland, the sex ratio of the total population is 931 (Table 2.10), out of which, the sex ratio in the rural and urban areas stand at 942 and 905 respectively. This is much higher than the average sex ratio of Nagaland in 2001, but is still lower than the national average which is 940. Even though we see an improvement in sex ratio between 2001 and 2011 (from 900 to 931), there is still much to be desired in order to attain equilibrium in the sex ratio (Table 2.10).

Table 2.10: Sex ratio (2001 and 2011): Nagaland

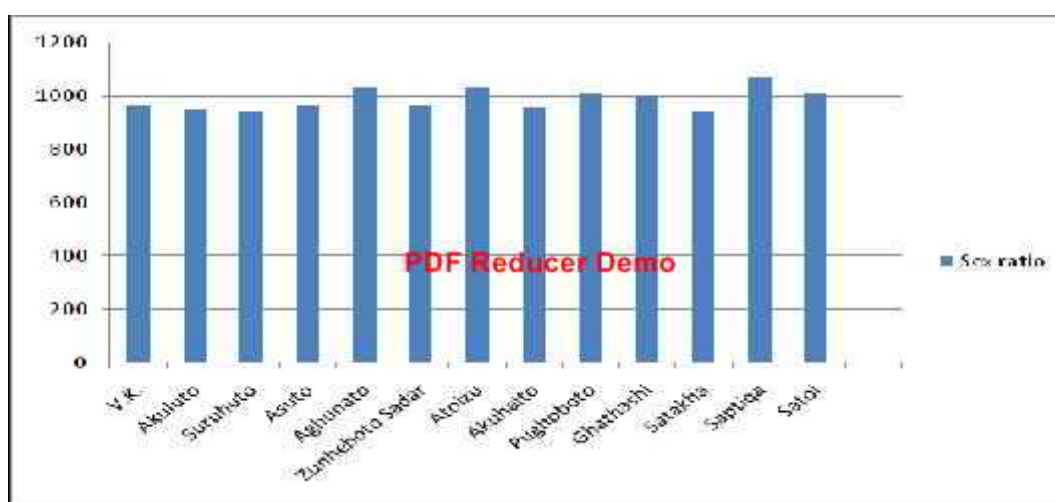
State/ District	2001	2011
Nagaland	900	931
Mon	879	898
Mokokchung	920	927
Zunheboto	947	981
Wokha	927	969
Dimapur	854	916
Phek	921	938
Tuensang	900	930
Longleng	889	903
Kiphire	900	961
Kohima	898	927
Peren	946	917

Source: Census of India 2011.

Fig.2.8: Sex ratio Comparison in Districts (2001 and 2011): Nagaland

Source: Census of India 2011.

In Zunheboto district, the sex ratio varies from circle to circle. For each of the circles, it is as given in the Figure 2.9, Circles namely V.K(963), Asuto (965), Aghunto (1031), Zunheboto Sardar (967), Atoizu (1029), Akuhaito (961), Pughoboto (1011), Ghathashi (1004), Saptiqa (1072), Satoi (1008) have shown favorable gender ratio. The remaining three Circles also have sex ratio above the State figure of 931(Fig 2.9). The 2011 census reveals an increase in sex ratio by 11% of decadal change in Zunheboto District.

Fig.2.9: Sex ratio (2011): Zunheboto

Source: Census of India 2011.

2.8 Economy

Despite the late start, difficult mountainous terrain and the remoteness of the area, significant progress and development has taken place in the district of Zunheboto since its birth as a district. As in other districts of Nagaland, land and forest are the major natural resources and the people primarily depend on agriculture for their livelihood and economy. Besides, cattle are reared for milk and meat, pigs and poultry are also reared for household consumption. Participation of worker in different economic activities is increasing over the years. Horticulture under the sponsorship of state government is fast growing and is picked up as a major economic activity in many areas, since jhuming is not productive. There are no large scale industries though small scale industries, cottage industries and home scale industries are growing with the impetus given by government and the NGO's. The small scale industries in the district that are worth mentioning are Tea production units and Citronella distillation units. And under Cottage and Home scale industries come weaving, carpentry, basket making, wood carving etc. Agriculture and its allied activities is the main economic activity of the district.

2.8.1 Agriculture System: Zunheboto

As mentioned agriculture is the main economic activity with Jhum cultivation as the major system of cultivation in the district (Table 2.11). Shifting cultivation also known as Jhum, Swidden or Slash and Burn constituting 58.95% of the annual total net cultivated area in the state is an agriculture system where a plot of land is cleared, dried and burnt for cultivation (Plate 2.1) and shift to other plot leaving the cultivated land to replenish. The clearing of forest is done in the month of December to early February which is followed by

burning in the late February and March (Plates 2.2 & 2.3). Rice is the major crop and the seeds are broadcast or sown in the month of April and early May (Plate 2.4). Weeding is done thrice and harvested in the month of late September and October (Plate 2.5). Harvested crops are stored in granary house or in large vessels weaved from bamboo (Plates 2.6 & 2.7). Traditional way of seed preservation is by hanging the seed laden crops in kitchen, granary house or outside in dry place. Mixed cropping is the normal form of sowing in Jhum field and has met the household food requirement as well as maintained the livelihood of the community (Plate 2.8). With modernisation decision making in the management of land is getting more influenced by external factors whereby land under subsistence croplands decrease with the consequent increase in land under crops for markets. Terrace rice cultivation is also practiced among the Sumis especially found in the Tizu valley (Plate 2.10).

The use of modern technologies such as improved seed, application of fertilizers etc is in limited use. The utilization of farm machineries is almost non-existent due to the steep slopes and hilly terrain (Plate 2.9). With less usage of agro-chemicals in crop production the advantages of going for organic farming is suitable and viable. The most commonly used weed killer because of the cheapness is salt. Besides rice, people grow maize, potato, pulses, Soya bean, tapioca, oilseeds, vegetables etc. and cash crops (Table 2.12 & 2.13) such as tea, kiwi, cardamom, etc. (Plates 2.11 & 2.12). There are various farmers' organizations such as- Farmers Club, Kiwi Growers Association, Passion Fruit Growers Association, SHG of bee keeping etc. which take care of agricultural activities.

Table 2.11: Jhum Landuse (2015-2016): Zunheboto

District	No. of households	No. of Jhumia families	Jhum area in Ha.	Area under Jhum annually (Sq km)
Zunheboto	25906	16481	11537	115.37

Source: State Jhum Land Survey Report 2015-2016, Department of Soil & Water Conservation, Nagaland.

Table 2.12: Agricultural Statistics of some major Crops (2009-2010): Zunheboto

Sl. No.	Name of crops	Area covered (Ha.)	Production (MT)	Productivity(Qt/Ha)
1	Rice (Jhum & TRC)	11424	21706	19
2	Maize	7690	13842	18
3	Sugarcane	650	27300	420
4	Soyabean	2910	2700	9.28
5	Beans	85	59	6.9
6	Tea	80	160	20

Source: Department of Agriculture & Allied Departments, Government of Nagaland.2012.

Table 2.13: Horticulture Statistics of some major crops (2012): Zunheboto

Sl.No.	Name of crops	Area covered (Ha)	Production (MT)	Productivity (Qt/ha)
1	Potato	174	882	50.7
2	Tomato	60	79	13.1
3	Squash	42	275	65.5
4	Cucurbits	96	480	50.0
5	Ginger	220	2017	91.7
6	Turmeric	41	215	52.4
7	Passion fruit	600	1140	19
8.	Kiwi fruit	30	87	29
9.	Banana	400	3040	76

Source: Department of Agriculture & Allied Departments, Government of Nagaland.2012.

2.9 Land Holding System

The Nagas believed that land is a gift of the super natural God, for their sustenance and was held as a common property. But side by side with the increase in population their place of habitation began to grow by forming new villages and thereby claiming more and more land for themselves for agriculture and pasture. And the land owned by the village is marked as village community land, clan land and family land.²⁶

Traditionally, most of the lands within the jurisdiction of a village belong to the villagers, except for land under Reserved or Protected forests. Nevertheless, individual land holding does exist though not at a substantial level. The individual land passes from one generation to another, from one person to another within the same village, and the sale of land to the outsiders including those who are otherwise of the same tribe is not allowed.

It is to be noted that the Nagaland Jhumland Regulation, 1964, has defined and regulated the right of the people to Jhumland and the right is conferred on the people to collect forest products from their Jhumlands for domestic use, but not for sale or barter.²⁷ The land to the Sumis is taken as their identity, signifying their wealth and prestige since ancestral times. The dynamics of land ownership among the Sumi Naga is quite different from the rest of the Naga tribes. In their case, almost all the entire village land is owned and controlled by the *Akukau* (Village Chief), though there are rare cases of other individuals owning the lands. For instance in Lumami village, the chief owns about 60% of the land and the rest 40% by a handful of others.²⁸ Under this system many landless villagers depend on the chief or the clans with land for their livelihood. Whoever is the chief or should be the one in Sumi village is consequential to the village formation. According to their tradition, the

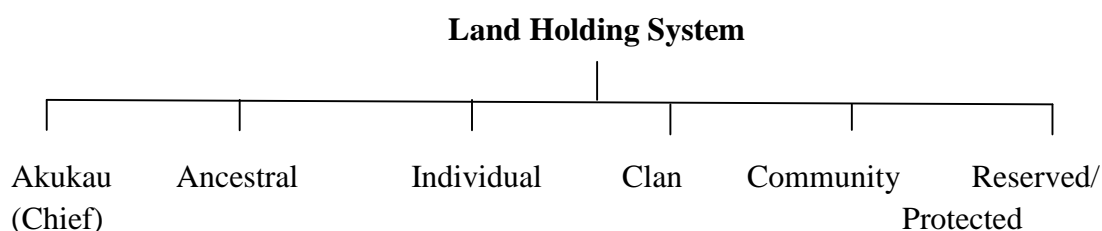
²⁶ Kath P and Thong J.S. 2012. *Glimpses of Naga Legacy and Culture*, Society for Naga Students' Welfare, Kerela. p 167

²⁷ Gosh B.B. 1979. *Nagaland District Gazeteers- Zunheboto*. Government of Nagaland, Kohima. p 67

²⁸ Kinny A and Martemjen. July-August 2015. Socio-Cultural Practices and Environment Management of Sumi Naga Tribe, *International Journal of Multidisciplinary Approach and Studies*. Vol.2 No.4. p 19

one who leads others in founding a village becomes chief of the village. Most of the other land belongs to the clan who first settled and formed the village under the chief. The land holding system of the Sumi according to the ownership and utilisation can be classified as: *akukau* land, ancestral land, individual land, clan land community land and reserved/protected land (Fig.2.10).

Fig.2.10: Land holding system: Sumi Naga

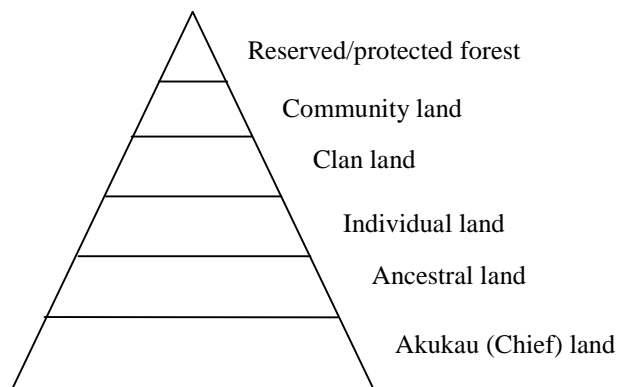


Majority of the land is owned by *akukau* in most of the villages except for some villages in Satakha , Ghathashi and Pughoboto circles. Clan land is more prominent in Pughoboto and Ghathashi circles as they have the influence of the land holding system of the Angami and Chakhesang Nagas, whose land are mostly under clan land and chieftainship does not prevail. Apart from these circles ancestral land constitutes the major land ownership next to chief. Ancestral lands are the lands that were inherited from the ancestors passing on from person in the same bloodline of the family. These lands are seldom sold and used by the families of the same ancestor, after taking permission either from the eldest in the family line is from the collective elders in the family line. Individual lands are those, bought and owned by and individual and the decision of usage and selling of the land solely lies on the individual owning the land. Community land in the Sumi area like Community ground, community forest, etc. are a community area, based only on usage and utilisation. As such the land is owned mostly by *akukau* or donated by clans, ancestral land

or by individual, which can be utilised by the community. Reserved/protected lands are forest cover that are owned and protected by the state government or donated by different land owners. There is strict restriction as to collection of forest produce, hunting, logging and other activities.

Even if the chief owns the maximum plot of land; individual ownership has seen increased in the recent times with the akukau and ancestral land being sold to individuals for various reasons. Selling of land to individuals of other villages of same tribe are being practiced at recent times, but restriction on selling of land to other tribes, in the Sumi villages is still strictly adhere to. The land under different land holding system is given in the pyramid form according to the area, as the pyramid ascend the area decreases (Fig.2.11).

Fig.2.11 Pyramid showing different land holding system



2.10 Education

Education has a vital role to play in social and economic development of a nation, state and a region. Nagaland has made great advances in providing education to its people, which can be seen from the fact that the literacy rate of the state is higher than the Nation's average. But it is to be noted that the quality of education in the State is still a concern.

It may be noted that *Apuki* (morung) (Plate 2.15) and *Iliki* (dormitory) played an important role in the social and political life of the Sumi Nagas, as it served as the center of learning.

It was the information centre from where young unmarried people used to learn their history, legends, myths and stories. During the Second World War furious battles were fought between the Allied forces and the Japanese army. This event along with the spread of Christianity through the help of Christian missionaries made a tremendous impact on the people and consequently, there was a tremendous awakening among the Nagas for school education. The demand for establishment of schools increased and several primary and middle schools were opened all over the Naga Hills and one was opened at a place which is now Zunheboto town. Since then there is immense development of formal education in the district.

Today it is home to the Nagaland University whose campus is situated in the village of Lumami in the sub division of Akuluto. This has become the cultural centre for the people of Nagaland, as all the Nagas irrespective of tribes come to study here.

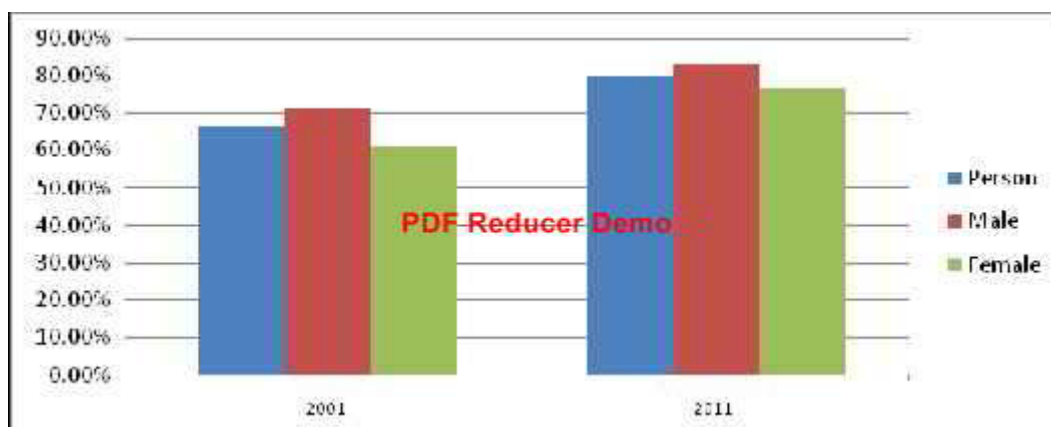
2.10.1 Literacy

The literacy rate in Nagaland is 80.11%, which is higher than the national average of 70.04%. One can observe that there is a marked improvement from 66.59% in 2001. In 2011, the total literates rose from 1,132,323 in 2001 to 1,357,579 in 2011 (Fig 2.14).

Table 2.14: Literacy rate (2001 and 2011): Nagaland

District	Literacy Rate 2001	Literacy Rate 2011	Decadal Difference
Nagaland	66.6	79.55	12.95
Mon	41.83	56.6	14.77
Mokokchung	83.92	92.68	8.76
Zunheboto	69.26	86.26	17
Wokha	80.55	87.6	7.05
Dimapur	75.57	82.54	6.96
Phek	70.65	84.53	8.48
Tuensang	52.15	73.7	21.55
Longleng	44.82	73.1	28.28
Kiphire	50.23	71.1	20.87
Kohima	78	85.58	7.58
Peren	65.92	79	13.09

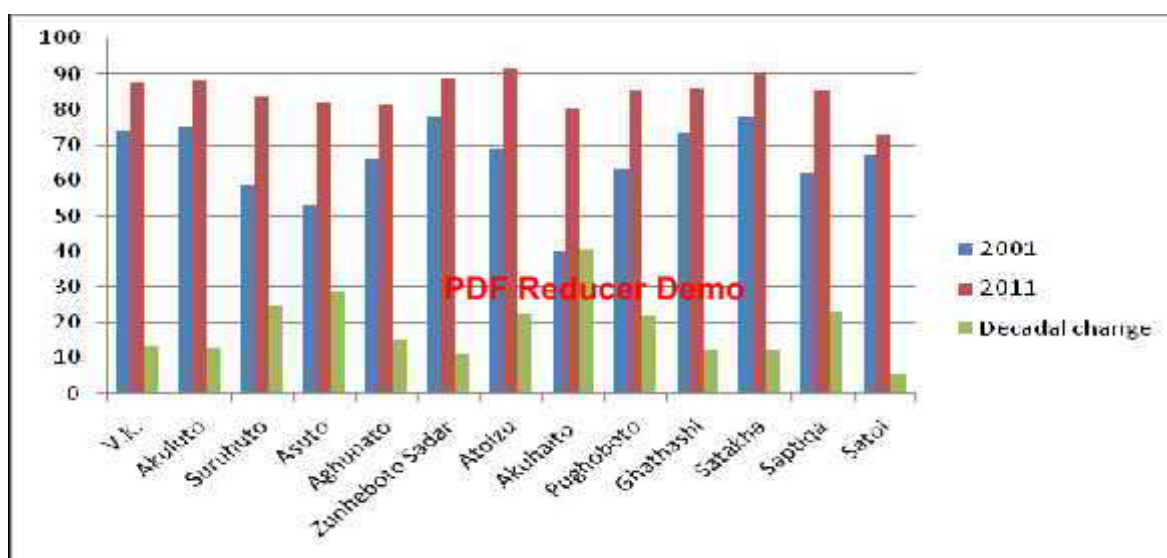
Source: Census of India 2011.

Fig.2.12: Literacy rate (2001- 2011): Nagaland

Source: Census of India 2011

Zunheboto has a literacy rate of 86.26% (2011). Of this, the male literacy rate is 88.86% and female literacy rate is 83.61%. The decadal increase in literacy level in the District is more with females than with males, with 19.09% and 15.11% respectively (Fig. 2.13). Though all the circles have increased in literacy rate Atoizu, Akuhaito, Suruhuto and Asuto circles have shown a drastic increase as that of 2001 census. The circles showing less growth are Zunheboto Sardar, V.K, Satoi and Akuluto circles. The literacy growth is rather interesting as the urban areas are experiencing a less growth while the areas away from the district headquarters are showing more. This is because of the increase in dropouts in the urban area as there are many avenues like starting business, working as labourers in construction site, etc and many are lured to the other urban centres such as Dimapur and Mokokchung. While in the rural areas, since there are no other avenues, except to work in the Jhum field, many opt to study, as the works in the field are quite hard some.

Fig.2.13: Decadal literacy rate (2001 - 2011): Zunheboto district



Source: Census of India 2011

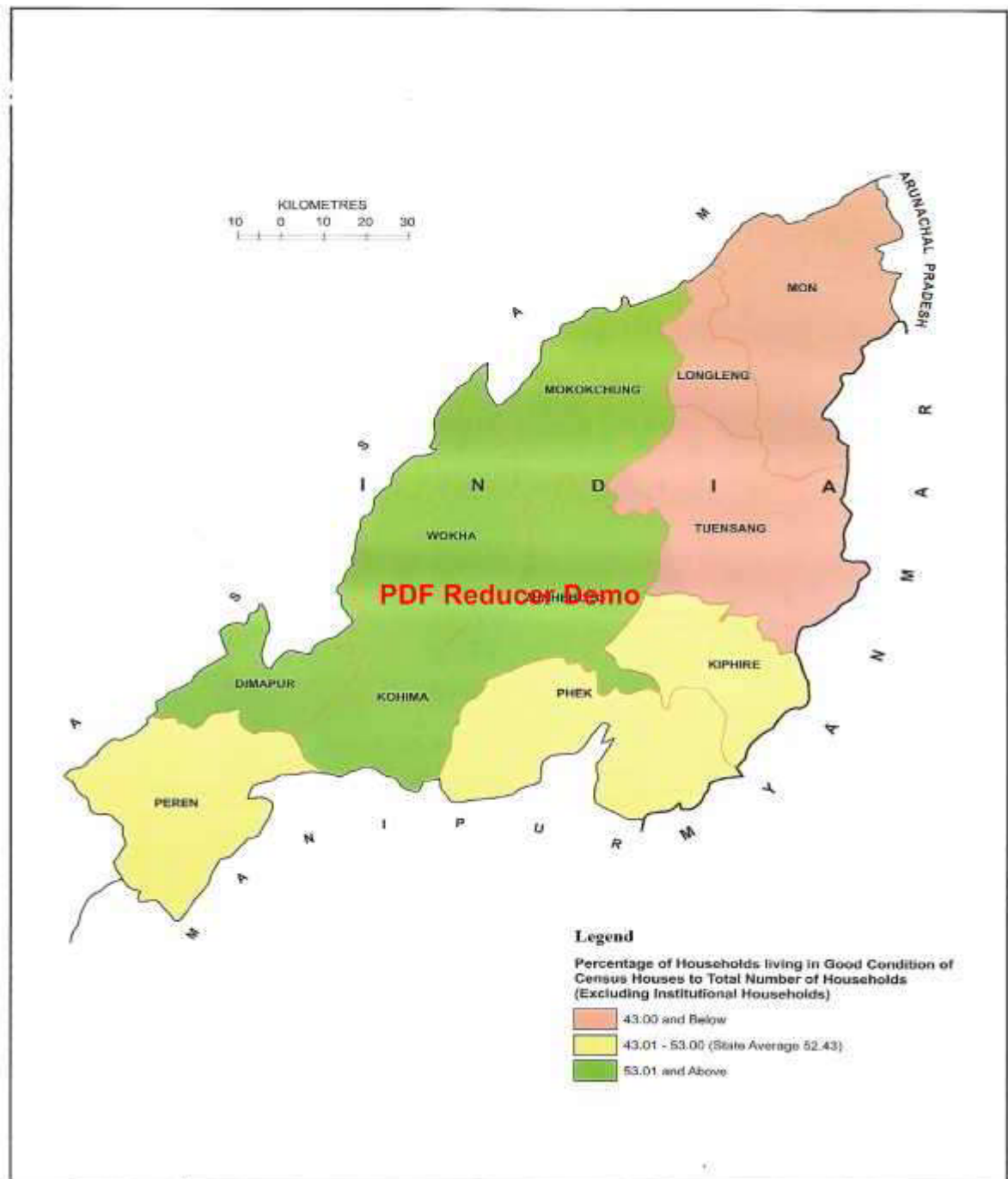
2.11 Public Amenities

In spite of immense rate of growth in the last two decades in Nagaland, full coverage of the population in terms of safe water supply, good housing condition, connectivity, toilet facilities and electricity remains a major challenge in the State. While there has been an improvement in 2011 census compared to 1999 and 2001 census, there is still large number of population without these basic amenities.

As per 2011 census, 47.15% of household has tap water facilities, 25.65% households uses well water, 6.65% uses hand pumps / tube well, and 20.54% households using other types of source of drinking water. More than 50% of the total household is living in good condition, while about 45% lives in livable house and only a few percent lives in dilapidated condition according to 2011 census (Fig. 2.14). 81.61% of the household has electricity as the main source of lighting as per 2011 census, whereas in 2001 census it was 63.60. This shows that there has been a significant development in lighting the villages with electricity between 2001 and 2011. Kerosene as the source of lighting accounts for 15.62%, other source of lighting 1.65% and only 1.12% of households has no source of lighting as per 2011 census.

According to 2011 census 12.92 % in Zunheboto district have access to tap water from treated source, while 46.72 % from untreated source. The district has achieved 95.1% of household with electricity with only 3.5% using kerosene for lighting purpose, 0.5% of household in the district have started using renewable solar energy to light their houses.

Fig. 2.14: Households living in good condition (2011) : Nagaland



Source: Census of India 2011

2.12 Connectivity

All the major towns and villages in Nagaland are now connected by all weather roads. The length of national highway in the State is 248kms and the State Highway is 1032.5 kms. The State is connected with the rest of the country by Rail and Air through Dimapur. The total length of roads in Nagaland was 13368.45 kms during 2002-2003. The surfaced roads have a length of 6225.62 kms, while unsurfaced roads account for 7142.83 kms.

Zunheboto district is well connected to other districts by surfaced and unsurfaced roads and has a road length of 1339.50 kms next to Wokha which has the minimum road length of 1256.35 kms. The district has 454.85 kms surfaced roads and 715.50 kms (Table 2.15) unsurfaced roads (2002-2003). Although towns and villages in Zunheboto district are connected by roads, the quality of roads is not good in most of the areas.

Table 2.15 Length of road: Nagaland

District	Surface (kms)	Unsurfaced (kms)	Grand Total
Kohima	1534.50	824.00	2358.50
Mokokchung	11661.50	1064.00	2225.50
Tuensang	1052.00	2067.00	3119.00
Phek	575.40	1063.20	1638.60
Mon	814.37	607.63	1422.00
Wokha	454.85	801.50	1256.35
Zunheboto	624.00	715.50	1339.50
Total	6225.62	7142.83	13368.45

Source: Environment and pollution control, Nagaland

2.13 Developmental Process

Nagaland is a state where the overall development is still at an infant stage. Various development activities in different sectors such as agriculture and allied activities, transportation, rural development, health care, education etc are carried out in the district. Apart from the benefits acquired from the pursuit of economic activities, the government has taken up many initiatives to alleviate poverty, provide employment, proper health facilities etc. Some of the major governmental programmes implemented are as follows:

) Mahatma Gandhi National Rural Employment Guarantee Scheme(MGNREGS):

This scheme seems to be the most implemented scheme in the district having the maximum participation of people. Achievements of this scheme are road connectivity to the fields; construction of rest house, foot paths, water tanks and village gates (Plates 2.14).

) National Rural Health Mission(NRHM):

The programme is implemented in almost all the villages visited. Community Health Workers (ASHA) has been selected and they plays an important role in recording and caring for the pregnant woman and children from 0-5 years of age. Numbers of Sub-centers, PHCs etc are covered by Rogi Kalyan Samiti (NRHM).

) Sarva Shiksha Abhiyan(SSA):

132 Government Middle and Primary Schools in the district are covered under this scheme. Mid Day Meal are given in all the schools.

) Rashtriya Madhyamik Shiksha Abhiyan(RMSA):

This is a programme of joint venture between the Central and state Government towards the overall quality of secondary and higher secondary education in the state. The Government of Nagaland under the aegis of Department of School Education

launched the RMSA mission in the state on 3rd March 2010. The number of Government secondary Schools upgrade under RMSA from 2009-10 to 2011-2012 is given in Table 2.16.

Table 2.16: No. of Government Secondary Schools upgrade under RMSA from 2009-10 to 2011-2012: Zunheboto District

	Existing	2009-10		2010-11		2011-12	
		New	Total	New	Total	New	Total
State Total	126	35	161	67	228	45	273
Zunheboto	13	3	16	5	21	4	25

Source: Annual Administrative Report 2011-12, Department of School Education, Government of Nagaland.

The above mentioned programmes are effectively implemented in most of the visited villages, though the implementation differs from village to village. As in the case of MGNREGS, one person from each of the household is employed as labour (Plate 2.13) for constructing village gate, foot paths, village ponds, agri-link road, etc.. While in some villages the funds received are utilized by hiring labours for constructing different village facilities and amenities. NHRM does exist in all the villages except in some remote circles where the staff hardly comes for work. SSA and RMSA seem to be one of the successful programmes with increase in Schools and increase in literacy rate decreasing drop outs massively.

Besides, there are a number of schemes and programmes such as National Horticulture Mission(HTM), Indira Awas Yojana, Pradhan Mantri Gram Yojana(PMGSY), Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY), Nagaland Beekeeping & Honey mission(NBHM), NEPED, Nagaland Bioresource Mission (NBRM) etc which are

implemented all over the state. Village Council and Village Development Board (VDB) play a greater role in implementing these schemes and programmes

The State shows a growth in the sex ratio of total population of 931, much higher than in 2001 census but still lower than the National i.e. 940. It is interesting to observe that in spite of Nagaland being a state with no reports of female foeticide or pre-natal gender selection, there is still a disparity in sex ratio. Literacy rate showing a positive growth in the entire district with a tremendous growth from 66.59% to 80.11% is higher than the National average (70.04%). The gender gap in literacy is 6.6% which is much lesser than the National i.e. 16.6%.

It is observed that though Nagaland as a state has seen and experienced changes and development in terms of social and economy, the state has still has a long way to go for equal and stable growth. Nonetheless, Zunheboto district is in the initial stage of development both in social as well as economy of the district. The district has seen growth in terms of education, connectivity and public amenities which can be credited to the various Central and state sponsored programmes, specially in the rural areas. The district has rich forest resources, nonetheless the forest cover in the district is declining because of various human activities such as agriculture and allied activities, logging, forest fire, deforestation, road cuttings, clearing of forest for settlements, etc. The main water resource of the district are rivers, ponds, and rainfall. The main rivers of the district are Tizu, Tita, Nanga and Tapu Ghoki. The land utilisation of the district is mainly under shifting cultivation. It is worth mentioning that the land utilisation pattern is changing with people opting for cash crops and tree plantation in the district, which will be discussed in the proceeding chapters.

Chapter 3
Pattern of Socio-Economic and
Environmental Change

3.1 Introduction

Every society has a history of change. One is not likely to come across any society that has been preserved in its pristine purity, uncontaminated by change²⁹. Social change can evolve from a number of different sources including contact with other societies, changes in ecosystem, technological change, and population growth and other demographic variables³⁰. In the case of the Nagas the major impact was made on the heels of the Christian missionaries coming to their land. Drastic change in socio-economic life of the people was brought about by their contact with the American missionaries and British colonist.

3.2 Social life: Zunheboto district before British rule and Christianity

Before the advent of the British to the Naga Hills, the Nagas were in a state of confinement following the traditions of their forefathers in all socio-economic and political aspects. There was hardly any change in the society³¹. Like any other tribes of Nagaland the Sumi Nagas too had little change in their socio-economic practices.

The area, traditionally under the occupation of the Sumi Nagas covering the whole of present day Zunheboto district was never known by a single nomenclature till the Second World War. It used to be called Sema area or Sema country or in various ways by different people and villages. And like any other Naga tribal group the Sumis belong to patriarchy where all the decisions making were taken by the father or the eldest male of the house. The properties were inherited by the male and women were not entitled to inheritance of property. Apart from this the womenfolk enjoyed a good status in the society with distinct areas of responsibilities like taking care of the children and of the domestic chores. Living

²⁹ Zhimo A.G. 2011. Culture, Identity and Change-6 the case of the Sumi of Nagaland. *Indian Anthropologist*(2011) 41:2,p 33

³⁰ Form W, Encyclopedia Britannica

³¹ Venuh N(edt).2004. *Naga Society- continuity and change*. Shipra Publications,p 1

in the autonomous villages, ruled by chief and his subordinates the village hierarchy of Sumi Nagas comprised of the chief (*akukau*), counsellors (*chochomi*), priest (*awou*), first reaper (*amthau*) and grave digger (*lapuu* or *amoshou*). The lowest section of people was *Mighimi*, which means orphan³².

As with all other Naga tribes the Sumi society was a communitarian society where decisions and activities pertaining to agriculture, hunting or fishing were taken and done by community. The aspect of community life is well demonstrated by the folk songs and folk dances of the Sumis. Almost all the folk songs and folk dances performed by a large number of persons have a bearing on agriculture practices and other social events such as fest of merits and festivals. This reflects the strong community ties among the people. Their community life is so closely knitted that they function like one family where both joys and sorrows are shared together. The loss of an individual in the hands of the enemy was considered a loss to the village. The pride of an individual in any good work was a joy to the whole village³³. This trait was very much prevalent among the Sumis.

Feast of merit and head hunting used to be an important part of their social activities. The practice and successful observance of which determined the position of an individual in the society. The Sumis, known to be a warrior tribe fighting fierce battles can be inferred from the strategic location of the villages at the top of the hills. The bravery and strength of a man used to be determined by the number of heads he could bring after the wars. Indeed headhunting was something more than war. It inspired wonderful dances and it stimulated artistic production, since the most elaborate textiles could only be worn by a successful

³² Zhimo A.G. 2011. Culture, Identity and Change: The case study of the Sumi of Nagaland, *Indian Anthropologist*. 41:2.p 35

³³ Yephthomi N. 1997. The early history of the Nagas, *From Darkness to Light*. Nagaland Baptist Church Council.p 32

head-hunter or one of his relations. Head-taking also inspired the manufacture of finely-wrought spears and other weapons as well as wood-carving³⁴.

Before the advent of the process of modernisation to their simple and traditional lifestyle the only economic activities were agriculture, hunting, rearing of domestic animals and food gathering from forest. The observance of festivals based on agricultural reasons constituted an important part of their social life.

The two main festivals of the Sumis were Tuluni and Ahuna festivals. Tuluni marked the end of sowing season and invoking of blessings upon the crops. The rituals of invoking blessings were performed by the *awou* (priest). It also involved reconciliation and sharing of feast as a gesture of forgiveness. Ahuna is derived from two word *ahu* which means upper or top and *na* referring to *ana* which means rice. During the festival the upper or top layer of the harvested rice is prepared in bomboo and shared among the villagers.

The Native Naga religion was basically similar to the type of religion found among the tribes throughout India. They can be regarded as nature worshipers, with all of the nature believed to be alive with unseen and mysterious forces. The tribal people recognised many minor deities, ghosts and spirits of trees, rivers and even hills as their gods. J.P Mills and J.H Hutton described the Nagas like any other tribes which have been labelled by the all embracing term “animist” as possessing an excess of beliefs coupled with a rareness of systemization.

The Sumi Nagas practiced dormitory system in the olden days. The male dormitory was called *Apuki* and female *Illiki*. These dormitories served as a traditional education system where the young unmarried Sumi boys were taught different tactics of hunting, fishing,

³⁴ Yephthomi N. 1997. The early history of the Nagas, *From Darkness to Light*. Nagaland Baptist Church Council.p 14

head hunting and making crafts. The young ladies were taught how to cook, weave, make potteries and other values that a lady should possess.

3.3 The Sumis Naga under British rule

The Britishers first reached Angami area of Naga Hills in 1832, which was followed by several excursions and expeditions and in 1866 the district of Naga Hills was formed. The first headquarters was in Semaguting in the plain bordering Assam, that was shifted to Wokha in 1876 and then to Kohima in 1878. All this time the present Zunheboto district remained outside the influence of the British administration. The constant disturbance and attack of the Sumi Nagas on the area under British administration led to expedition of the Britishers and in 1952 the Sema area came under Tuensang Division. In December 1957 the Tuensang Division was joined with Naga Hills to form Naga Hills Tuensang Area (NHTA). That time Mokokchung Sub-division was made into a district. Later, the NHTA became Nagaland in 1961 but Zunheboto continued to remain a Sub-division of Mokokchung district. Nagaland was formally established as a State in 1963 but there was no change in the districts. In December 1973, the three Sub-divisions of Mokokchung were turned into three districts, thus Zunheboto became a district in 1973. The other two Sub-divisions such as Wokha and Mokokchung also became districts from that time³⁵.

The conquest, invasion and eventual ruling of the British led to a change in the administration system which in turn affected the Nagas world view. The introduction of the colonial administrative system restructured village political systems. The British also created two important offices- the village chiefs known as the Gaonburas (GB) and the interpreters known as the Dobashis (DB).

³⁵ Gosh B.B. 1979. Nagaland District Gazetteers- Zunheboto, Government of Nagaland, Kohima.p 29-30

When the British arrived in Nagaland, the Sumis were living together in the heart of Nagaland. Annexation of the entire region by the British government was a gradual process that continued throughout the nineteenth and the twentieth century. British administration brought to an end the isolation of the region and introduced new elements in its political, economic, social and cultural composition. However, J.C. Beaves, the then Deputy Commissioner of Kohima made a wide circulation of an appeal for migration to the plain areas, primarily considered a wild abode. None dared to take the migration certificate but Mr. Kiyezu, the then G.B of Nikuto village dared to leave his native village and established a village in 1912. Thereafter, many Sumis with the British permission occupied the plain areas. They moved out and took up residence in new villages, naming the villages in relation to the place or the name of the chief. Thus, today they are found scattered in different parts of Nagaland calling themselves Central Sumi, Western and Southern Sumi with their headquarters in Zunheboto.

3.4 The Advent of Christianity to Sumi-land

Until the American Baptist Missionaries started their work by the middle of the 19th century in Naga inhabited territory, the Nagas lived in a world of their own without any close contact with outsiders, and separated from the rest of the world for many generations. The growth of Christianity in the early stage was rather slow since the Nagas attitude towards the missionaries was hostile. Severe punishments were imposed on those who converted to Christianity. Missionaries also engaged themselves in various activities like medical care and education and by the beginning of the 20th century; the fruit of their deeds became apparent. Gradually the initial suspicion and reservations they had about Christianity and the White Man changed to an attitude of appreciation, understanding and acceptance. The first 50 years of the century saw the trend (Table 3.1) when conversion

and adherence to Christianity came to be the known as it is now. The Nagas responded to the simplicity of the new faith, which was liberation from old superstitions and taboos³⁶.

Table 3.1: Growth of Christianity (1951- 2011): Nagaland

Year	1951	1961	1971	1981	1991	2001	2011
Persons	98,068	195,588	344,798	621,590	1,057,940	1,790,349	17,39,651
Percent of Population	46.05	52.98	66.76	80.21	87.47	90.02	87.93

Source: Computed from Census of India

Table 3.2: District-wise Christian Population: Nagaland

District	2001		2011	
	Persons	%	Persons	%
Mon	2,486,84	95.40	2,368,83	94.50
Tuensang	4,062,87	98.09	1,920,58	97.59
Mokokchung	2,192,82	94.48	1,804,98	93.44
Zunheboto	1,500,97	97.09	1,372,48	97.33
Wokha	1,550,09	96.15	1,581,43	95.13
Dimapur	1,890,98	61.36	2,329,93	61.84
Kohima	2,788,44	89.68	2,367,64	87.67
Phek	1,430,48	96.53	1,581,01	96.82

Source: Census of India

The decadal growth of Christians in Nagaland shows more or less the same. Dimapur being the commercial hub of Nagaland has a fusion of population residing in the district, making it the least in Christian population in the state (Table 3.2).

The Gospel of Christ reached the Sumis in the southern part through the Angamis in 1904. The first converts were Ghopuno and Ghusuna from Ighanumi village and were baptised by Rev. Dr. S.W. Rivenburg. In the central part after 1904 the Ao reached the Sumis with the Gospel in 1918, and the first convert under the influence of Ao missionaries is said to be Mr. Zhekiqhe of Shitsumi village. According to J.H.Hutton there was a small Christian

³⁶ Sangyu V. 1997. The Nagas in the 1st half of the 20th Century, *From Darkness to Light*, Nagaland Baptist Church council. p 158

community in Lazemi (present Lazami); a very small Christian population less than a dozen houses at Shitzimi (present Sumi Settsu) on the Old Sema Road; and a few scattered households in villages along the same road southwards and westwards towards Lotha region during 1915-192. Since then, Christianity spread to the other part of the Sumi-land which now constitutes 97.33% (2011 census) of the total population of Zunheboto district.

3.5 Modernization

The process of modernisation in the form of the introduction of a cash economy, modern education and medicine, judicial and political system etc. began rather late compared to other regions in Naga inhabited land. The development of the modern state order, social and economic development initiatives through education and various development packages and the globalizing factors of the modern society have greatly impacted the material culture of the Naga society. Their social life is going through a historical phase of change and transformation where the old is replaced by the new. However, what is striking, as of now, is the tremendous change in their cultural values as a result of the inroads made by modern lifestyle and technology.

The Sumi Nagas like any other tribal groups once known for closely knitted communitarian society have started becoming individual oriented society, with the availability of government jobs and other business avenues. In the modern society the dormitory system is replaced by modern education system. Though modern education has helped the people to live a better life, the traditional and cultural values of our ancestors taught in the dormitories and upheld by forefathers are now waning among the young generations. Formal and modern education has brought about many positive changes in terms of better lifestyle such as hygiene, better health amenities, learning and adopting other culture clothing, food habits and exposure and contact with other parts of the world

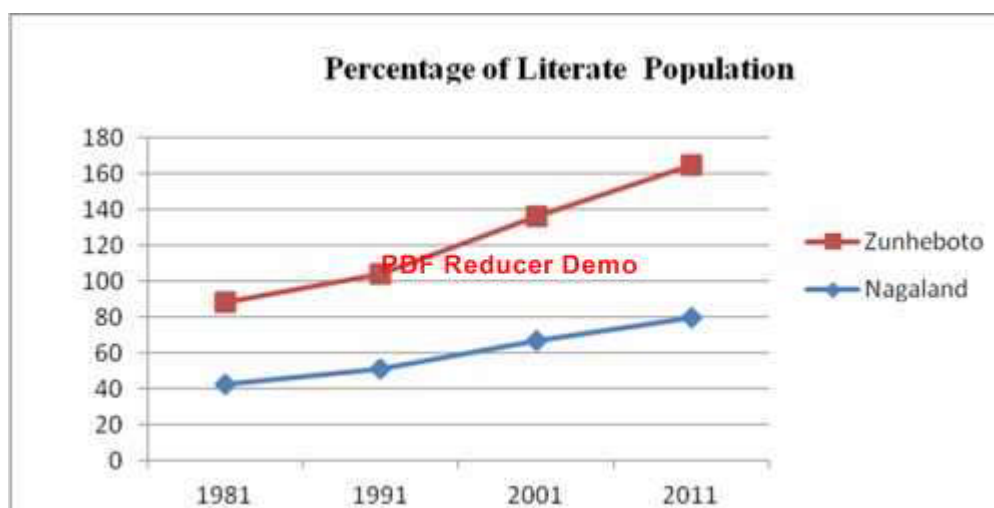
through different modern communication mediums. Yet, it has also brought about a number of negative influences in the society. The tribes which were known for their honesty, hospitality and hard work are now seeing these values being depleted.

The literacy rate has accelerated in a fast pace since the inception of Zunheboto district (Table 3.3). It is observed that the literate population of the district has increased from 27,883 persons in 1981 to 102881 persons, witnessing a percentage of 85.26%, higher than the State's percentage of 79.55%.

Table 3.3: District-wise Literacy rate (1981-2011): Nagaland

State/District	1981		1991		2001		2011	
	Literate Population	Percentage (%)	Literate Population	Percentage (%)	Literate Population	Percentage (%)	Literate Population	Percentage (%)
NAGALAND	329,878	42.67	617,736	51.07	1,132,323	66.6	1,342,434	79.55
Mon	15,703	19.89	52,424	35.02	109,030	41.83	141,879	56.6
Mokokchung	64,369	61.78	123,294	77.85	194,765	83.92	179,030	92.68
Zunheboto	27,883	45.59	50,676	52.67	106,698	69.26	102,881	86.26
Wokha	26,255	55.49	61,066	73.92	129,865	80.55	145,625	87.6
Dimapur				68.65	232,887	75.57	313,461	82.54
Phek	26,828	37.99	63,939	62.59	104,699	70.65	138,032	84.53
Tuensang	46,443	30.49		48.39	97,000	52.15	145,042	73.7
Longleng					54,492	44.82	36,983	73.1
Kiphire					53,540	50.23	52,637	71.1
Kohima	122,397	48.94		69.58	171,731	78	231,119	85.58
Peren					59,832	65.92	75,014	79

Source: Computed from Statistical Handbook of Nagaland, Directorate of Economics & Statistics, Govt, of Nagaland; and Primary Census Abstract, Directorate of Census Operation.

Fig. 3.1: Percentage of Literate Population (1981-2011): Nagaland and Zunheboto District

Source: Computed from Statistical Handbook of Nagaland, Directorate of Economics & Statistics, Govt, of Nagaland; and Primary Census Abstract, Directorate of Census Operation.

Evidently, with the advent and growth of modern education and establishment of Zunheboto as a district, there has been growth and improvement of medical facilities and health care in the district as one can notice from Table 3.4 . Increase in rural health facilities can be attributed to National Rural Health Mission (NRHM), a programme implemented by the Government of India to improve health care in rural India.

Table 3.4: Medical Facility Centers (1989-2010) : Zunheboto District

Year	Hospital	CHC	PHCs	SHCs	Dispensaries	Sub-centres	STD Clinics	DTC	Total
1989	6	-	3	3	1	29	-	-	42
1999	3	1	6	3	2	38		1	54
2009-10	1	2	13	-	-	47	1	1	65

Source: Computed from Statistical Handbook of Nagaland, Directorate of Economics & Statistics, Govt, of Nagaland

Table 3.5: District-wise road length (2011): Nagaland

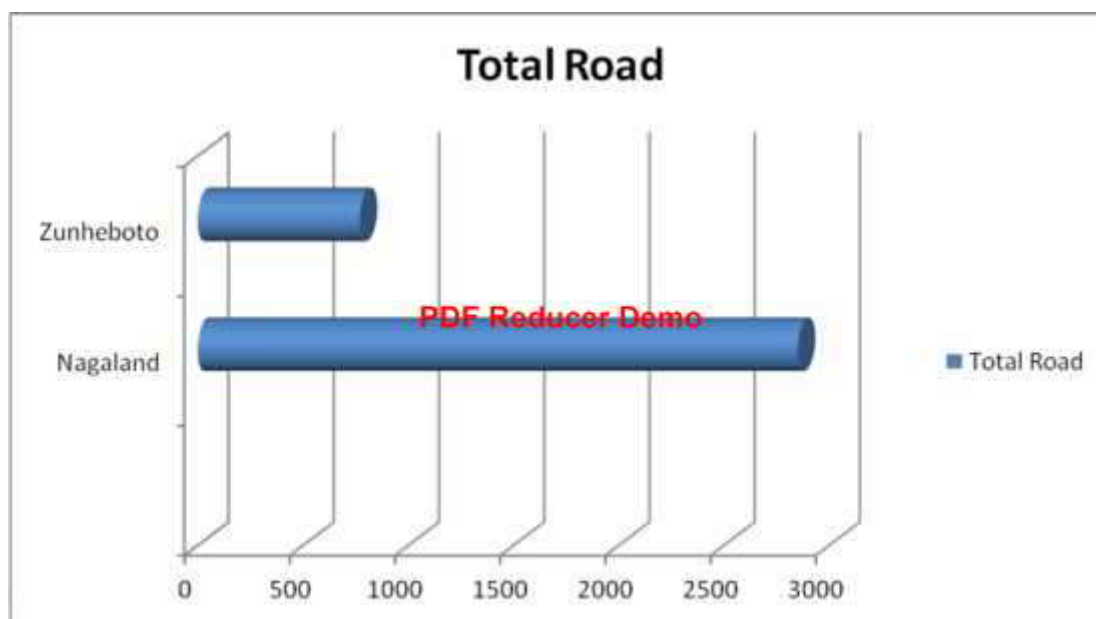
District	Surface	Unsurface	Total
Kohima	744.50	715	1459.5
Mokokchung	722.20	814	1536.2
Tuensang	84	893	977
Mon	397.40	665.90	1063.3
Phek	614.10	360.70	974.8
Wokha	406	693	1099
Zunheboto	292.60	961.94	1254.54
Dimapur	697.70	158.48	856.18
Peren	392.57	332	724.57
Longleng	190.80	199	389.8
Kiphire	86	233	319
Total	4627.87	5893.02	10653.9

Source: Statistical Handbook of Nagaland (2014)

Table 3.6: Road Length (1986-87 to 2008-09): Zunheboto District

Year	State Highway		Major Road		Other Road		Village Road/Rural Roads		Road Under Border		Total		Total Road
	Surfaced	Unsurfaced	Surfaced	Unsurfaced	Surfaced	Unsurfaced	Surfaced	Unsurfaced	Surfaced	Unsurfaced	Surfaced	Unsurfaced	
1986-87	21	-	-	-	14	162	13	436	-	-	48	598	646
1996-97	21	-	-	-	22	172	24	477	102	-	169	649	818
2008-09	-	-	157	106.10	114.5	363	21	492	-	-	292.5	961.1	1253.6

Source: Computed from Statistical Handbook of Nagaland, Directorate of Economics & Statistics, Govt, of Nagaland

Fig.3.2: Total Road Length (2009): Nagaland and Zunheboto

Source: Statistical Handbook of Nagaland, Directorate of Economics & Statistics, Govt. of Nagaland

Table 3.7:Block-wise road length (2001): Zunheboto District

R.D Blocks	Surface (km.)	Unsurface (km.)	Total
Ghathashi	24	195	219
Zunheboto	480	205	685
Akuluto	120	150	270
Tokiye	0	165.5	165.5
District	624	715.5	1339.5

Source: Statistical Handbook of Nagaland. 2001

Changes can also be seen in transportation, the once traditional and tribal tracks are now replaced by better roads under the various developmental activities of the government of Nagaland (Table 3.5). This has connected the villages and the district with other parts of the State and the country. The clearing of forest for construction of roads is also one of the main impacts of development activities on the environment.

Even though the length of road has increased in Zunheboto (Table 3.6) and almost all the villages in the district have been connected the road condition in majority of the district can rather be termed as pathetic. Road construction without proper technique and care is the major cause of landslide in the district. These eventually lead to loss of plant diversity in the landslide affected area. Among the RD blocks of the district Zunheboto being the main urban and cultural centre has better road connectivity, while Tokiye block has the least road length (Table 3.7) and consequently villages in this block are among the underdeveloped in the district.

Greater and easier access to market facilities and various forms of media have made the people of the district no longer isolated but rather are influenced by other culture. The feast of merit is no more observed. And even though the two major festivals of the Sumis-Tuluni and Ahuna are observed, it is observed as a community festival in diverse forms. In the olden days these festivals were more a religious rite rather than festivals.

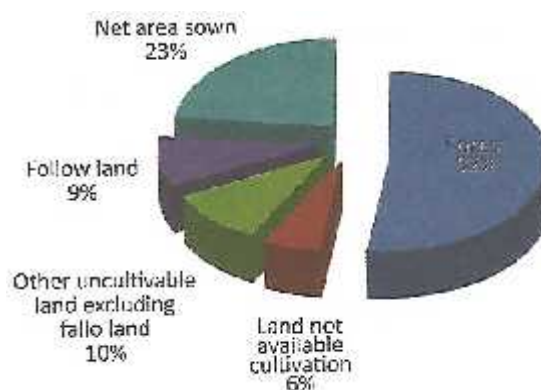
The replacement of barter system by cash economy or consumerism has now become one of the important root causes of all social evils and has also effected the people's perception on the intricate and close relationship with their natural environment. Thus, the socio-economic state of the district is in somewhat a transition state from their old traditional way of life to the new western influenced life style.

Christianity, British rule and Modernity has no doubt effected the beliefs regarding nature and environment. It also has changed the relationship of the Sumis with their surrounding nature and environment.

3.6 Land Utilization

Land has always been an important component of development especially for rural people. From times immemorial, there is no commodity more valuable than land and tribals are no exception³⁷. Cash economy is one of the main causes of change in land utilisation. The state has seen a change in the cropping pattern from traditional crops to cash or commercial crops. As per the land utilization statistics, the total reported area of the state in 2012-2013 is recorded at 16.51 lakh hectare. Out of the total reported area, area under forest constitutes 8.62 lakh hectare, net area sown 3.80 lakh hectare, other uncultivable land excluding fallow land 1.63 lakh hectare, land not available for cultivation 0.95 lakh hectare and the area under fallow land was 1.49 lakh hectare. The percentage distribution of land use in Nagaland is given in Fig.3.3.

Fig. 3.3: Percentage Distribution of Land Utilization 2012-2013



Source: Nagaland Economic Survey 2014-2015. Government of Nagaland, Directorate of Economics and Statistics.

³⁷ Dimchuilu P. (2013). Customary land use Pattern of the Tribals in Manipur: a case study of the Zeliangrong Community in Tamenglong District. *Journal of Humanities and Social Science*. p 57-63

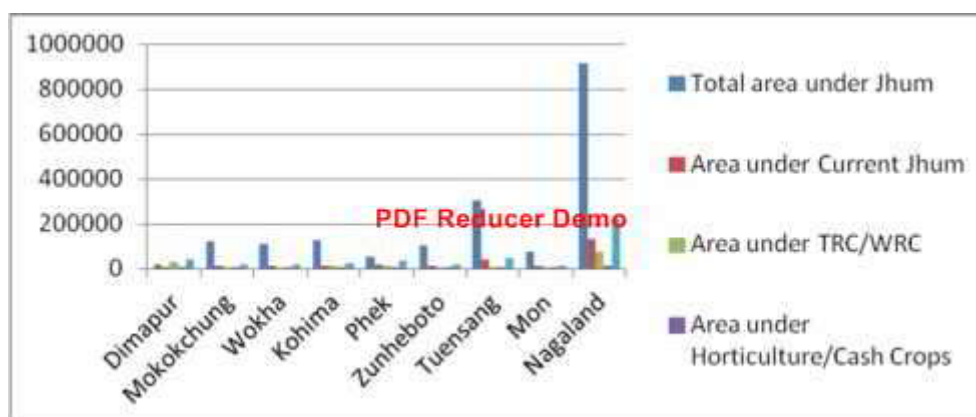
Total cropped area in the state recorded 4.88 lakh hectares in 2012-13 from 4.74 lakh hectare in 2011-12. Thus, total cropped area in the State increased by 2.95 percent over the year.³⁸

Table 3.8: District-wise Land Use Pattern: Nagaland

District	Total area under Jhum	Area under Current Jhum	Area under TRC/WRC	Area under Horticulture/Cash Crops	Total Area under Agricultural Activity
Dimapur	18307	4340	30937	6091	41368
Mokokchung	123063	11923	2986	1928	16837
Wokha	109185	15580	1991	1166	18737
Kohima	126036	11529	13004	1542	26075
Phek	52660	21054	15561	1533	38148
Zunheboto	106046	12306	3574	1058	16938
Tuensang	306275	41083	6684	1293	49060
Mon	75515	13534	1251	839	15624
Nagaland	917087	131349	75988	15450	222787

Source: Statistical Handbook of Nagaland (2007)

Fig. 3.4: Land use pattern: Nagaland



Source: Statistical Handbook of Nagaland (2007)

³⁸ Nagaland Economic Survey 2014-2015. Government of Nagaland, Directorate of Economics and Statistics.

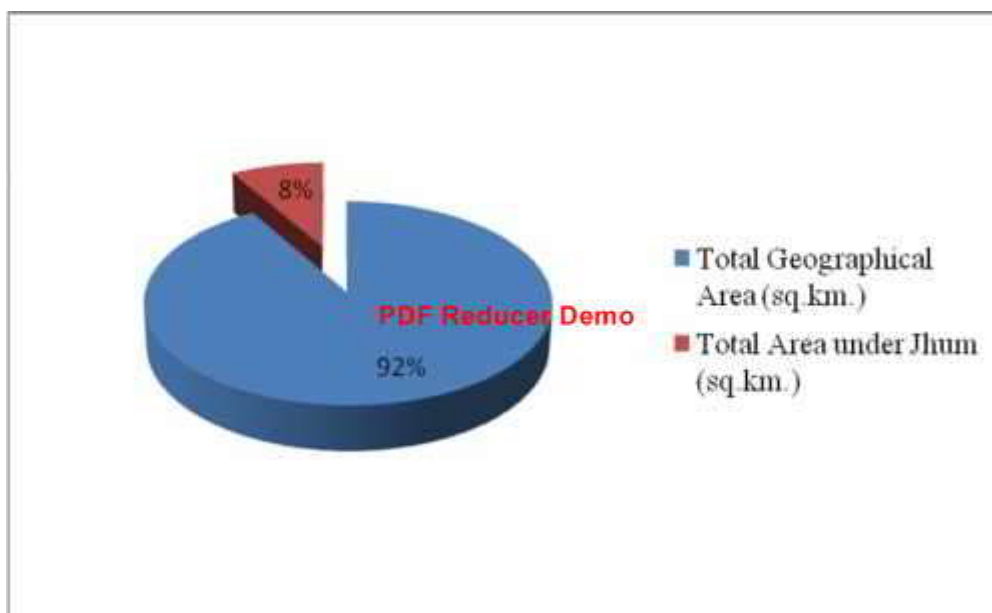
From the above table and figures one can observe that total area under jhum exceeds the other land use areas in the State. Tuensang district has the largest area under jhum, followed by Kohima district, Mokokchung district, Wokha district and so forth. Dimapur district leads in area under horticulture and cash crops, while Mon has the least.

Table 3.9: Jhum Area (2015-2016): Zunheboto District

District	Total Geographical Area (sq.km.)	Total Area under Jhum (sq.km.)
Zunheboto	1255	115.37

Source: State Jhum Land Survey Report 2015-2016

Fig 3.5: Total Area under Jhum (2015-2016): Zunheboto District



Source: State Jhum Land Survey Report 2015-2016, Department of Soil and Water conservation, Govt. of Nagaland.

Jhum cultivation is the major land utilisation under agriculture, in the district with 8% of land under jhum (Fig.3.5). Though area under horticulture/cash crops is negligible in the district (Fig. 3.4), it should not be taken lightly as the district is witnessing a change in the pattern of crops. Land utilisation in village like Aotsakilimi has seen a tremendous change in land utilisation, as most of the household have converted jhum land into cash crop plantation such as kiwi, tea, cardamom, etc. It is observed that some plots of land in Lazami village have been converted to ginger cultivation. These trends are mushrooming in most of the villages under Zunheboto district.

3.7 Man- Environment Relationship

For ages tribal communities lived in the lap of the nature. Their economy and culture were closely associated with nature which was like the womb of the mother³⁹. The Nagas were known to have lived in harmony with their natural environment. The interaction between human being and nature had always been mutual. There existed a symbiotic relationship between the livelihood pursuits of the people and their surrounding natural resource base like the forest, land, water bodies and other flora and fauna. The Sumi Naga tribe was no exception. There was a close relationship between their different social and economic activities and environment. Though the Sumis lived in isolation from the outside world, their close relationship and adaptive nature with the environment enabled them to survive in a hostile environment. Land and forest were the most important source of livelihood and thus was considered sacred. The relationship between man and environment was a matter of spiritual concern to the Sumis, much like the rest of the Nagas. Big trees, stones, dense

³⁹ Oraon V.2012.Changing Patterns of Tribal Livelihoods: A case study in Sundargarh District, Odisha, Thesis submitted in the Department of Humanities and Social Sciences, National Institute of Technology Rourkela,p 8.

forests etc were considered to be the dwelling place of spirits and deities. Thus, they made sure that such places were protected and remained untouched because of various superstitious beliefs and taboos associated with them⁴⁰. In the past hunting was done with the help of bow, arrows, spear and dao (machete), hence there was limited killing and destruction of animals and their habitats. Besides, they made sure that wildlife and birds were never hunted during gestation period. For, they believed that misfortune would befall upon the hunter and his family. Thus, with strict taboos and restrictions they were able to profoundly manage their wildlife resources. The vestiges of such beliefs can still be found in the contemporary society. However, there has been a drastic change in the intricate relationship with natural environment. With the introduction of different developmental policies and programmes, and the intrusion of non-tribals, into the area has disturbed the age-old tradition and practices of the tribes living in the district. These changes have affected the natural resource bases and the traditional management of the environment.

Shifting cultivation is widely practised by the Sumi Nagas. This system of agriculture is thought to be the main reason behind the mass destruction of forest in the region. The other factor of forest destruction is cutting of trees for fire wood and construction of houses. But all these activities had little effect on the environment as the needs of the Sumis were less. The jhum cycle was also long enough for the forest and land to replenish. The farmers were aware of the benefit of forest for their sustenance and therefore care was taken to conserve the environment around the cultivated area.

With the growth of population, the number of villages increased. The clearing of forest for settlement led to destruction of forests. The dependence on land and forest increased with

⁴⁰ Kinny A and Martemjen. 2015. Socio- Cultural Practices and Environmental Management of Sumi Naga tribe. *International Journal of Multidisciplinary Approach and Studies*, Volume 02, No.4, July-August, p 19.

the increase in population which led to exploitation of resources. With the establishment of Zunheboto District, construction of infrastructure for education and government offices and urbanisation of the region also initiated. These activities definitely, brought about changes in land use and land cover.

The perceptible changes in the forest of Nagaland and in Zunheboto district were brought about during the British rule with the introduction of cash economy. One of the major factors is the introduction of cash economy. People in their quest for comfort and luxurious living give more importance to earning more cash and the importance of natural environment and resources are relegated to the background. The introduction of exotic species for cash in the forest and agricultural land of the district has become a trend in the district. The indigenous trees, herbs and shrubs are decreasing at a large rate and are being replaced by cash crops and plantation of new exotic species for timber and other economically viable uses. With the cash economy the tribals have started collecting forest produce in large quantity for selling to the ever demanding markets. Exotic species of plants are invasive and they suppress the indigenously growing plants. They are also infesting the other plants with diseases and act as carrier too. The farmers are of the view that they know how to handle the old weeds or plants but have no knowledge to handle the new weeds and plants.

As discussed above, the Sumi Nagas have experienced a great change in terms of their beliefs and religion, education system, increase in quality of life and connectivity to other parts of the world through road connectivity and mass media. Although the socio-cultural life of the Sumi Nagas has seen great change through their contact with Christianity and British Administration, much change in their economy can be said to have been experienced after the declaration of the traditional Sumi inhabited region as Zunheboto

District. The mindset of the people is also changing from sustained livelihood to cash oriented society. The work culture has changed from once hardworking to easy money culture. These have led to change in the pattern of crops, economic activities; social setup and also in their perception about man-environment relationship which has turned from mutual to one way relation as man exploit the nature to satisfy their greed. However, the future is not bleak because the younger generations with modern education are starting to understand and realise that culture and tradition are their identity and that one should preserve and carry on throughout the generations. They understand the importance of having a mutual relationship with nature like our forefathers did which have sustained throughout the ever changing world. Thus, the concept of modern conservation and environment management coupled with the traditional and indigenous knowledge and practices of environmental management is taking roots in the mind of the younger generations.

In order to understand the precepts of the people on environment in the district the respondents were asked their views on some questions (Table 3.10)

Table 3.10: People's precepts on environment: Zunheboto District

Questions/ View	Agree	Neither agree nor disagree	Disagree
Humans Have the right to modify the natural environment to suit their needs	77.04	4.08	18.88
Humans are severely abusing the planet	43.37	22.45	34.18
Plants and animals have the same rights as humans to exist	63.77	8.67	27.56
Humans are meant to rule over the rest of nature	32.65	14.28	53.07
The balance of nature is very delicate and easily upset	65.30	20.42	14.28
Nature is strong enough to cope with the impact of the fast developing activities in Zunheboto District	55.10	10.71	34.19

Source: Questionnaire survey

The responses illustrates that people are not clear on the relationship between the natural environment and man. Most of the respondents (77%) are of the view that humans have the right to modify the environment but 53% disagrees that humans are meant to rule over the environment. 65% believes that balance of nature is intricate and can easily be disturbed, yet 55% of respondents are of the view that the natural environment in the district is strong enough to cope with the impact of development in the district. The respondents consisted of students, teachers, business persons, home makers and mostly farmers give views of only few segment of the district and that it cannot be taken as absolute views for the entire district. However, from these questions and their views one can understand their confusions over the environmental issues. It is interesting to note that quite a number of them were not sure if humans are abusing the planet. Since the district has more rural population, and that the rural people lives in close proximity to the natural environment, awareness should start from the village level. Educating the young and old about the relationship between man and environment though initiated and promoted by the state government and NGO's, this has to gain more momentum before our delicate environment suffer the consequences of our ignorance and carelessness.

Chapter 4
Impact of Socio-Economic Changes on
Environment

4.1 Introduction

Environmental degradation is a result of the dynamic inter-play of socio-economic, institutional and technological activities⁴¹. Environmental changes may be driven by many factors including economic growth, population growth, urbanization, intensification of agriculture, rising energy use and transportation⁴². Human activities have had a great impact on natural environment. This impact can be seen on climate and other atmospheric phenomena, on vegetation, soils, animals, water as well as on geomorphologic processes⁴³. Population growth and distribution is one of the major causes of environment degradation. Not only the number of people, but also the lifestyle, consumption patterns, and regions people inhabit and use directly affect the environment. The relationship between population growth and environmental degradation may appear to be rather straightforward. More people demand more resources and generate more waste. But when looking at the impact of human activities, the situation is more complicated due to the wide variety of government policies, technologies, and consumption patterns worldwide⁴⁴. The surface of the earth is configured by natural processes. However, the activities of human modify the earth surface for different interests. Land is one of the three major factors of production in classical economics (along with labour and capital) and an essential input for housing and food production. Thus, land use is the backbone of agricultural economies and it provides substantial economic and social benefits. Land use and land cover is a focal theme and emerging issue in the study of global environment change⁴⁵. Human modifications and alterations of

⁴¹<https://saferenvironment.wordpress.com/2008/08/16/population-growth-and-environmental-degradation/>

⁴² <https://saferenvironment.wordpress.com/>

⁴³ Saxena H.M.2010. *Environment Management*. Rawat Publications. p 40-41

⁴⁴<http://www.prb.org/Publications/Lesson-Plans/HumanPopulation/Environment.aspx>

⁴⁵ <http://www.choicesmagazine.org/magazine/article.php?article=49>

the environment cause impacts on the surface of the earth, threaten global sustainability and livelihood systems, contribute to changes in the biochemical cycles of the earth, which in turn affects atmospheric levels of greenhouse and other trace gases.

4.2 Major Sources of Impact on Environment

4.2.1 Population Growth

Human population and economic growth are considered to be the major drivers of natural resource and environment degradation. The growth of population and expansion of settlement area increases the clearing of forest. The area for agricultural practice also increases, leading to depletion and degradation of forest cover, soil and land. The natural flow of energy in the ecosystem is being disrupted through increase in human activities which is as a result of increase in human population⁴⁶. The list of necessary commodities of our everyday life has been growing longer and longer as a consequence of population growth and the prevalence of the concept of consumerism in the society⁴⁷.

Nagaland's demographic history reveals that from a population of 516,449 persons in 1971, the state population rose to 12, 09,546 persons in 1991, twice that of 1971, in a span of 20 years. In 2011 Nagaland recorded a total population of 19, 78,502 (Table 4.1).

Table 4.1: Growth of Population: Nagaland (1971-2011)

Year	Persons	Decadal Variation	Percentage in Decadal Growth
1971	516,449	+147,249	(+)39.88
1981	774,930	+258,481	(+)50.05
1991	12,09,546	+434,616	(+)56.08
2001	19,90,036	+780,490	(+) 64.53
2011	19,78,502	-11,534	(-)0.58

Source: Computed from Statistical Handbook of Nagaland 2014, Govt. of Nagaland

⁴⁶ Iwejingi. S.F. 2011. Population Growth, Environmental Degradation and Human Health in Nigeria, *Pakistan Journal of Social Sciences*, Volume: 8, Issue: 4, p 187-1910

⁴⁷ <http://docplayer.net/34899316-Chapter-i-introduction-out-of-the-degradation-of-environment-not-only-the-areas-under-human-inhabitation.html>

Zunheboto has witnessed a growth in its population since its inception as a district (Table 4.2). There has been a positive growth in decadal growth rate from 1981 to 2001; with negative growth from 2001 to 2011 (Table 4.3). The district has also seen growth in urban population from 23,081 in 2001 to 27,597 in 2011.

Zunheboto district being a hilly with rugged topography, people face difficulty in their agricultural practices and different developmental activities. The population growth definitely has led to more use of land under cultivation, which consequently has decreased the duration of jhum cycle from 15-20 years to 5-10 years. The decrease in jhum cycle has resulted in soil erosion and land degradation. With the decline of agricultural productivity the people of Zunheboto district are migrating to the urban areas and plains i.e. Dimapur district in search of jobs and livelihood. The majority of the young generation are educated and, therefore, have no interest in working in the jhum field and are allured to the urban areas by different jobs and business avenues.

Table 4.2: Population (1981-2011): Zunheboto District

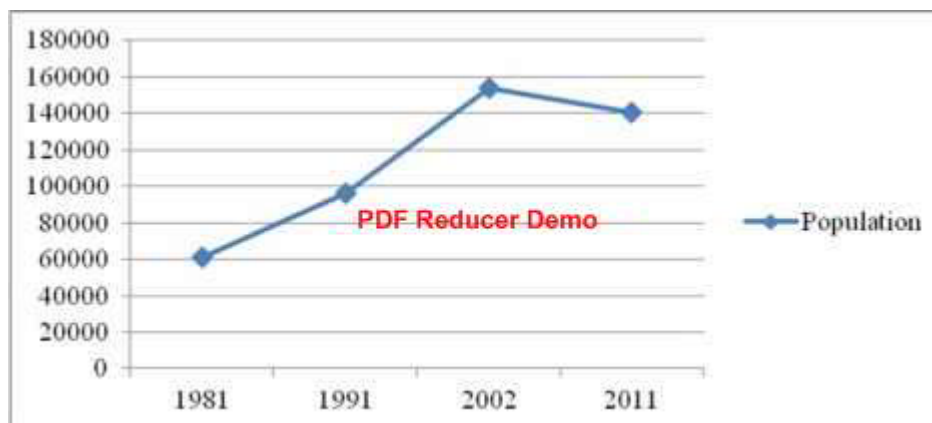
Year	1981	1991	2001	2011
Population	61,161	96,212	1,53,955	1,40,757
Density per sq. km.	-	77	123	112

Source: Computed from Statistical Handbook of Nagaland, Govt. Of Nagaland

Table 4.3: Decadal Growth Rate: Zunheboto District

Year	1981-1991	1991-2001	2001-2011
Decadal Growth Rate (%)	57.32	60.1	-8.79

Source: Computed from Census of India.

Fig.4.1: Growth of population (1981-2011): Zunheboto District

Source: Statistical Handbook of Nagaland, Govt. Of Nagaland

Table 4.4: No. of Jhumia Families in Selected Villages (2015-16): Zunheboto District

Selected Villages	No. of houses	No. of jhumia families
Phishumi	123	115
Sumi Settsu	130	110
Aichisaghemi	397	350
Aotsakilimi	125	70
Asuto Vil.	43	30
Satami	275	225
Ghukiye	327	140
Sheyipu	175	80
Keltomi	146	115
Sathakha Village	114	50
Shena Old	450	300
Ghokhuvi	221	90
Satoi Vil	90	36
Ghathashi	294	280
Ighanumi	377	270
Mishilimi	413	360
Lazami	832	520
Rotomi	165	150

Source: State Jhum Land Survey Report 2015-2016, Department of Soil and Water Conservation, Kohima, Nagaland

Table 4.5: No. of Houses in Jhum in Selected Villages (2005-2006): Zunheboto District

Selected Villages	No. of houses	No. Of Jhumia families	Jhum area in Hectares
Phishumi	100	90	70
Sumi Settsu	108	86	52
Aichisaghemi	394	284	170
Aotsakilimi	116	96	72
Asuto Vil.	42	36	28
Satami	207	187	170
Ghukiye	210	130	85
Sheyipu	158	80	65
Keltomi	130	120	90
Satakha Village	113	78	32
Shena Old	444	210	147
Ghokhuvi	216	150	138
Satoi Vil	77	54	40
Ghathashi	163	150	127
Ighanumi	257	249	198
Mishilimi	540	540	486
Lazami	920	806	685
Rotomi	150	120	95

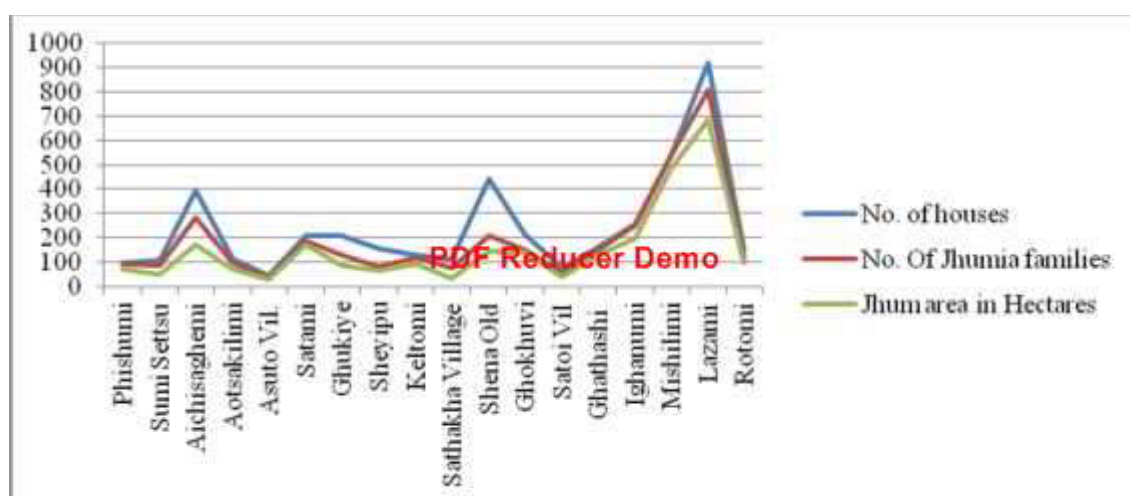
Source: State Jhum Land Survey Report 2005-2006, Department of Soil and Water Coservation, Kohima, Nagaland.

The number of households practicing jhum in all the selected villages has increased except for Mishilimi and Lazami which declined in 2016 (Table 4.4 & 4.5). From the Table 4.5 one can infer that the villages with higher number of household have larger area under jhum, while villages, with less number of household have less area under jhum. However, Sumi Settsu, Shena Old and Satakha have less area under jhum compared to the number of household. This can be attributed to either these villages have less village area or the village situated near urban areas.

Two main factors affecting jhum cycle are number of household practicing jhum in the village and the total area of the village. The more the household practicing jhum, the more

the area under jhum (Fig.4.2), and therefore the jhum cycle decreases. The total area of a village is also a factor for jhum cycle. The villages having the luxury of large area have the high probability of higher jhum cycle, whereas the villages with less village area have high probability of short jhum cycle, since the villagers will not have enough plot of land to shift their field.

Fig.4.2: No. of houses and Area under Jhum in selected villages (2005-2006): Zunheboto district



Source: State Jhum Land Survey Report 2015-2016, Department of Soil and Water Conservation, Kohima, Nagaland.

4.2.2 Land Use

Land is the basis resource of human society. Its utilization shows a reciprocal relationship between the prevailing ecological conditions of a region and man⁴⁸. In many instances, land use and land cover are used interchangeably, though, there are differences between them. Land use refers to how man use the land and land cover refers to the biophysical attributes of the earth surface⁴⁹. Land use, changes to land use and forestry are all major sources of greenhouse gas emissions. Land clearing and farming can release carbon

⁴⁸ R.B. Mandal (2nd edition), 1990. *Land Utilization: Theory and Practice*. Concept Publishing Company, New Delhi.p 3

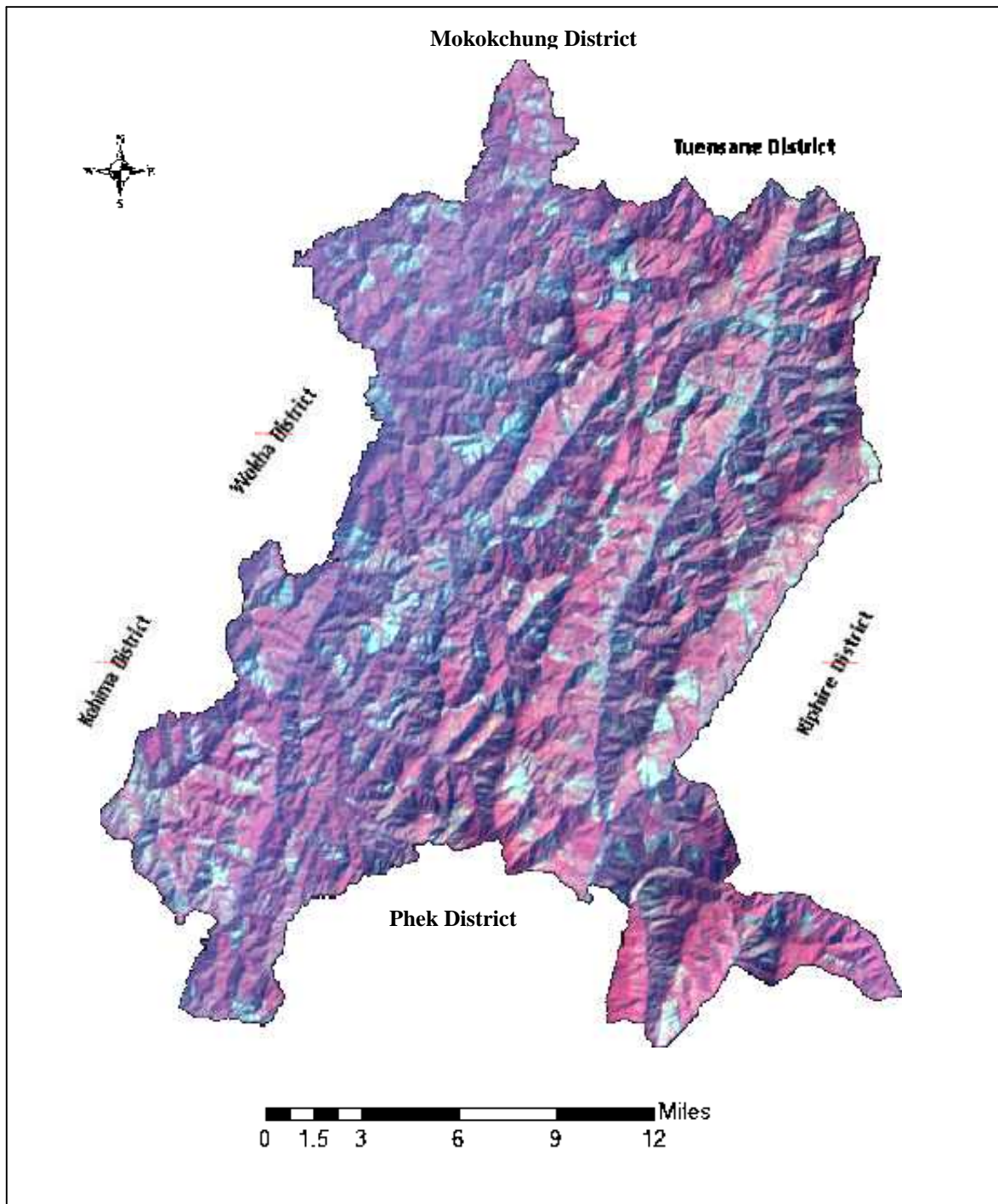
⁴⁹ http://shodhganga.inflibnet.ac.in/bitstream/10603/5500/10/10_chapter%205.pdf

stored in the soil and vegetation into the atmosphere. And logging accounts for approximately one fifth of global greenhouse gas emissions. Land cover change takes place due to multiplicity of a number of natural as well as anthropogenic factors. At present man-induced factors are causing more damages to the environment than the natural factors. Land cover and land use changes are one of the most important drivers of the earth's environmental change which is significantly affecting the key aspects of earth system functioning. Use of land in different ways for various purposes is determined mostly by various physical, socio-economic and historical factors leading to the evolution of a certain pattern.

The main factors of land use change in Zunheboto district are found to be anthropogenic in the form of agricultural activities, deforestation, human settlement, etc. In order to recognize the change in land use in the district, land use/cover change analyses was carried out using two years (1980 and 2016) temporal data of satellite imagery (LANDSAT LISS III). The satellite imageries, from which the Land Use Land Cover map is generated, are taken in the month of January. The month of January is selected taken into consideration that shifting cultivation will be more prominent during the month from December- March, as this is the period where forest are cleared and burned for shifting cultivation.

Six different land use/cover classes were identified based on the socio-economic and environmental profile of the district. The following are the classes identified: i) Settlement ii) Shifting cultivation (jhum) iii) Terrace cultivation iv) Water bodies v) Open forest vi) Dense forest.

Fig. 4.3: LANDSAT LISS III ETM Satellite Imagery (1980): Zunheboto District



Source: USGS Earth Explore

Fig.4.4: Generated Land Use Land Cover map (1980): Zunheboto

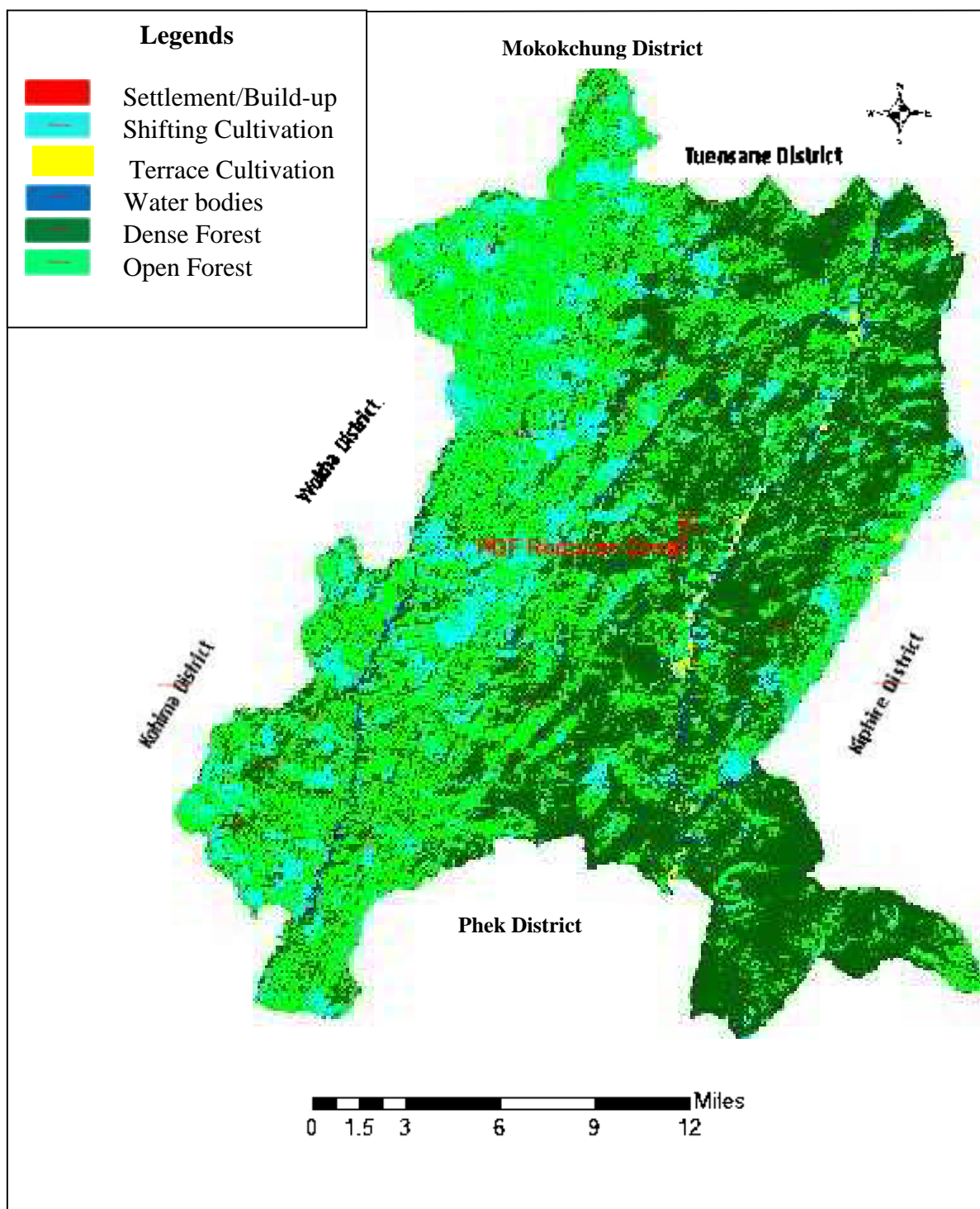
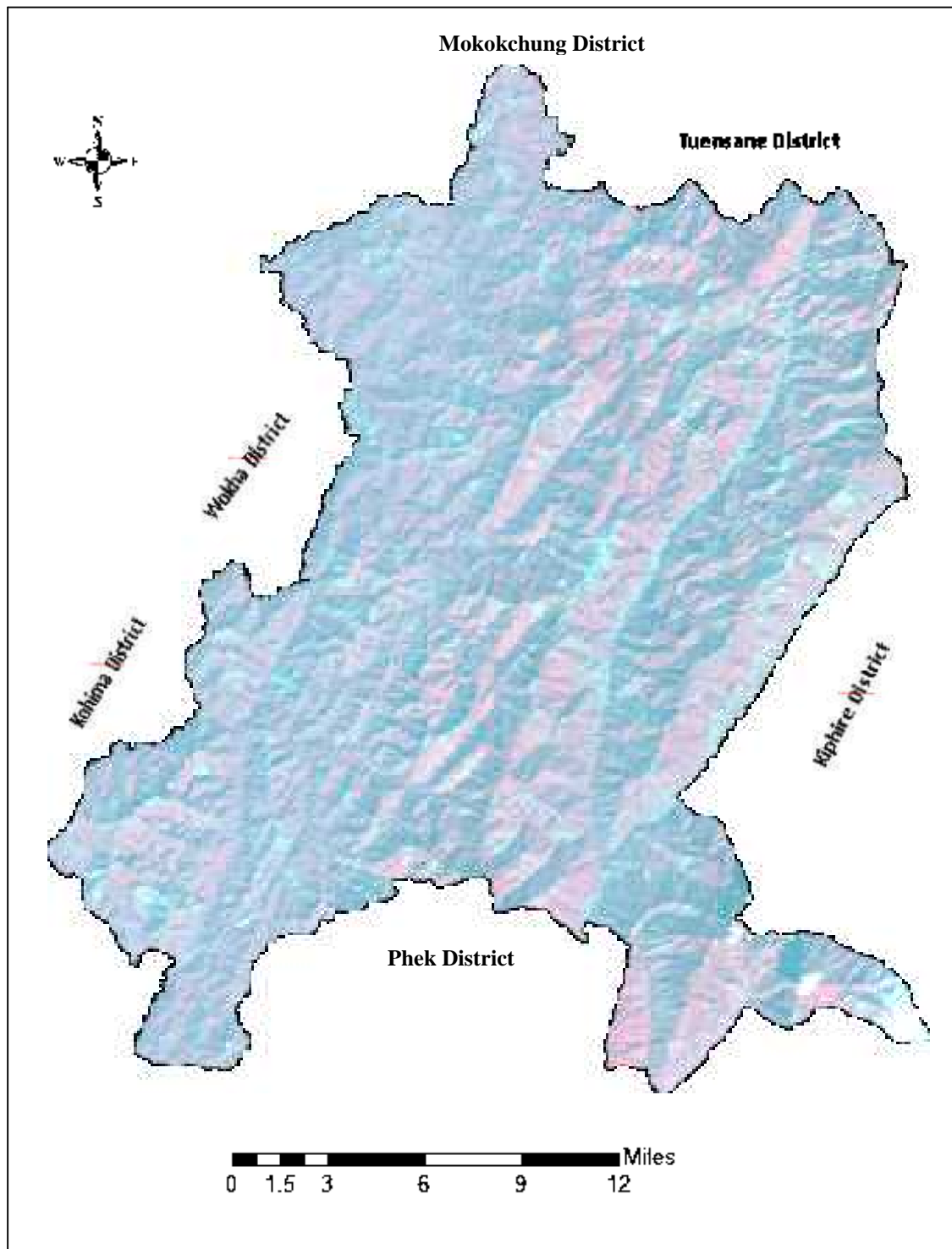


Fig. 4.5: LANDSAT LISS III ETM Satellite Imagery (2016): Zunheboto District



Source: USGS Earth Explorer

Fig. 4.6: Generated Land Use/ Land Cover Map (2016): Zunheboto District

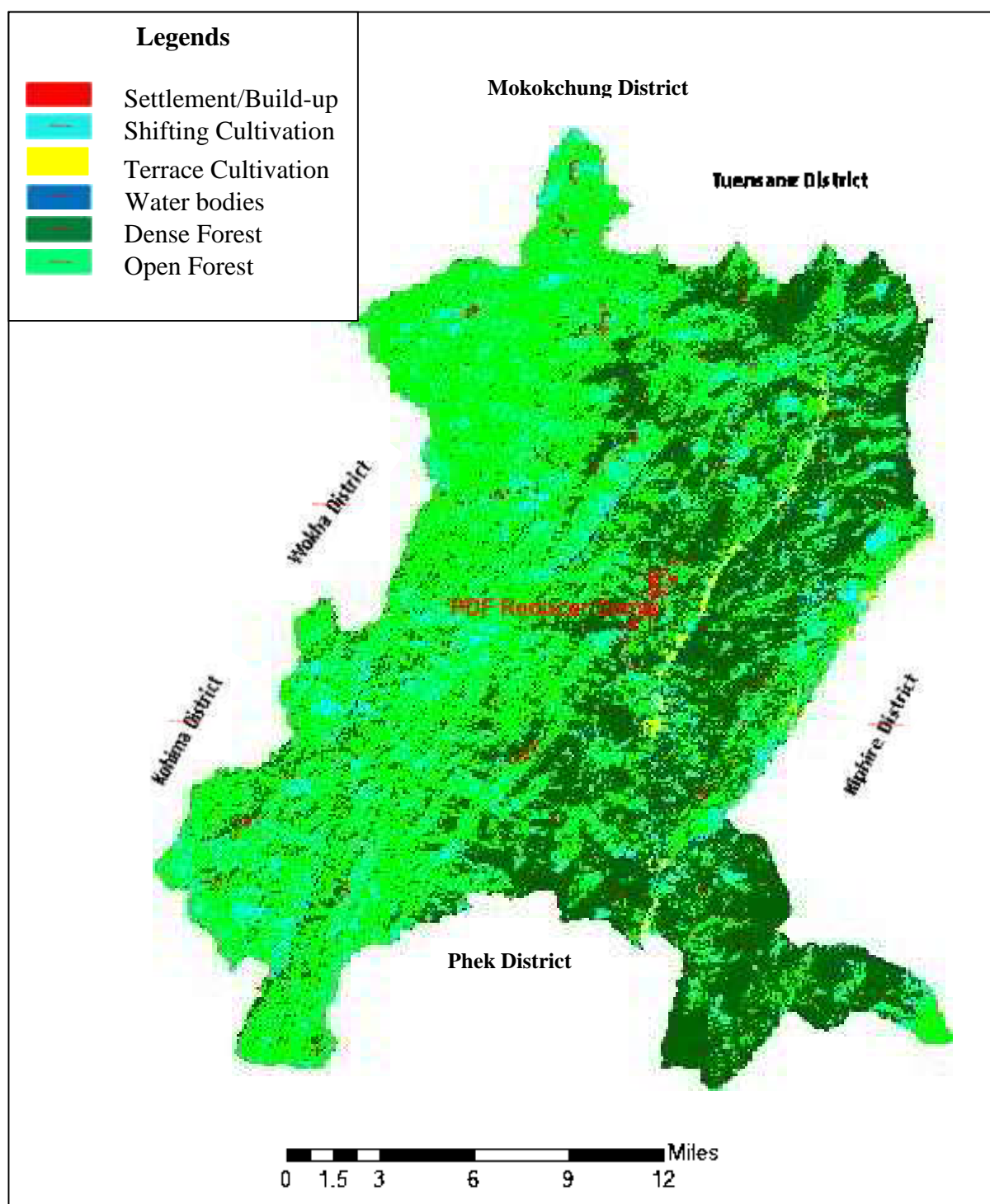
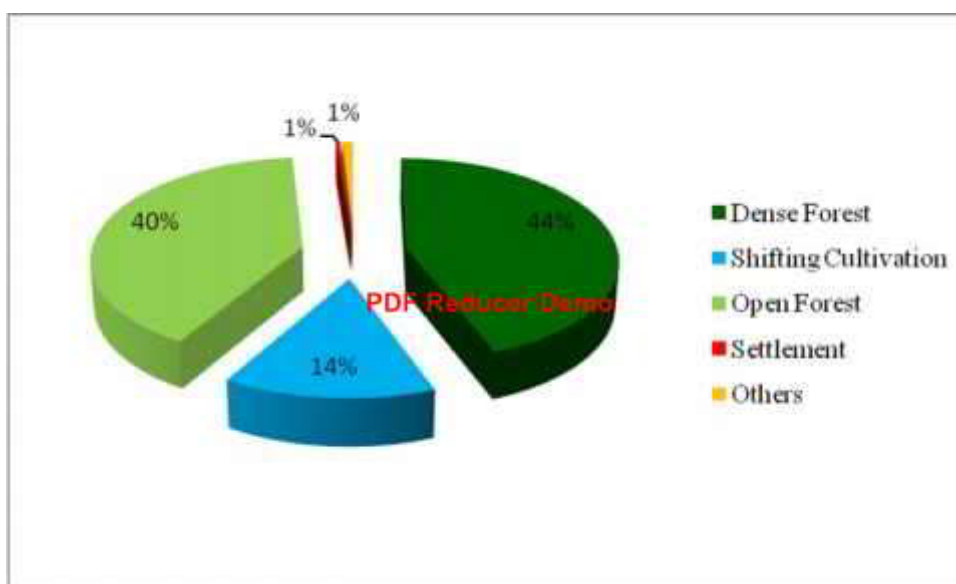


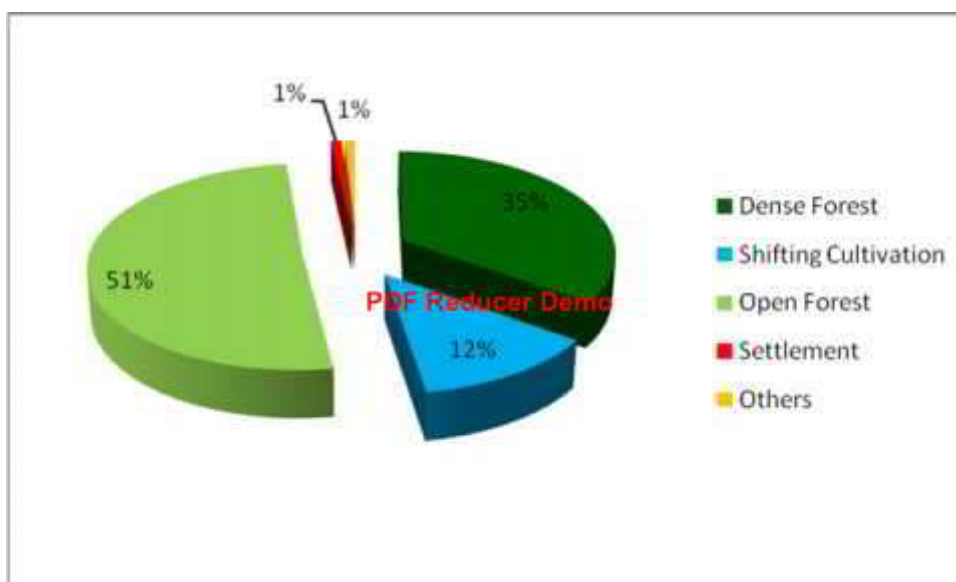
Table 4.6: Land Use/ Land Cover (1980 & 2016): Zunheboto District

Classes	1980	2016
Settlement/ Buildups	570.173	1438.109
Shifting Cultivation	22686.865	20127.793
Terrace Cultivation	638.46	1438.109
Water bodies	843.48	488.093
Open Forest	64188.172	80819.082
Dense Forest	70572.0725	55679.3
Total	159499.2225	

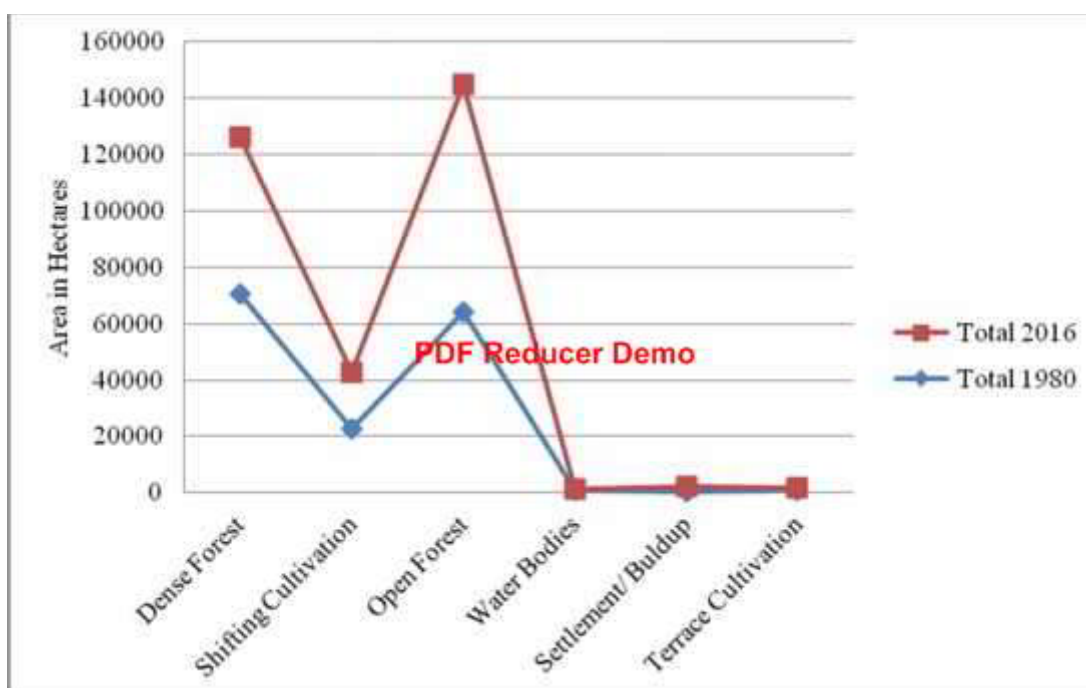
Source: Generated from the satellite imageries

Fig.4.7: Percentage of Land Use / Land Cover (1980): Zunheboto District

Source: Generated from the satellite imageries

Fig.4.8: Percentage of Land Use Land Cover (2016): Zunheboto District

Source: Generated from the satellite imageries

Fig.4.9: Comparison of LU/LC (1980 & 2016): Zunheboto District

Source: Generated from the satellite imageries

A comparative evaluation of the satellite data of 1980 and 2016 revealed significant changes in dense forest, open forest, shifting cultivation and settlement/build ups. The change shows that settlement/build ups has increased from 570.173 hectares in 1980 to 1438.109 hectares in 2016. Open forest has drastically increased by 11% in 2016 and dense forest decreased by 9% in 2016 (Fig 4.7 & 4.8). Terrace cultivation has also seen an increase. There is certain limitation in demarcating the water bodies since the study area is hilly and has rugged topography coupled with the resolution of the satellite imageries being low (23.5m), limits the accuracy of water bodies.

Table 4.7: Land Use/ Cover Change Assessment Matrix (Change Analysis Statistics): Zunheboto District

Classes	Dense Forest (hectares)	Jhum/ Shifting Cultivation (hectares)	Open Forest (hectares)	Water bodies (hectares)	Settlement / Buildups (hectares)	Terrace Cultivation (hectares)	Total 1980
Dense Forest	55679.3	1941.5	12539.5	102.443	273.262	36.0675	70572.0725
Jhum/ Shifting Cultivation	0	6019.81	16293.6	18.315	222.142	132.998	22686.865
Open Forest	0	12011.3	51656.2	21.375	372.532	126.765	64188.172
Water bodies	0	155.183	329.782	345.96	0	12.555	843.48
Settlement/ Buldup	0	0	0	0	570.173	0	570.173
Terrace Cultivation	0	0	0	0	0	638.46	638.46
Total 2016	55679.3	20127.793	80819.082	488.093	1438.109	946.8455	159499.2225

Source: Generated from the satellite imageries

To get the quantified changes land use/ cover assessment matrix was prepared (Table 4.7). The change analysis statistics shows that 1941.5 hectares of dense forest in 1980 has been converted to jhum, 11239.5 hectares to open forest and 273.26 to settlement/ build ups in 2016. 16293.6 hectares of jhum has been converted to open forest and 222.142

hectares to settlement/build ups. While, 12011.3 hectares of open forest has been converted to jhum and 372.532 hectares to settlement/ build ups in 2016.

It is interesting to observe that though the jhumia households are increasing, the land under jhum has decreased (Table 4.8). The reason for which, is decrease in labour in the jhum field since only the parents are full time workers in the recent times, while in the past all the family toil in the field. The other reason, being increase in plantations over the years.

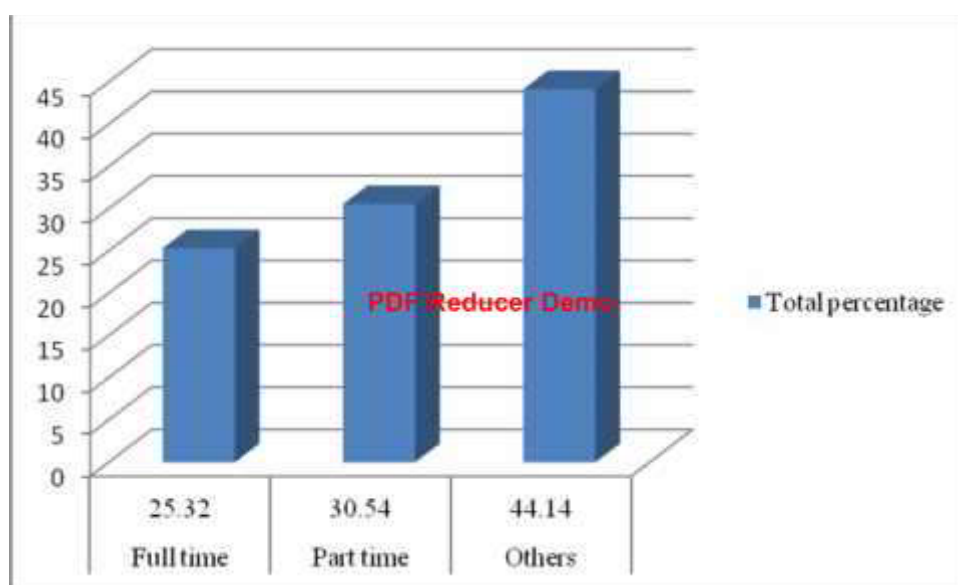
Table 4.8: Jhum (Shifting Cultivation) Landuse : Zunheboto District

Year	No. Of households	No. Of Jhumia families	Jhum area in Ha.	Area under Jhum annually (Sq km)
2005-06	20361	14925	11658	116.58
2015-16	25906	16481	11537	115.37

Source: State Jhum Land Survey Report 2015-2016

Out of the 520 sample household taken covering the whole circles of Zunheboto, 25% of persons are working in jhum field as full time, while 30.54% as part time and 44.14 % are engaged in other activities such as Govt. employee, business etc.(Fig. 4.10). The full time workers include the person working in the jhum field throughout the year, while the part time consists of persons working in the jhum field occasionally or seasonally. In the past whole family worked in the field but now children are absorbed in going to school, while the father is engaged in secondary and tertiary works and only the mother works in the field full time.

Fig.4.10: Percentage of full time and part time jhum field workers: Zunheboto District



Source: Field survey and Questionnaire

4.2.3 Introduction of Exotic/Invasive Species and Monoculture

Introductions of species, particularly plants into new areas, by whatever means and for whatever reasons have brought about major and permanent changes to the environment over large areas⁵⁰. According to the World Conservation Union, invasive alien species are the second most significant threat to biodiversity, after habitat loss. In their new ecosystems, invasive alien species become predators, competitors, parasites, hybridizers, and diseases of our native and domesticated plants and animals⁵¹. Plant invasion are human introduced or of natural means natural like winds, birds, animals, water. It affects indigenous species diversity, soil ecology and dynamics and economics of agricultural ecosystem throughout the world.

⁵⁰ https://en.m.wikipedia.org/wiki/Invasive_species&grqid

⁵¹ <https://www.ec.gc.ca/eee-ias/default.asp?lang=En&n=4612AC81-1>

The Himalayas, within which Nagaland falls, and extending from east to west in the North of India, are one of the 34 hotspot of biodiversity and home to a variety of plants exhibiting great diversity and richness. It represents a unique combination of endemics and exotics, some of which have proven to be useful as crop plants, for instance. However, the regional diversity is under enormous threat from various biotic, abiotic and anthropogenic induced pressures. Notable among these is the presence of a large number of exotic plant species that have either been introduced deliberately or have entered accidentally⁵².

Monoculture forest plantations are fast increasing in developing countries and although this growth is fuelled by low production and labour costs, carbon sequestration for the developed, and government incentives, these plantations have serious social and environmental impacts. Nagaland is no exception where large area of land is being converted to the plantation of rubber, pine, gamari, teak (Plate 4.2, 4.3 & 4.4) etc for different economic purposes. Large-scale monoculture plantations destroy the natural diversity of forest life. They are artificial, driven by profit and are environmentally and socially destructive. Tree plantations are a form of agriculture, they are not forests. These plantations are green deserts. They offer no sustenance; they offer no reprieve from deforestation or the loss of natural forests and the species therein. They are quite simply wood farms of invasive tree species which dry up water sources and are implanted on community lands labelled as degraded. A broad assessment is given of the contentions that plantation forests are high consumers of water, increase acidification, sustain a low diversity of wildlife, and store more carbon than the unmanaged forests. The continuous

⁵² Ravinder K. Kohli, Daizy R. Batish, H. P. Singh & Kuldip S. Dogra. 2006. Status, invasiveness and environmental threats of three tropical American invasive weeds (*Parthenium hysterophorus* L., *Ageratum conyzoides* L., *Lantana camara* L.) in India, *Biological Invasions* . p 1501–1510

process of such biological invasion poses a threat to human, wildlife and native plant species of the state as a whole, and Zunheboto district in particular. Some of the major invasive species and their origin found in Zunheboto are *Ageratum conyzoides* L, *Mikania micrantha*, *Cuscuta chinensis*, etc. (Table 4.9).

Table 4.9: Major Invasive Species and their Origin: Zunheboto District (Plates 4.1)

Botanical, common name and habit of alien plant	Origin
<i>Ageratum conyzoides</i> L. (Goat weed) Asteraceae Herb	Tropical America
<i>Ageratina adenophora</i> / <i>Eupatorium adenophorum</i> Sp. (Crofon weed, catweed, Mexican devil) Asteraceae Shurb	Mexico
<i>Mikania micrantha</i> (Climbing hempweed, bitter vine) Asteraceae Perennial climber	North, Central and South America
<i>Mikania cordata</i> / <i>Mikania scandens</i> / <i>Eupatorium cordatum</i> Asteraceae Vine	
<i>Synedrella nodiflora</i> (Cinderella weed, nodweed, pig grass) Asteraceae Herb	Central America and Tropical South America
<i>Cuscuta chinensis</i> Cuscutaceae Herb	Mediterranean

Source: Field survey

4.3 Impact on Forest and Biodiversity

The status of forest in Nagaland is in a declining and degenerated state as all the private forests vested with the villagers are being haphazardly and unscientifically exploited to meet the demand of timber, fire wood and domestic needs. Forest cover has seen a decline from 1987 which was 14,351 hectares to 13,044 hectares in 2013 (Table 4.10). In reserved and protected forest too there is illegal exploitation in the disguise of every form and type making it difficult to control the removal of forest products from these areas. There is, however, a revolution in the jhum fields where the farmers are planting trees along with raising their agricultural crops. Still there is a need of bringing this system under scientific system of management based on the concept of sustained yield.

Table 4.10: Forest Cover: Nagaland

Year	1987	1989	1991	2001	2003	2005	2009	2011	2013
Forest Cover	14,351	14,356	14,278	13,345	13,609	13,719	13,464	13,318	13,044

Source: Computed from India State of Forest Report 2013

The change in the land use pattern is the chief cause of loss of forest and depletion of biodiversity in Zunheboto district. From the land use/cover analysis, it is observed that large area under dense forest was converted to open forest due to shifting cultivation. Shifting cultivation, settlement, road construction and other land use purpose are the major cause of deforestation in the district.

Shifting cultivation is one of the leading causes of wild fire. The most common hazard for forests is fire. During dry season, when there is no rain for months, the forests become littered with dry leaves and twigs, which could burst into flames ignited by the slightest

spark. Approximately 90 percent of the fire accidents are human-induced, intentional or unintentional due to the negligence and poor knowledge of the people. Collections of forest produce, shifting cultivation, cooking food in the forest etc. are the basic anthropogenic causes that ignite forest fires.

4.4 Impact on Water

Water is the most essential natural resources for life next to air and is likely to become a critical scarce resource in many regions of the world in the coming decades. Although water is the most abundant substance on earth, it is not equally distributed. Rainfall in India on an average is 1050 mm, unevenly distributed with time and space. Thus, many areas in the country face water scarcity. Due to increasing demand for water table and resources are over-exploited resulting in lowering of water table and as a result many rivers are rendered dry in non-monsoon season. This has a serious impact on water quality⁵³

Nagaland receives annual rainfall of 2500 mm, yet most of the part of the state faces scarcity of water during dry season. The decrease in jhum cycle a resultant of population increase has adversely affected forest areas that house the source of springs.

Certain chemicals and heavy metal in drinking water such as, arsenic concentration was found to be a major threat in northeast states. The analysis report in a study done by the North Eastern Regional Institute of Water and Land Management, Tezpur, Assam shows that arsenic concentration in groundwater exceeds the permissible level (50g $\mu\text{g L}^{-1}$) in Assam, Arunachal Pradesh, Nagaland, Manipur and Tripura states⁵⁴. In Nagaland the district found to be contaminated by arsenic were Mokokchong, Wokha, Mon and

⁵³ Dashmishra, M. 2011. *Political Economy of Development and Environment Degradation in India*. Concept Publishing Company Pvt.Ltd. New Delhi. p 98 & 102

⁵⁴ A.K. Singh and et al.2009. *Assessment of Arsenic, Fluoride, Iron, Nitrate and Heavy Metals in Drinking Water of Northeast India*. North Eastern Regional Institute of Water and Land Management Tezpur, Assam.p 36

Zunheboto. Table 4.11 gives the block wise quality of drinking water in Zunheboto district where 99% of the samples were found to be contaminated by bacteriological contaminants and 5% of the samples were contaminated with multiple contaminants of iron, fluoride, salinity, nitrite and arsenic.

Table 4.11: Block Wise Quality Profile for Lab Testing (2013-2014): Zunheboto District

Block	Total Source Tested	No. Of Sources with Bacteriological Contaminants		No. Of Sources with Multiple Contaminants	
		E-Coli(MPN/100 ml)	Coliform	In Fluoride, Salinity, Nitrate Arsenic Iron, &	Also with Other Contaminants
Akuhaito	34	34	1	4	27
Akuluto	27	27	0	2	22
Gathashi	35	35	0	1	28
Satakha	35	35	0	2	27
Satoi	20	20	0	0	18
Suruhuto	60	60	0	6	41
Tokiye	49	49	0	3	35
Zunheboto	112	111	0	2	76
Total	372	370	1	20	274

Source: Ministry of Drinking Water and Sanitation, Govt. of India

4.5 Impact on Soil and Land

Erosion is a major problem affecting soil worldwide. Though soil erosion is a natural process, human activities such as agriculture and different land management practices have intensified the rate of erosion. The main causes of soil erosion are rainfall, soil type and slope angle. High annual rainfall (2500mm) coupled with hilly physiography aggravates soil erosion in Nagaland. The size of soil in the study area also varies from medium to coarse grain which makes water seepage on the soil surface high. Deforestation and creation of arable land allow considerable water to seep into the soil which causes soil erosion and mass movements. The slope angle ranges from 35-40 degree which is quite high resulting in higher rate of down slope movement. Large heavy trees on weak slopes can also cause instability.

Since the entire district is hilly, land is prone to soil erosion. The lands under Jhum cultivation are also subjected to soil erosion. With the increase in pressure of population on land and also the advent of development programmes, the hazards of soil erosion are getting amplified. Faulty land use practices such as jhum cultivation and heavy constructions are also landslide initiators. Water stored in paddy fields induces instability because of great pore-water pressure generated on the soils due to retention of excess water for the paddy plants. Another important factor causing landslides in the district is faulty road construction methods. Landslides occur due to faulty road construction design and slope stabilization structures. Besides natural environmental factors, excavation for rocks and slope modification for agriculture have made many parts of our environment susceptible to mass wasting.

Shifting cultivation which was considered to be sustainable has taken a different direction with decrease in jhum cycle and complete cutting down of trees in the jhum field for construction purpose and fire wood. The ethics of environment management of the forefathers are fast depleting as the population driven by consumerism are destroying and

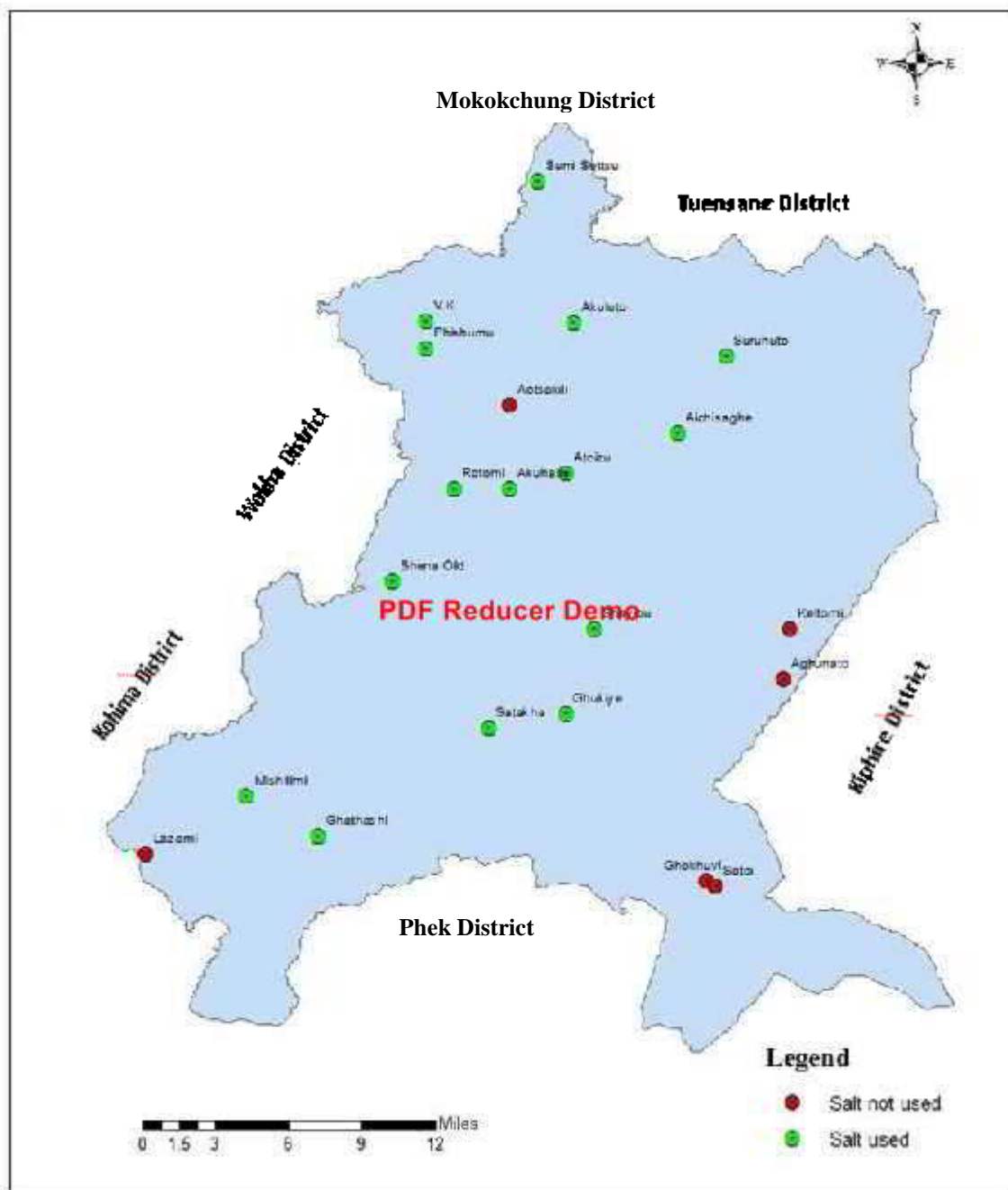
clearing the entire forest cover under jhum aggravating soil erosion. The use of salt as weed killer is also on the rise in the district. The reasons for use of salt are its cheapness, readily available and minimum use of labour force. The prolong use of which will reduce the soil quality. Salt was found to be used as weed killer in the jhum field in the following sample villages/towns (Table 4.12). The incessant use of salt compacts or hardens soil, which causes water to run straight off the surface after rain, taking soil particles with it, instead of infiltrating into the soil. Roundup (Plate 4.6) is yet another weed killer, which use is on the rise in the study area. It is as weed killer mostly in the areas surrounding terrace field and also for killing weeds surrounding the houses (Plate 4.7). It is scientifically proved to have ill effects on human health as well as soil. Hence, studies of its use and its consequences have to be taken up in depth in the district as well as state level. Thus apart from the traditional practice of jhum cultivation, improper ways of construction of roads and the soil condition in the rugged and hilly terrain, the use of various chemicals adds to the aggravation of soil condition and its durability in the district.

Table 4.12: Use of Salt as Weed Killer in Zunheboto District

Circles	Sample Town/Villages	Use of Salt as weed killer
V.K	V.K Town	Yes
	Phishumi	Yes
Akuluto	Akuluto Town	Yes
	Sumi Settsu	Yes
Suruhuto	Suruhuto Town	Yes
	Aichisaghemi	Yes
Atoizu	Atoizu Vil.	Yes
	Aotsakilimi	No
Asuto	Asuto Vil.	-
	Satami	-
Zunheboto Sardar	Ghukiye	Yes
	Sheyipu	Yes
Aghunato	Aghunato Vil	No
	Keltomi	No
Satakha	Satakha Town	Yes
	Shena Old	Yes
Satoi	Ghokhuvi	No
	Satoi Vil	No
Ghathashi	Ghathashi Town.	Yes
	Ighanumi	
Pughoboto	Mishilimi	Yes
	Lazami	No
Akuhaito	Akuhaito Town	Yes
	Rotomi	Yes
Saptiqa	Saptiqa	-
	Shena Old	Yes

Source: Field Survey and Questionnaire

Fig. 4.11: Map Showing use of Salt as Weed Killer in Zunheboto District



Source: Field Survey and Questionnaire

4.5.1 Land Degradation

Land degradation in Nagaland is man-made as well as natural phenomenon. Rapid population growth, improper land use, absence of land use policy, and the growing demands of increasing urbanization are exerting pressure on the environment and on the natural resources of the State. The total degraded land of Nagaland covers 26.62 % of its geographical area. Out of the total degraded land maximum degraded area is found in Mon district (38.83%) followed by Tuensang district (31.56%), Phek district (26.27%), Kohima district (24.60%) and Zunheboto district (24.39%) districts (Table 4.13).⁵⁵

Loss of vegetation due to deforestation, unsustainable fuel wood extraction, shifting cultivation/ jhum, unplanned agricultural practices, encroachment into forest land for agriculture and settlements, forest fire, non-adaptation of adequate conservation measures and improper crop rotation are some important factors contributing to land degradation.⁵⁶

Studies on land degradation is lacking in the State and almost non-existence for Zunheboto. Land resource in Zunheboto district is fast degrading due to extreme reliance on jhum and dependence on forest for timber, firewood and other domestic and commercial use. Consequently, there are soil loss and erosion, depletion of soil fertility and reduced land productivity, water shortage and other socio-economic and environmental problems. One important consequence is the decrease in soil fertility leading to decrease in crop production. This has led to migration of population to fertile lowland area in Dimapur, as we can observe a negative growth of population in Zunheboto District in 2011 census.

⁵⁵ Inventory of degraded Lands of Kohima, Phek, Wokha, Zunheboto, Mokokchung, Tuensang and Mon districts of Nagaland using Remote Sensing Techniques.

⁵⁶ State of Environment Nagaland 2005, Nagaland Pollution Control Board

Table 4.13: Nature, Extent and Percentage of Degraded Land of Nagaland

Mapping Symbol	Description	District Area (ha)							Total Area (ha)	%
		Kohima	Wokha	Mokokchung	Zunheboto	Tuensang	Phek	Mon		
	Shifting Cultivation									
Sc1d2	Current Jhum	12950 (3.20)	11984 (7036)	10785 (6.68)	13672 (10.89)	85501 (20.22)	14796 (7.30)	47049 (26.34)	196737	11.87
Sc2d2	Abandoned Jhum	58671 (14.52)	14418 (8.86)	16228 (0.05)	15883 (12.66)	45845 (10.84)	21866 (10.79)	20937 (11.72)	193848	11.69
	Water Erosion									
We1d2	Severe Water Erosion	27787 (6.88)	160 (0.10)	186 (0.11)	1058 (0.84)	2102 (0.50)	16569 (8.18)	1351 (0.76)	49213	2.97
	Waterlogging									
W11a1	Seasonal Waterlogging	-	1465 (0.90)	65 (0.04)	-	-	-	11 (0.01)	1541	0.09
	Total Degraded Land	99408 (24.60)	28027 (17.22)	27264 (16.88)	30613 (24.39)	133448 (31.56)	53231 (26.27)	69348 (38.83)	441339	26.62
	Total Geographical Area	404100	162800	161500	125500	422800	202600	178600	1657900	

Source: Inventory of degraded Lands of Kohima, Phek, Wokha, Zunheboto, Mokokchung, Tuensang and Mon districts of Nagaland using Remote Sensing Techniques.

4.6 Air Pollution

The industrial base of Nagaland is narrow. The majority of the industrial units/village industries are based on local forest products, agro-products and traditional handloom and cottage industries⁵⁷. The State has established six growth centres for industrial development. However, they have not been able to satisfactorily meet the objectives for which they were envisioned. Nagaland had only 73 industrial units including small scale industries, government emporiums, and district industrial centres and specialized farms in 1980. This increased to 1160 in 1999–2000. This includes 1064 small-scale units. The Paper Mill established at Tuli in Mokokchung District and Sugar Mill in Dimapur faced serious difficulties. The Sugar Mill has since been closed down while efforts are on to revive the Paper Mill at Tuli⁵⁸. Small scale industries have been growing in the state in the last decades, most of which are concentrated in

⁵⁷ Nagaland State Human Development Report, 2004

⁵⁸ Nagaland State Disaster Management Plan, Nagaland Disaster Management Authority, Home Department, Government of Nagaland.

Dimapur. Air quality in Dimapur and Kohima, the commercial hub and capital city of Nagaland respectively, are reported to be deteriorating due to increase in vehicular emissions and small scale industries. However, this is not so in the case of Zunheboto District.

Air pollution problems in Zunheboto are not yet felt much due to fewer motorized vehicles and industries. The primary sources of emission are wood and biomass. The major source of air pollution is dust. The roads in the district are in deplorable condition. Out of 27 villages and town visited and surveyed through questionnaire, only 8 villages/towns were observed and responded with roads in good condition. The plying of the vehicles produces redundant air pollution and dust upheaval, especially during winter season as the roads becomes dry and dusty. Air pollution not only has ill effect on human health but on the flora population by the road side as well.

Another concern of air pollution in the district is indoor air pollution. About 90% of the district is rural, where people use fire wood for cooking as well as for warming purpose. The villagers use fire wood without proper and adequate ventilation systems and it causes severe indoor air pollution, adversely affecting their health. The burning of Jhum field though seasonal also causes air pollution.

4.7 Environmental Issues and Human Health

Environment and health are closely interwoven and the health condition of the people largely depends on the existing environmental condition. Degradation and depletion of environment has great consequences on human health.

Climate sensitive diseases such as acute respiratory diseases are in a rise in Nagaland. It is associated with increase in pollutant loading in the outdoor as well as indoor atmosphere and with virus/ bacterial/pollens/ allergens etc. The accurate respiratory diseases in

Nagaland have increased almost 3 times, between 2008 and 2010. This data includes respiratory diseases related to pollution, pollens and allergens as well as infections such as viruses and bacteria. Limited measured data available from an urban area, namely Dimapur, indicates that the Respirable Suspended Particulate Matter (RSPM) is increasing along with Suspended Particulate Matter (SPM). The concentrations of RSPM and SPM are more than the allowed national standards of 60 and 140 respectively⁵⁹.

From the survey conducted in the selected sample towns and villages of Zunheboto district, some of the major health problems related to environment in the district are respiratory diseases and water borne diseases such as typhoid, malaria, dysentery, diarrhoea, etc. (Table 4.14). Due to dust pollution, indoor air pollution and Jhum burning, maximum of the people in sample villages has respiratory problems. Respiratory problems include diseases related to chest, allergies related to dust, etc. Though respiratory problems can be seen in almost all the sample villages it can be noted that respiratory problems are more prominent in the Eastern higher elevated part of the district. The major villages, out of the selected ones for present study, included in this eastern part are: Satoi, Aghunato, Keltomi, Suruhuto and Aichisaghemi. This is mainly attributed to the fact that the people climb their fields carrying their crops and agricultural tools and implement. The children too in these areas have complains of respiratory problems since they climb to their school carrying their books loaded bags. It is also noticed that malaria is more prominent in the

⁵⁹ Nagaland State Action Plan on Climate Change: Achieving Low Carbon Development Trajectory. Government of Nagaland. p 117

warmer western part of the district with lower elevation, while it is less prevalent in higher elevated colder Eastern region of the district.

Table 4.14: Common Diseases Related to Environment in Selected Sample Villages/Town: Zunheboto District

Circles	Sample Town/Villages	Diseases
Zunheboto	-	Malaria, Dysentery, Typhoid
V.K	V.K Town	Respiratory, Malaria
	Phishumi	Respiratory, Malaria
Akuluto	Akuluto Town	Respiratory, Malaria, Typhoid
	Sumi Settsu	Respiratory, Malaria
Suruhuto	Suruhuto Town	Typhoid, Malaria
	Aichisaghemi	Respiratory, Malaria
Atoizu	Atoizu Vil.	
	Aotsakilimi	Respiratory, Malaria
Asuto	Asuto Vil.	-
	Satami	-
Zunheboto Sardar	Ghukiye	Respiratory
	Sheyipu	Respiratory, Dysentery
Aghunato	Aghunato Vil	Respiratory
	Keltomi	Respiratory
Satakha	Satakha Town	Malaria, Typhoid
	Shena Old	Respiratory, Malaria
Satoi	Ghokhuvi	Respiratory
	Satoi Vil	Respiratory
Ghathashi	Ghathashi Town.	Typhoid, Malaria, Dysentery, Diarrhoea
	Ighanumi	Malaria, Respiratory
Pughoboto	Mishilimi	Malaria, Dysentery, Diarrhoea, Respiratory
	Lazami	Diarrhoea, Respiratory, Dysentery
Akuhaito	Akuhaito Town	Typhoid, Malaria
	Rotomi	Respiratory
Saptiqa	Saptiqa	Respiratory
	Shena Old	Malaria

Source: Field and Questionnaire Survey

4.8 Climate Change and Global Warming

The increasing human population and the advancement in technology have not only become significant factors in the variations in world climate but also responsible for the various changes in atmospheric conditions including air pollution⁶⁰. Some of the human influence on global climate are- Carbon dioxide emission, deforestation, overgrazing, aerosol generation, chlorofluoro carbon, thermal power, dust addition to ice caps etc.

Humans and animals face new challenges for survival because of Climate change. More frequent and intense drought, storms, heat waves, rising sea levels, melting glaciers and warming oceans can directly harm animals, destroy the places they live, and wreak havoc on people's livelihoods and communities⁶¹. Carbon dioxide (CO₂) is the main heat-trapping gas largely responsible for most of the average warming over the past several decades. Forests help protect the planet by absorbing massive amounts of carbon dioxide, the most abundant type of pollution that cause climate change and global warming. Unfortunately, forests are currently being destroyed or damaged at an alarming rate. Logging and clearing land for settlements, agriculture or livestock release huge amounts of carbon dioxide and other harmful greenhouse gases into the atmosphere and also diminishes that region's ability to absorb carbon pollution.

According to NASA the earth's temperatures in 2015 was the hottest ever recorded,. This is an issue, because a change of even 1 degree Fahrenheit – which may sound small – can upset the delicate balance of ecosystems, and affect plants and animals that inhabit them. Instrumental observations over the past 157 years show that temperatures at the surface have risen globally, with important regional variations. For the global average, warming in

⁶⁰ Saxena H.M.2010. *Environment Management*. Rawat Publications. p 41

⁶¹ <https://www.worldwildlife.org/threats/effects-of-climate-change>

the last century has occurred in two phases, from the 1910s to the 1940s (0.35°C), and more strongly from the 1970s to the present (0.55°C). An increasing rate of warming has taken place over the last 25 years, and 11 of the 12 warmest years on record have occurred in the past 12 years⁶².

Nagaland being situated in the North East Hills forms an extended part of the Eastern Himalayas which makes it most vulnerable to climate-mediated risks. The economy is characterised by low level of development with high dependence of livelihoods on natural resources- water, forest, agriculture, etc. Increasing population along with continuous deforestation in the state is not only leading to heavy atmospheric carbon emission but also taking the state towards heavy impact of climate change and unknown diseases.

Warmer summers and increase in the number of pests like locusts in the fields and mosquitoes in urban areas may be a pointer that climate change has already arrived in Nagaland. Since October 2008 till March end, the state hardly experienced any rain leading to severe drinking water shortage in hill areas, while farmers in many places complained of either delay in sowing or non germination of seeds. Climate Change is affecting the indigenous vegetables of Nagaland. Vegetable suppliers are saying that everywhere in North-east, farmers are complaining about unknown diseases affecting the crops, with traditional management of such disease not working anymore. There were indications of a significant rise in the occurrence of Summer-borne diseases as well as an increased occurrence of pests and vectors such as mosquitoes at high altitude such as in Zunheboto

⁶² IPCC. 2007. *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

than was found earlier. In the winter of 2007, there was snowfall in Aghunato under Zunheboto, previously unheard of phenomena in that area⁶³.

The climate change projection for Nagaland indicates that between 2021 and 2050, it will experience an increase in annual average temperature between 1.6°C and 1.8°C. Southern district (Kohima, Wokha, Phek, Zunheboto and Tuensang) show higher increase in temperature rising between 1.7°C and 1.8°C. Precipitation is likely to increase overall by 10-20% with 2 days extreme rainfall conditions (100mm/day) in areas like Phek, Tuensang and Kohima per year. Further it is expected that the climate change, along with socio-economic factors, is likely to have impact on health and give rise to new diseases in the state⁶⁴.

Zunheboto district too has started experiencing climate change and its effects. The district has been experiencing erratic rainfall (Table 4.15) and change in temperature as in higher temperature in summer and lower temperature in winter (Fig. 4.12). The district has rather experienced a variable rainfall in the in last three decades with decrease between 1995-2001 and increase between 2002-2005, which declined till 2010 (Table 4.15). Moreover, it is experiencing a rise in temperature in the last nine years (Table 4.16). These have adverse effects mainly on the agriculture and its allied activities in the district. Farmers are lamenting that the harvesting period has changed, their seeds and preserved crops are infested by storage grain pests and the erratic rainfall has affected their yield. For instance, Jhum cultivation is wholly dependent on monsoon rain. Erratic rainfall has been a hindrance to the farmers, so as to decide time of sowing as well harvesting.

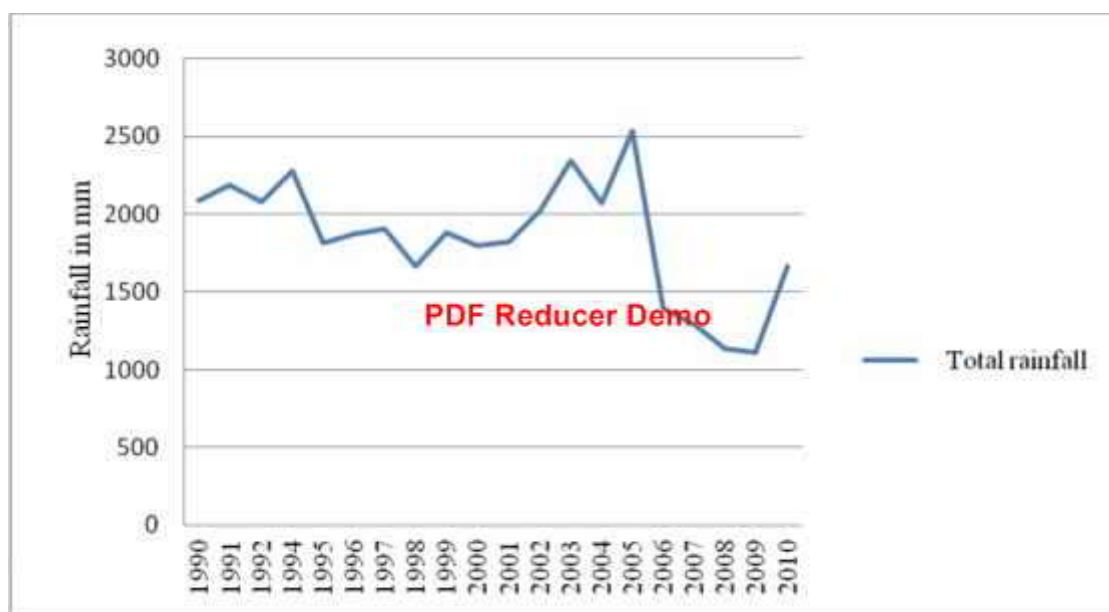
⁶³ <https://hendrawanm.wordpress.com/2011/02/11/the-morung-express-climate-change-in-nagaland/>

⁶⁴ Nagaland State Action Plan on Climate Change, version 2012.2. Achieving a Low Carbon Development, Trajectory. Govt. of Nagaland.

Table 4.15: Total annual rainfall (1980-2007): Zunheboto district

Year	Total rainfall in mm
1980	1991.97
1981	2128.663
1982	1795.567
1983	2169.055
1984	2103.003
1985	1796.538
1986	1657.08
1987	1796.526
1988	2266.203
1989	1828.771
1990	2089.195
1991	2182.713
1992	2077.71
1994	2276.95
1995	1814.358
1996	1872.724
1997	1906.221
1998	1661.725
1999	1880.235
2000	1795.082
2001	1821.231
2002	2018.622
2003	2343.6
2004	2073.5
2005	2530.1
2006	1393.1
2007	1293.2
2008	1133.1
2009	1108.7
2010	1662.9

Source: http://www.indiawaterportal.org/met_data and Soil and water conservation department, Govt. Of Nagaland

Fig.4.12: Total Annual Rainfall (1990-2010): Zunheboto District

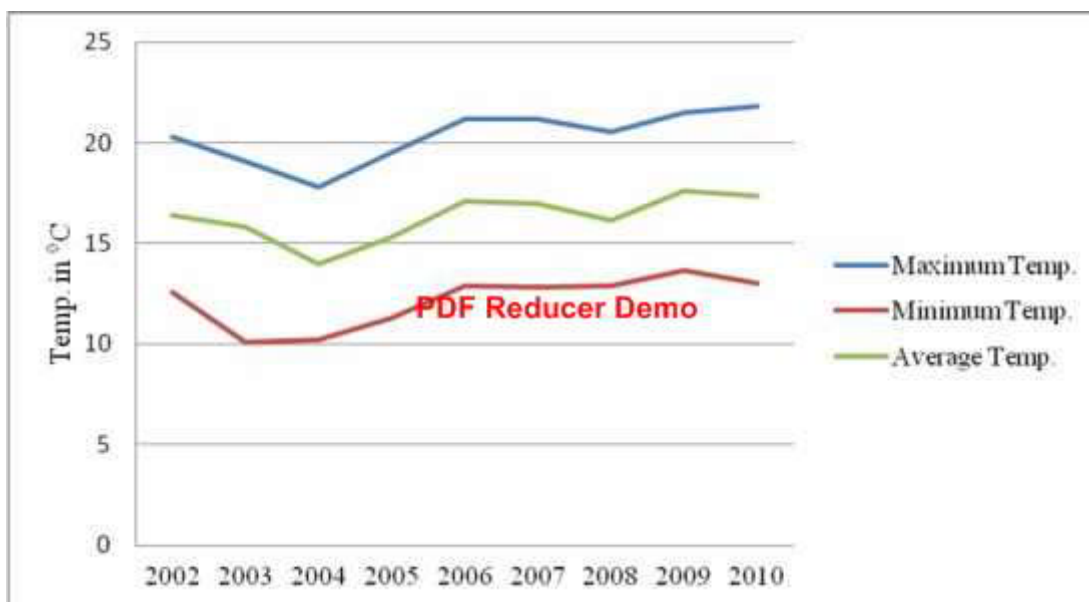
Source: http://www.indiawaterportal.org/met_data and Soil and water conservation department, Govt. of Nagaland.

Table 4.16: Annual Maximum, Minimum and Average Temperature (2002-2010) : Zunheboto District

Year	Temperature (°C)		
	Maximum	Minimum	Average
2002	20.3	12.6	16.4
2003	19.1	10.1	15.8
2004	17.8	10.2	14.0
2005	19.5	11.3	15.3
2006	21.2	12.9	17.1
2007	21.2	12.8	17.0
2008	20.53	12.87	16.12
2009	21.52	13.64	17.58
2010	21.8	13.0	17.36

Source: Soil and water conservation department, Govt. Of Nagaland

Fig.4.13: Maximum, Minimum and Average Annual Temperature (2002-2010): Zunheboto District



Source: Computed from Soil and water conservation department, Govt. of Nagaland.

In 2014, monsoon started late which led to poor yield in paddy and in 2015, it rained till the end of September, which made it difficult to harvest and the already ripened rice germinated from the plant leading to less harvest. The harvest time is becoming late as such they use to harvest at the end of August and early September but now they harvest in mid and late September of the year. This trend has been evident since two to three before. The seeds that are preserved traditionally are infested by storage grain pests which were of recent occurrence making it difficult to store and preserve seeds for the next sowing season. The reason behind this can be harvesting and storing the seeds at a time when moisture content in the air is high or the rise in temperature. Pest population increases at higher rate at higher temperature, which can be linked to the rise in temperature in the study area.

Change is inevitable and cannot be stopped but there is always a way where one can learn to lessen the harm to one's surroundings and to be prepared to adapt to the changes. The human impact on environment mentioned above can act as an eye opener to understanding the various environmental problems caused and proliferated mainly by humans and its consequences, and to move forward to a better sustainable society.

Chapter 5
Need and Suggestions for Sustainable
Development

5.1 Introduction

Man has continually, and at an increasing rate, been changing the forms and modes of his interaction with the environment. The environmental problems such as climate change, global warming, environment degradation, depletion of natural resources and biodiversity, various forms of pollution, etc. are associated with development activities of man, have raised questions regarding the type and way of development and this has given rise to the concept of 'sustainable development'.

5.2 Sustainable Development Concept

Sustainable development is a bridge concept connecting economics, ecology and ethics⁶⁵. In 1987, the Brundtland Commission published its report, 'Our Common Future', in an effort to link the issues of economic development and environmental stability⁶⁶. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

-) the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
-) the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.

In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and

⁶⁵ Framing Sustainable Development The Brundtland Report – 20 Years On. Sustainable Development in Action, United Commission on Sustainable Development.

⁶⁶ Rachel Emas, Florida International University. Brief for GSDR 2015 .The Concept of Sustainable Development: Definition and Defining Principles.

institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations⁶⁷.

The Brundtland Report laid the groundwork for the convening of the Earth Summit in Rio de Janeiro five years later. The Rio Summit held in June 1992 was the largest environmental conference ever organized, bringing together over 30,000 participants, including more than one hundred heads of state. The summit represented a major step forward, with international agreements made on climate change, forests and biodiversity. Among the summit's outcomes were the Convention on Biological Diversity, the Framework Convention on Climate Change, Principles of Forest Management, the Rio Declaration on Environment and Development, and Agenda 21, which required countries to draw up a national strategy of sustainable development. It also led to the establishment of the UN Commission on Sustainable Development. Ten years later, the 2002 World Summit on Sustainable Development in Johannesburg led to more governmental commitments and helped extend the concept's reach into the areas of business, local government and civil society⁶⁸.

The results of the UNCED included the Rio Declaration enunciating 27 principles of environment and development, Agenda 21, and a statement of principles for the sustainable management of forests, which were all adopted by consensus (without vote) by the conference. The institutional innovation resulting from the conference included an agreement on the operating rules for the Global Environmental Facility (GEF), United Nations Convention on Biological Diversity, and the establishment of the United Nations Commission on Sustainable Development (CSD) on the basis of an Agenda 21

⁶⁷ Our Common Future: Report of the World Commission on Environment and Development.

⁶⁸ Framing Sustainable Development The Brundtland Report – 20 Years On. Sustainable Development in Action, United Commission on Sustainable Development.

recommendation. The United Nations Framework Convention on Climate Change (UNFCCC) and United Nations Convention on Biological Diversity were products of independent, but concurrent, negotiating processes that were opened for signatures at UNCED⁶⁹.

The Convention divides countries into two groups: those who are listed in Annex 1 of the Convention and those who are not (known as 'non-Annex 1 Parties'). Annex 1 Parties are the industrialized countries, who have historically contributed the most to climate change. For example, North America and the European Union are jointly responsible for 85 percent of the human-made carbon dioxide in the atmosphere today. The UNFCCC established leading roles for industrialized countries in curbing global warming and required them assist developing countries to avoid the negative effects of climate change and to allow adaptation. UNFCCC called on Annex-1 Parties to stabilise their greenhouse gas emissions at 1990 levels by the year 2000.

5.3 United Nations Commission on Sustainable Development

The United Nations Commission on Sustainable Development (CSD) was established by the UN General Assembly in December 1992 to ensure effective follow-up of UNCED. It is responsible for reviewing progress in the implementation of Agenda 21 and the Rio Declaration on Environment and Development, as well as providing policy guidance to follow up the Johannesburg Plan of Implementation (JPOI) at the local, national, regional/

⁶⁹ https://www.unostamps.nl/subject_united_nations_conference_environment_development.htm

and international levels. The JPOI reaffirmed that the CSD is the high-level forum for sustainable development within the United Nations system⁷⁰.

The United Nations Conference on Sustainable Development (Rio+20 Conference) held in June 2012, recognized that while some progress had been made in the implementation of sustainable development since the Earth Summit in 1992, implementation was still a challenge for many countries. Reasons for this lack of implementation lie in insufficient progress and setbacks in the integration of the various dimensions of sustainable development (economic, social and environmental). The establishment of the United Nations high-level political forum on sustainable development (HLPF) was part of the response of the international community to this problem.

The green economy in the context of sustainable development and poverty eradication was one of the two themes for the UN Conference on Sustainable Development held in Rio de Janeiro in June 2012 (or Rio+20). Negotiations on green economy in the lead up to Rio+20 were challenging and the concept became a source of controversy and disagreement. Despite these challenges, governments agreed at Rio+20 to frame the green economy as an important tool for sustainable development; one that is inclusive and can drive economic growth, employment, and poverty eradication, whilst maintaining the healthy functioning of the Earth's ecosystems. Importantly, the outcome document also recognises that capacity building, information exchange and experience sharing will be critical for implementing green economy policies⁷¹. In this context, it invites the UN to work with partners to provide support to developing countries and to develop toolboxes, best

⁷⁰ Ida Kubiszewski and et al. 2007. United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, Brazil. *The Encyclopaedia of Earth*. p 1

⁷¹ <https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=738&menu=35>

practices, methodologies and models to aid green economy policy design and implementation.

Regardless of the efforts of the UN and the world community as a whole, many environmentalists and scholars are of the opinion that the above mentioned conferences, declarations, principles, commissions and policies has not been much of a success. This was mainly liable to the fact that the genuine idea of Sustainable Development was marred by political and economical aspirations of both the Developed and Developing countries. United States (US) and the nations of European Union (EU) have been influential in adaptation and implementations of Sustainable development principles and policies. While, G-77, comprising of the developing nations have been voicing out their opinion regarding these issues, given that the Sustainable Development strategies and policies differ from developed nations to developing nations, nations to nations, region to region and from local to national level.

5.4 National Status

The concern for environment and its protection was almost absent in the official policies from the very beginning of the planning programmes in India. The environmental policies of the Government Started in 1972 with the setting up of the National Committee on Environmental Planning and Co-ordination and the Environment Department in 1980⁷².

Chapter 8 of Agenda 21 agreed at the UN Conference on Environment and Development in Rio in 1992 called for the development of National Sustainable Development Strategies (NSDS). Ten years later, the World Summit for Sustainable Development in 2002 also urged states to take immediate steps to progress their national strategies and begin

⁷² Mitra A. 1998. Environment and Sustainable Development in the Hilly Regions of North- East India: A Study in Arunachal Pradesh, *International Journal of Social Economics*, Vol.25 No. 2/3/4. p 196-206

implementation by 2005. In response, a large number of countries have developed what have been (often loosely) defined as NSDS. UNDESA reports that, as at 2009, 106 countries were implementing a NSDS based on reporting to the UN Commission on Sustainable Development⁷³.

With regard to the above statement, Indian Council for Sustainable Development was established in 2007. It seeks to further fortify cooperation and exchange between India and the international community in the field of environment and development, with the broad objectives of:

-) Assessing the challenge of integrating environmental issues with development strategies, in order to establish a pattern of sustainable development in India,
-) Formulating strategies and directions, which would be provided as recommendations and advise to various levels and agencies of the Government of India, and
-) Disseminating and publishing information on issues linking the environment and development in India and practices to promote sustainable development.

India is signatory of many important international treaties in the field of environment, e.g. the International Convention for the regulation of Whaling, the International Plant Protection Convention, the Antarctic Treaty, the Vienna Convention for the protection of the Ozone Layer; the Basel Convention on Trans-boundary movement of hazardous substances, the Framework Convention on Climate Change; Convention on the Conservation of Biodiversity and the Montreal Protocol on the Substances that Deplete the Ozone Layer. (CSD 2002)⁷⁴

⁷³ <http://www.un.org/en/development/desa/climate-change/strategies.shtml>).

⁷⁴ <http://www.iisd.org/measure/capacity/sdsip.asp>, <http://www.gtz.de/rioplus/>

The National Environmental Policy (NEP) of 2006 articulates the spirit of sustainable development and states that only such development is sustainable which respects ecological constraints and the imperatives of social justice. The NEP 2006 also asserts that the most viable basis of environmental conservation is to ensure that people gain better livelihood from the act of conservation of natural resources than from environmental degradation.

Table 5.1: Key policies and programmes in India relevant to sustainable development

Economic	
Key Policies and Programmes	New Industrial Policy, 1991 Pharmaceuticals Policy, 2002 Marketing Assistance Scheme for SME Export Promotion Capital Goods Scheme National Mineral Policy, 2008 New Exploration and Licensing Policy National Telecom Policy, 2011 National Electricity Policy, 2005
Social	
Key Policies and Programmes	National Housing and Habitat Policy, 1998 Pradhan Mantri Gramodaya Yojna, 2000 National Policy for Empowerment of Women, 2001 Sarva Shiksha Abhiyaan, 2003 National Policy for Urban Street Vendors, 2004 National Rural Health Mission, 2005 National Food Security Mission, 2007 National Rehabilitation and Resettlement Policy, 2007 Debt Waiver and Debt Relief Scheme, 2008 National Mission on Education, 2009
Environment	
Key Policies and Programmes	National Forestry Action Programme, 1999 National Afforestation Programme, 2002 National Mission for a Green India, 2011 Auto Fuel Policy, 2002 Mission Clean Ganga Initiative National Forest Policy
Social equity(economic and social)	

Key Policies and Programmes	Rural Infrastructure Development Fund, 1995 Annapurna Scheme, 2000–2001 Rashtriya Krishi Vikas Yojana, 2007 Indira Gandhi National Old Age Pension Scheme, 2007 Indira Gandhi National Widow Pension Scheme, 2009
Social-ecological(environmental and social)	
Key Policies and Programmes	National Agricultural Policy, 2002 National Urban Sanitation Policy, 2008 Integrated Watershed Management Programme, 2009
Green economy (economic and environment)	
Key Policies and Programmes	Technological Upgradation Fund Schemes, 1999 Fodder and Feed Development Scheme, 2005 Integrated Energy Policy of 2008 Perform, Achieve and Trade (PAT)
Sustainable development(social, environment and economic)	
Key Policies and Programmes	Mahatma Gandhi National Rural Employment Guarantee Scheme, 2005 National Urban Transport Policy, 2006 National Environmental Policy, 2006 National Urban Housing and Habitat Policy, 2007 National Action Plan on Climate Change, 2008 National Disaster Management Policy, 2009 National Rural Livelihood Mission, 2009

Source: Ministry of Environment and Forests, Government of India, 2011

In India around 700 million people in the rural area are directly dependent on climate-sensitive sectors (agriculture, forests, and fisheries) and natural resources (such as water, biodiversity, mangroves, coastal zones, grasslands) for their subsistence and livelihood. Climate change and its effects will further reduce the adaptive capacity of dry land farmers, forest dwellers, fisherfolk, and nomadic shepherds, which is already very low. Water, soil, and air, which are the vital environmental sources for maintaining life have

been shrinking alarmingly⁷⁵. Agriculture, in India is a tradition, which for centuries has shaped the thought, the outlook, the culture and the economic life of the people. Agriculture therefore, is and will continue to be central to all strategies for planning socio-economic development of the country. Rapid growth of agriculture is essential not only to achieve self-reliance at national level but also for household food security and to bring about equity in distribution of income and wealth resulting in rapid reduction in poverty levels⁷⁶. Under different agro ecological zones characterized by varying temperature and rainfall levels, agriculture is practiced in lowlands and uplands in India. Because of their varied topography and poor soils, the uplands sustain lower populations than the more fertile lowlands⁷⁷. The various problems that confront the upland agriculture are as follows:

-) Degradation of natural resources (soil, water, forests)
-) Change in climate, biophysical conditions, population and technology, affecting the natural resources carrying capacity and social and economic development
-) Land tenure
-) Farmers' limited technical skills
-) Marketing of agricultural products
-) Gender issues
-) Gaps in agricultural production processes, marketing and industry in terms of regulations, technology, human resources, and physical infrastructure.

⁷⁵ Shara. R. 2009. Sustainable Development: The Way for Future, Where are we?. *Indian Journal of Community Medicine*. V.34(4).p 276-278

⁷⁶ Mathur U.C.2008. *Rural Marketing- Text and Cases*. Exel Book.p 479

⁷⁷ <https://www.scribd.com/document/93983461/Sustainable-Farming-Systems-in-Upland-Areas>

The following are some of the major watershed development projects being implemented in India:

-) National Watershed Development Project in Rainfed Areas
-) Watershed Development in Shifting Cultivation Areas
-) Soil Conservation in the Catchments of River Valley Projects and Flood Prone Rivers
-) Integrated Wasteland Development Project
-) Drought Prone Area Development Program
-) Desert Development Program
-) Watershed Development Fund.

5.5 North East Region

The intricate cultural and ethnic mosaic which the North-East region represents, with over 200 ethnic groups with their own languages and socio-cultural identity, coupled with factors such as geographical location and connectivity, poses a variety of challenges on the law and order and security fronts⁷⁸.

With 96 per cent of the borders of the North Eastern Region constituting international boundaries, and in explicit recognition of the need to break the fetters of the geo-political isolation of the Region, it is necessary to factor in what the Minister of External Affairs has described as “new inputs” in foreign, defence, internal security and international trade policy.

⁷⁸ <http://www.sa.i-pdf.info/h-economy/343016-1-i-north-eastern-region-vision-2020-the-vision-statement-independenc.php>

The gap between the region and the rest of the country in terms of various developmental outcomes, productivities and capacities of people and institutions is large and growing, and has to be bridged. Even within the region, there are vast differences, particularly between populations living in the hills and in the plains and between those living in the towns and villages. Given the vast disparities within the region, a development strategy will have to be evolved depending upon prevailing resources, conditions and people's needs and priorities. Further, the development strategy for the various tribes in the region will have to be participatory and should be calibrated in their own setting. Given the complexity of the task, augmenting investment to accelerate growth in the region is only a part of the story. The successful transformation of investments into developmental outcomes requires a variety of strategic initiatives.

5.6 Sustainable development and its relevance in Nagaland and Zunheboto

Under the dominant notion of development there is an infinite exploitation of ecological resource base which is seriously affecting the lives of the tribal and indigenous communities. The socio-cultural life of the tribals /indigenous people which is so closely linked to their ecology is rapidly eroded as a result of development- induced resource base destruction. The gap between the North east region and the rest of the country in terms of various developmental outcomes, productivity and capacity of people and institutions is large and growing, and has to be bridged. Even within the region, there are vast differences, particularly between populations living in the hills and in the plains and between those living in the towns and villages. Given the vast disparity within the region, a development strategy will have to be evolved depending upon prevailing resources, conditions and people's needs and priorities. Further, the development strategy for the

various tribes in the region will have to be participatory and should be calibrated in their own setting. Given the complexity of the task, augmenting investment to accelerate growth in the region is only a part of the story. The successful transformation of investments into developmental outcomes requires a variety of strategic initiatives.

The hills of Nagaland exhibit a remarkable topographic diversity with rare and variety of flora and fauna. Nagaland has a typical monsoon climate varying from tropical to temperate condition. Here the average rainfall falls between 2000mm-2500mm (approx). These climatic conditions and altitudinal variations coupled with varied flora and fauna generate a very unique biodiversity, and it comes under the Indo-Myanmar Biodiversity hotspot of the world. Though blessed with rich resources, these resources are extracted, exploited and destroyed in the name of development. It is a fact that Nagaland is a developing state, where the Government of Nagaland has taken up various developmental activities to be on par with the other parts of the country. Though development is necessary, proper implementation and mitigation of the developmental activities too is essential. For a development to be called sustainable it should bring into consideration of all the three pillars of sustainable development i.e. social, economic and environment. Any development failing to overlook any of three aspects cannot be considered sustainable. At present most of the developmental activities in Nagaland seems to be haphazard leading to environmental problems and depleting the quality of environment around us. Very recently the people as well as the Government of Nagaland are coming to the realization that if this trend continues then the future is bleak. The government of Nagaland is working for Sustainable development in the state through the department and other organizations such as Forest and Environment Pollution Control, Soil and Water Conservation, Land Resource Development, NEPED etc.

Recently a landmark Memorandum of Understanding (MoU) was signed between the government of Nagaland (GoN) and the Tata Trusts to collaborate towards sustainable development and improvement of the overall quality of life of 10,000 households of eight blocks in three districts Phek, Kiphire and Tuensang. Such collaboration by the Government of Nagaland with other organizations in the country and other countries are also taken up.

Though Government of Nagaland is doing its share in pursuing sustainable development as well as conserving the rich biodiversity of the state, exceptional credit is to be given to the people as most of the conservation initiatives are carried out by the people who depend on forest for their livelihood.

Forest plays a crucial role in the life-support system. They maintain the delicate ecological balance, conserve soil and recharge underground water resources. It is being reinforced by the development professionals who create awareness on biodiversity conservation among village communities. However the endeavour results from the village communities far exceed that of the professional. The gradual extinction and decrease of flora and fauna reported by the elders of the community is an important motivational factor for the communities to take up protection and conservation of the forest and biodiversity of their village or community. Many communities in Nagaland have taken initiatives in land within their village jurisdiction as well as combine efforts of cluster of neighbouring villages. In Nagaland, despite traditional conservation and wise-use practices to protect biodiversity over centuries, rampant hunting, forest degradation and tree felling are greatly threatening the State's biodiversity. The revival of traditional conservation practices through the creation of Community-Conserved Areas (CCAs), however, offers hope for conservation,

as communities set aside parcels of forests within productive, jhum (shifting cultivation) landscapes. CCAs face numerous challenges in their creation, effectiveness and sustainability. To ensure the future of Nagaland's CCAs and thereby its biodiversity, a multi-pronged approach including alternative livelihood opportunities through the development of wildlife tourism, legal recognition, ecological restoration, and long-term ecological monitoring is required. This CCA is not new to the Nagas. Since the Nagas belong to the community-based society, the conservation of their surroundings has been in practice. All decisions in the village pertaining to cultivation, preserving of forest, socio-economic issues are collectively made. Community Conserved Area is not a new phenomenon for the Nagas. Nagas were aware of the importance they depended on it for their livelihood. Though the name was different with different tribes and villages, Nagas were known to set aside a community forest where jhumming or other agricultural activities were prohibited. At present more than 500 CCAs are known to exist. A study of Nagaland's CCAs conducted by TERI and the Forest Department of Nagaland found that almost one-third of Nagaland's villages have constituted CCAs and as many as 82% of these 407 CCAs have completely or partially banned tree felling and/or hunting within the CCAs and enforce various regulations for forest protection (TERI, 2015). These CCAs which cover more than 1700 sq. km, by setting aside forests for conservation, also contribute extensively to carbon storage (an estimated 120.77 tonnes per ha (TERI, 2013), reduce emissions from deforestation and degradation, and are an important mitigation and adaptation strategy for climate change⁷⁹. Some of the CCA initiatives worth mentioning are:

⁷⁹Morung Express, November 17, 2015

5.6.1 Community Lead Nature Conservation and Tragopan Sanctuary; and Ecotourism in Khonoma Village

Community Lead Nature Conservation and Tragopan Sanctuary; and Ecotourism initiatives in Khonoma Village are a great success. Keeping in view of negative impact of logging and hunting, the Village Council and the villagers collectively banned logging and hunting. The efforts towards the conservation are in line with the directives of the Tourism Department. In 2003 Khonoma was selected and started the funding of Green Village project by Tourism Department of Nagaland under the scheme of the Ministry of Tourism, Govt. of India. After being initiated and funded from government scheme it is still identified as a community initiative for the following reasons:

-) Community members have taken a lead in planning and implementation of the project.
-) The sense of ownership in the community is high.
-) Ecotourism is flourishing with effort of community, well beyond the budget and period of project⁸⁰.

5.6.2 Nature Conservation and Eco-Tourism Project in Jotsoma Village

Jotsoma Village has recently taken up the “Nature Conservation and Eco-Tourism Project” in their Community Reserved Forest under which the Puliebadze Wildlife Sanctuary is situated. It is to be mentioned that Jotsoma youth plays an important role by maintaining vigilance of trekkers and make sure nothing is taken from the reserve. The villagers are of the view that ecotourism industry can boost the village’s economy by generating

⁸⁰ Patel B. 2008. *Education for Sustainable Development - A case study of the community lead conservation and ecotourism initiatives in Khonoma, in Nagaland state, India*. Submitted to Asia Good ESD Practice Project, Centre for Environment Education, Thaltej Tekra, Ahmedabad.

employment and revenues in the form of tourist guides, tourist transport and lodging place for tourists.

5.6.3 Amur Falcon Conservation

Nagaland is declared as the Amur Falcon capital of the world by an international team of Ornithologist from the Ministry of Environment and Forests, Wildlife Institute of India, Convention of Migratory Species Office, United Nations Environment Programme and Environment Agency. Every year, huge number of migrating Amur Falcons from Siberia stops over in the state, on their way to Africa. It is considered to be one of the biggest falcon roosts in the world. The conservation programme is mainly implemented by a local NGO-Natural Naga, Nagaland Wildlife and Biodiversity Conservation Trust, working with the Nagaland Forest Department along with the village council of Pangti, Ashaa and Sungro village, Wokha district. The village council of the three villages signed a declaration making hunting and killing of Amur Falcons illegal and punishable. This initiative with the positive support from village communities not only helped in reaching a zero mortality rate of the birds during its roosting period in Nagaland, but also has started attracting hundreds of tourists and curious scientists. Pangti village has won the Royal Bank of Scotland Conservation award for its protection and conservation efforts of Amur Falcons that roosts in their village and surrounding villages for two months.

Apart from these, some of the important CCAs are: Tszula Green Zone CCA(Mokokchung), Mt. Pauna CCA,Sendenyu CCA (Kohima),PKR CCA, Tostsu-Phiro CCA, Saramati-Awung CCA, Kanglatsu Chantongya CCA(Mokokchung), Phom CCA, Zanuba CCA, Zipuhu-Meluri CCA, SAPO CCA and YLK CCA.

Some of the CCAs under Zunheboto district are: Ghosu Bird Sanctuary, Satoi CCA, Sukhai CCA spreading over 450 hectares, Nanga Greener Zone (Plate 5.1) is a watershed protected area involving 14 villages through which the river Nanga (Doyang) flows through, Chishilimi CCA, Tizu CCA etc

In most of the CCAs the entire land under CCA belongs to individual, which has been donated to ensure better future. The success of such initiatives has opened the eyes of other villages and communities to tap the natural resources for Sustainable development and livelihood.

5.7 Initiatives and Potentials of Ecotourism and Sustainable Tourism Development in Nagaland

Considering the present Environmental issues and degradation due to Jhum Cultivation and various development activities, the State Tourism Department is encouraging and promoting Community participation in Ecotourism and Sustainable Tourism Development. The State Tourism Department facilitates the Tourist destination, by providing facilities to the local people in the rural areas. However, the initiatives adopted by the government are not sufficient to cater to the needs of the tourists coming to the state. Therefore, the Department is taking up the measures to open paying guest accommodations which are also known as 'Homestays'. This concept is already popular in some villages such as Khonoma, Kigwema, Jakhama etc. There is a need for more research on ecotourism and sustainable tourism so as to be able to implement the concept in different areas and destinations of the state.

As discussed above, the state has a strong philosophy of democratic and participatory approach. One can experience the clean and pollution free environment. Many villages have community forests which are conserved in their traditional way without inflicting much harm on the environment⁸¹. The area under forest cover is as high as given in Table 5.2.

Table 5.2: Forest Area Statistics, 2009-2010

Sl.No.	Particular	Forest area in Hectare	% to total forest area
-	Legal Status	-	-
1	a)Reserved Forest	6226	0.72
-	b) Purchased Forest	19247	2.23
2	Protected Forest	51679	5.99
3	Wildlife Sanctuary	3469	0.40
4	National Park	20202	2.34
5	Village Forest	-	
(a)	Accessible Forest	477827	55.37
(b)	Degraded Forest	284280	32.94
Total		862930	100
	Ownership		-
1	State	100823	11.76
2	Private	762107	88.24
Total		862930	100

Source: Statistical Handbook of Nagaland 2011, Directorate of Economics & Statistics Govt. of Nagaland

5.7.1 Wildlife and Bird Sanctuaries

Nagaland does have a number of Wildlife/Bird Sanctuaries that are located and scattered in different parts of the state. The chief ones are:

- (a) Intanki National Park spreading over 20202 hectares and is located in Peren District. It provides shelter to Hoolock Baboons, Elephant, Mithun, Barking Deer, Sloth Bear, Flying Squirrels, Hornbill etc. This sanctuary is one of the popular forest reserves in the eastern territory of Nagaland.

⁸¹ Kinny, A. and Lanusosang T. (2016). Exploring the Potentials for Ecotourism and Sustainable Tourism Development in Nagaland, India. *International Journal of Applied Research*. p 156-160.

- (b) Rangapahar Wildlife Sanctuary covering an area of 470 hectares houses many avifaunas such as Cuckoo, Parrot, Wood-pecker, Hornbill etc. Varieties of animals like Deer, Squirrels, Monkeys, Porcupines, Snakes etc are also found.
- (c) Fakim Wildlife Sanctuary situated in Tuensang District, has an area of 642 hectare, housing various flora and fauna, avifauna and plants which have medicinal value. This sanctuary was established in 1983 rising to almost 3000m close to Myanmar border.
- (d) Puliebadze Wildlife Sanctuary covering an area of 923 hectares is situated in Kohima District. Wildlife inhabiting this sanctuary are Wild Cat, Asian Black Bear, Wild Boar, Deer, Tragopan etc.
- (e) Ghosu bird Sanctuary is situated in Ghukiye village, 8 km away from Zunheboto District headquarter. It provides habitat to more than twenty species of endangered avifauna. Migratory birds can be sighted in the month of June to September. This bird sanctuary is maintained by the village community with the support from the neighboring villages prohibiting hunting and poaching in this area.

Besides fauna, these sanctuary houses rich flora too, with varieties of exotic and medicinal Orchids, Rhododendrons, Ginseng etc.

5.7.2 Festivals

Different tribal groups in Nagaland have their own festivals which are always celebrated in consonance with the change of seasons. The celebration of the festivals is deeply rooted to their attachment to their environment and it makes the landscape of the land more

attractive and colourful. Rightly, the state has been called the ‘Land of Festivals’, therefore. Major festivals observed by various tribal groups and their timing or season for celebration is as under:

Table 5.3: Important Festivals and Time of Celebration

Festival	Associated with	Month in which Celebrated
Sekrenyi	Angami	February
Moatsu	Ao	May
Suhkruhnye Tsukhenyie	Chakhesang	January May
Naknyulem	Chang	July
Tsokum	Khamnuingan	October
Aoleang Monyu	Konyak	April
Tokhu Emong	Lotha	November
Monyu	Phom	April
Yemshe	Pochury	October
Ngada	Rengma	November
Tuluni	Sumi	July
Amongmong	Sangtam	September
Metemniu	Yimchungru	August
Hega/Chega gadi	Zeliang	February/October

Source: Directorate of Tourism

From the above, one can aptly ascertain that Nagaland with its scenic beauty coupled with socio-economic ethos has a great potential for improving upon the development of tourism. The state has great potential for ecotourism. The success of Tourism Development in the State can also be tapped through local participation. Sensitizing the people to the

potential along with the measures from the side of government definitely will go a long way in working towards the preservation of nature since the festive occasions are mostly based on agricultural rhythm as progressed by nature itself.

5.8 Awareness Programmes on Sustainable development and Environmental Issues

The Government of Nagaland has been undertaking various awareness programmes through various department that are mentioned above. Awareness is disseminated through workshops, seminars and trainings in rural as well as urban areas. In the attempt to spread awareness among the young generation, Government funded Eco-clubs are set up in Schools. Apart from Govt. of Nagaland various NGO's are also playing a pivotal role in spreading awareness regarding environmental issues and need for Sustainable Development.

Nagaland Baptist Church Council (NBCC) one of the prominent church organisation in the state has voiced concern on Climate Change and Biodiversity loss. 20 associations/conventions and four associate members are affiliated to the council. Baptists form more than 80% of Nagaland's population and are the most Baptist dominant state in the world. The Sumi Naga tribe has three associations affiliated to the NBCC - Sumi Baptist Akukhou Kuqhakulu (Nito Mount), Sumi Aphuyemi Baptist Akukhou Kuqhakulu and Western Sumi Baptist Akukhou Kuqhakulu⁸². The organisation has encouraged their members to protect the God created natural environment. The organisation is doing their bid to battle the effects of climate change by incorporating lessons on environment, ecology and climate change in its Sunday school curriculum. The churches observes Green Sunday on the first Sunday of June every year, where the church

⁸² https://en.wikipedia.org/wiki/Nagaland_Baptist_Church_Council

leaders aware themselves and the church members on the different environmental issues.

The council has adapted “Rotomi Resolution No. 8 of February 2011 that:

1. Baptist churches will initiate change adaptation strategies and other eco-biological friendly actions, sensitise on conservation of forest and preservation of wild life, and work closely with the community leaders and concerned Departments for addressing the environment alarm.
2. Abstain from using jungle meat during NBCC and churches gatherings.
3. Discourage churches from offering wild animals during its Thanksgiving Services⁸³”.

5.9 Effectiveness of the Measures Taken

Despite the fact that the Government as well as NGOs are trying to protect and conserve the environment and biodiversity of the state, there are certain setbacks and negative implication in their effort. So far the CCA’s are getting momentum which, if encouraged more will be a great success in protecting and conserving the environment of the state.

Afforestation programme under the initiative of forest department rather will have negative effect on the environment in the long run. This is because most of the tree samples distributed by the Forest department are exotic species posing a threat to the forests of the state. Native tree species distribution will rather have positive impact on the forests of the state. Development plans, Laws and Act in the state seems to be developed without consulting the local people who are living at the lap of the forest. Developmental and

⁸³ Nagaland Institute of Health, Environment and Social Welfare.(2015). *ENVIS NEWSLETTER*. Vol:XIV No. 2. p3

conservation plans should rather be build up from grassroots level i.e. villages to upper level such as administration, implementation etc.

Though effort has been made to spread awareness, still, in the course of field work and respondents in Questionnaire are of the view that in most of the sample villages, awareness of such initiatives are not yet held in their villages. The respondents and the villagers also shared their view that such awareness to all the villages and concern citizens is the need of the hour.

5.10 Traditional and Indigenous Knowledge of Agricultural Practice and Forest Management of the Sumi Nagas

Shifting or jhum cultivation has been and continues to be the main agricultural activities of the Sumi Nagas. Though many have the contention for jhum to be the reason for loss of forest cover and environment degradation, one cannot deny that traditional practice of keeping fallow cycle in jhum has resulted in preserving the soil quality as well as replenishment of the forest. The traditional agriculture practice and forest management of the ancient Sumi has proved to be scientifically viable even though they did not have the luxury of present science technology. Most of their valued knowledge is based on time tested trial and error method.

Even though the rugged topography of the study area make it susceptible to soil erosion and landslides, the farmers in the area have avoided this problem in the jhum field by laying bunds in the slopes of the field. Mix cropping not only provides with all required nutrients but also helps in crop yield. The legume crops grown in the jhum helps in fixing nitrogen, thus, making the soil fertile and productive. Flowering plants such as cock's

comb and climbers are planted in the field to scare away rodents. Traditional ways of preserving seeds are simple yet effective. Small seeds such as sesame, mustard, cucumber, beans etc. are preserved in dry bamboo baskets or dried wild bottle gourd. Other seeds such as maize, millets, etc are hanged either in kitchen or outside in dry place (Plate 5.2 & 5.3). Smoke produced in the kitchen fireplace also prevents the seeds from pest manifestation. The sharing of seeds among the villagers and the neighbouring villages helps in maintaining the variety and continuity of seeds.

Forest and agriculture has been the main influence on the social and economy of the Sumis since ancestral times. People depended on the forest for all their needs. Forest provided food and house, the most basic needs of the human and hence forest was considered sacred and was used with care. Most of the villages have plot of land reserved as community forest, where cutting and felling of trees, hunting and collection of wild fruits and green leaves for commercial purpose are restricted by the village council. Cutting of trees or collection of forest produce in the clan or ancestral land is done with care taking due permission from the elders. The people live in close proximity with the forest and depend on it for their daily needs and therefore, they utilise the forest in such a way, that they may have enough for the future use too.

The relationship between man and environment was a matter of spiritual concern to the Sumis much like the rest of the Nagas. Big trees, stones, dense forests etc were considered to be the dwelling place of spirits and deities. Thus, they make sure that such places were protected and remain untouched because of various superstitious belief and taboos associated with them. Respect for the natural environment can be attributed for the conservation of environment in the ancestral times. The ancestral Sumis believed that

plant, stones, animals and other innate things too has spirits and therefore rash and careless destruction of these things were considered as bad omen. However, the pristine cultural practices are fast waning away specially among the younger generation. Thus, in this present scenario it would be advisable for the policy makers and conservationist to correlate the valuable indigenous knowledge system with modern strategies while adopting various acts and laws for the management and conservation of the environment⁸⁴.

5.11 Suggestions

Sustainable development should encompass social, economic and environment aspects. Therefore, these three are considered in order to understand the need for sustainable development in Zunheboto district. Traditional and modern practices are regarded as the two principal features of socio-economic activities present in the district.

Traditional practices in the district in terms of agriculture are the shifting and terrace cultivation. In terms of forest or natural resources usage the activities involved are collection of fodder, timber, firewood, medicinal plants and fauna. The resources used are for constructing house, fences, front yard or backyard platform etc. The tools and implements used in traditional practices are primitive. In the traditional society the needs of the people is limited and the usage of the resources was based on what is needed. Therefore, the quality of environment is good but the quality of life of the people is low.

In modern aspect the agricultural practices mainly consist of settled cultivation, horticulture and monoculture. Loggings, firewood, and collection of forest resources for commercial purpose are some of the activities related to forest and natural resources.

⁸⁴ Kinny A and Martemjen. J. 2015. Socio-Cultural Practices and Environment Management of Sumi Naga Tribe, *International Journal of Multidisciplinary Approach and Studies*. Vol.2 No.4. p 16-21

Construction of houses, offices, parks, roads, etc are the activities where natural resources are used. Modern tools and technology are used for different activities leading to easy harvesting of natural resources in large scale than the natural processes can replenish and reproduce. People's quest for comfort and luxury lifestyle has changed the usage of natural resources from needs to wants. Therefore, the quality of life of the people is good but not so with the environment.

Taking the account of both the traditional and modern aspects of socio-economic activities of the people of the district, there is need for integrating traditional and modern technique, ideas and ideals in order to achieve sustainable development. Therefore, keeping this in mind, why Sustainable Development is essential and suggestions for Sustainable Development are given in Figure 5.1 and 5.2 respectively. Any sustainable development strategies should consider the three pillars i.e. social, economy and environment. To achieve sustainable development in the district improvement in social aspects such as education, livelihood and health should be considered; while in economic aspects, improving the jhum by increasing the cycle, proper use and implementation of government schemes and developmental plans should be in line with the tradition and culture of the people and the environment can be improved through integrating traditional environmental practices and modern conservation technique/technology which will be more effective if its community based. Improving and upliftment of the mentioned aspect of the district will be successful through the following steps: a) awareness on the importance of the nexus between man and environment, b) encouraging traditional and indigenous agricultural practices and forest management c) integration of modern technology and traditional environment management techniques and d) mitigation and monitoring of various development activities. However, one should keep in mind that the successes of any

strategies or plan implemented are the combining effort from all section of the society. Naga in general and Sumis in particular, being a community based society has a strong tradition of village councils and community participatory initiatives. Therefore, any development or conservation efforts or initiatives should be community based having a participatory approach.

Fig.5.1: Social, Economic and Environment: Sustainable Development

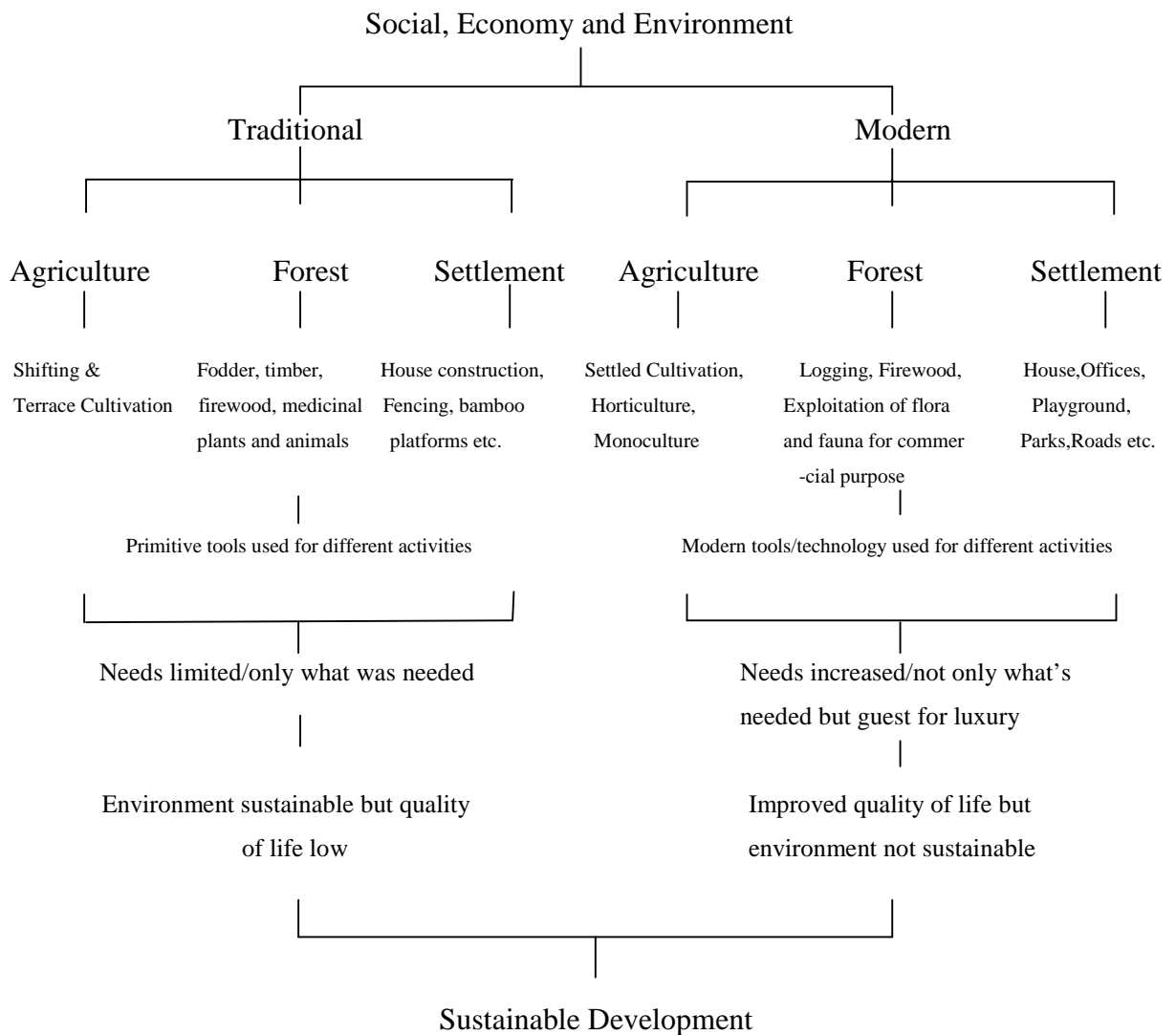
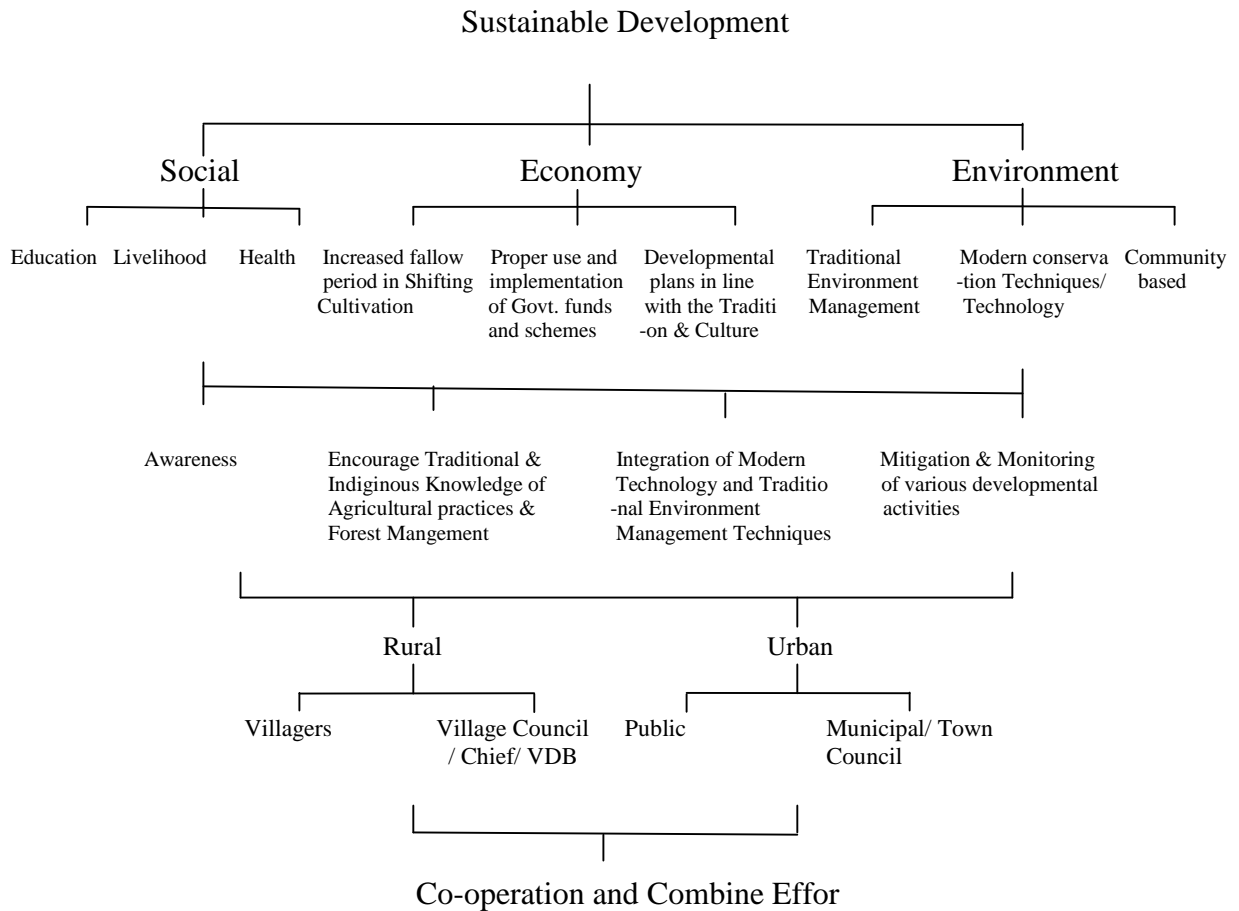


Fig.5.2: Suggestion for Sustainable Development

The world community is facing all kinds of environmental problems coupled with economic instability. Thus the need for Sustainable development encompassing all the aspects of Social, Economic and Environment is realised and accordingly efforts are made. With numerous talks, deliberations and developing of strategies and policies, it seems to have failed in implementation of the strategies and policies. Nagaland is no exception when it comes to implementation of laws, policies and strategies. As it is said ‘think globally, act locally’, it is high time that we not only think but act promptly for a better future. It is unmistakable to say that sustainable development will not be easy. Yet, it is an

unavoidable responsibility that is achievable with better planning, stronger policies, and effective execution. Governments can no longer look at the issue from a narrow, short-term perspective. To avoid destabilization of the planet, the inclusion of the sustainable development agenda in public and private policy spheres is not only unavoidable, but inescapable. Moreover, the general populations need to be aware of the environmental issues and need for conservation. Implementation of government defined policies alone cannot bring about massive change, greater change can be brought about by the people of all walks of life, since man and environment relation is complex and needs attention to the tiniest detail. Since the villagers are the people living in the hearth of nature they must be educated as to the importance of preserving and conserving our natural environment. A sense of dependence between the human and the natural environment has to be inculcated among the old and the young minds. The young generation through education, are becoming aware of that traditional and scientific practices in environment management and conservation, if integrated can go a long way in the sustainable development of the state as well as in the local level. What one has to realize, is that our earth, human and environment is like travelling on a plane, if the plane crashes, everyone faces the consequences no matter one is sitting in business class or economy class. If our earth's environment deteriorates all human kind faces the consequences with no distinction as developed or developing countries.

Chapter 6

Summary and Conclusion

Summary of research observations, remarks, findings, recommendations and suggestions are presented in this chapter. The research attempted to study the patterns of socio-economic change and its impact on environment in Nagaland and particularly in Zunheboto district of the state. Introduction to the research topic and concepts, methodology used, objectives of the study and review of literature are included in Chapter 1. In order to know the drive behind the theme, selected for the study area in a better way, one has to first understand geographical settings and socio-economic status of the study area. These two, as a background to the study have been dealt with in Chapter 2. Nagaland's demographic history reveals that from a population of 516,449 persons in 1971, the state population rose to 12, 09,546 persons in 1991, twice than in 1971 within 20 years. In 2011 Nagaland recorded a total population of 19, 78,502. Zunheboto has witness a growth in its population since its inception as a district. There has been a positive growth in decadal growth rate from 1981 to 2001 whereas a negative growth from 2001 to 2011. The district has also seen growth in urban population from 23,081 in 2001 to 27,597 in 2011. Agriculture is the main economic activity with jhum cultivation as the major system of cultivation in the district. Shifting cultivation also known as jhum, swidden or slash and burn constitutes 58.95% of the annual total net cultivated area in the state. In spite of immense rate of growth in the last two decades in Nagaland, full coverage of the population in terms of safe water supply, good housing condition, connectivity, toilet facilities and electricity remains a major challenge in the district. Zunheboto district is well connected to other districts by surfaced and unsurfaced roads and has a road length of 1339.50 kms. Land and Forest are the major natural resources serving the socio-economic needs of the district. The people primarily depend on agriculture for their occupation and economy. Cattle are reared for milk and meat. Pigs and poultry are the major livestock in

the district. However, Nagas as a whole and Sumis in particular are non-vegetarians, and therefore livestock are usually used for household consumption. The land holding system among the Sumis is similar to that of other Naga communities. Apart from community or village reserved forest, the land belongs to the villagers or rather to the Chief. The tradition and culture of the Sumi community is also marked by various beliefs and superstitions. But the advent of Christianity and the development of education system have played a vital and great role in changing the mindset of the people in regard to their traditional beliefs and superstitions.

No society remains stagnant. Every society or community has experienced different phases of changes in social, economic and environment aspects. And Chapter 3 tries to explain and describe how the people living in Zunheboto have changed in terms of social and economic activities so as their relationship with the natural environment has changed. Nagas lived in a world of their own, separated from the rest of the world for many generations. The Nagas like any other tribes are known to have lived in harmony with their natural environment. Though they lived in isolation from the outside world, their close relationship and adaptive nature with the environment enabled them to survive in hostile environment. Land and forest were the most important source of livelihood and thus were considered sacred. The Shifting cultivation they practiced has been considered by many as the main cause of forest depletion, but the Naga traditional way of managing their forest and natural environment has been remarkably preventing the environment from complete destruction. Drastic change in socio-economic life of the people was brought about by their contact with the American missionaries and the British colonists. Christianity, British rule and Modernity have no doubt affected the beliefs regarding nature and environment. These have led to change in the pattern of crops, economic activities, social setup and their

perception on man-environment relationship which has turned from mutual to exploitive. The mindset of the people is also changing from a sustained livelihood to cash oriented society, marked by hardworking to easy money culture. Mutual relation has given way to exploitation of nature due to greed.

Like any Naga group the Sumi Nagas too belong to community-based society. The collectiveness and the feeling of oneness which are a trademark of the communitarian society is fast changing, with the availability of government jobs and other business avenues the society has become individual oriented society. Cash economy or consumerism has now become one of the important root causes of all social evils and has also affected the people's perception on the intricate and close relationship with their natural environment. There is no more dormitory system, being replaced by modern education system. The tribes who were known for their honesty, hospitality and hard work are markedly no longer so.

Thus the development of the modern state order, social and economic development initiatives through education and various development packages and the globalizing factors of the modern society have greatly impacted upon the material culture of the Naga society. Like the case of other Nagas, Sumi Nagas are going through the process of changes wrought by modernity.

Though less in comparison with many of the Indian states in terms of environment problems, one cannot just write off the possibilities and consequences of various developmental activities in the study area. Nagaland is rated as an underdeveloped state. The reason is not the lack of funds but the major cause is the improper and non implementation of various development activities. Much of the positive growth has been in

educational sector and in living quality, but one cannot say they are at their best. Developmental activities seem to be implemented without much visionary. Most of the developmental activities in the study area are carried out keeping in mind only the short term profit and not the long term benefits. Environment ethics which was very much an ethos of the tribals including the Sumi Nagas is no longer adhered to.

In Chapter 4 attempts have been made to analyse how environment has been impacted by various human activities in the study area. Major affected areas are on forest and biodiversity, water, soil and land. Conspicuous consequences are: decrease of forest, loss of biodiversity, decrease in source of water, land degradation, soil erosion, landslides etc. Environment and human health are closely related and therefore, degradation and depletion of environment has great consequences on human health in the study area. The main sources of impact on the environment are population growth, change in land use pattern, introduction of exotic/invasive species, monoculture etc.

The main factors of land use change in the Zunheboto district are found to be anthropogenic in the form of agricultural activities, tree plantations and human settlement. Plant invasions are human introduced or of natural means like winds, birds, animals and water. It affects indigenous species diversity, soil ecology and dynamics and economics of agricultural ecosystem. The problem is rampant in Zunheboto with invasive plants such as *Argeratum conyzoids* L, *Eopatorium adenophorum* Sp., *Mikania micrantha* etc covering a large area of wasteland and jhum fallow land. Monoculture forest plantations which are rightly called Green Deserts are fast increasing in Nagaland with no exception of Zunheboto district. Plantations of rubber, pine, gomari, teak etc are striving in the district where large areas of land are being converted to these plantations for different economic

purposes. Such trend in monoculture poses a threat to the biodiversity and environment in the state.

The change in the land use pattern is the chief cause of loss of forest and depletion of biodiversity in Zunheboto district. Approximately 90 percent of the fire accidents in Nagaland are human-induced, intentional or unintentional due to the negligence and poor knowledge of the people. Collection of forest produce, shifting cultivation, cooking food in the forest etc. are the basic anthropogenic causes that ignite forest fires.. The decrease in jhum cycle has greatly impacted forest areas that house the source of springs, leading to loss of spring discharge capacity in the study area. Since the entire state is hilly, land is prone to soil erosion. With the increase of population pressure on land and also the advent of development programmes, the hazards of soil erosion are increasing in magnitude. In the study area the construction of road seems to be the major cause of landslides. The district has young land formation which is not stable, and therefore, faulty road cuttings and the vehicular vibration leads to landslides. Land degradation in Nagaland is man-made as well as natural phenomenon. Rapid population growth, improper land use, absence of land use policy, and the growing demands of increasing urbanization are exerting pressure on the environment and on the natural resources of the State. Air quality in Dimapur and Kohima, the commercial hub and the capital city of Nagaland respectively, are reported to be deteriorating due to increase in vehicular emissions and small scale industries. However, this is not the same case in Zunheboto District. The air pollution problems in Zunheboto are not yet felt much due to fewer motorized vehicles and industries. The primary sources of emission are wood and biomass. The major source of air pollution is dust.

The ethics of environment management which used to be part of the ancestor's approach to the nature seems to be fast depleting, driven by consumerism. Forest cover is destroyed and cleared for cash crops and the plantation of exotic trees. Therefore, there need to be certain strategies as to how one can achieve sustainable development according to the socio-economic set up and need of the study area.

Though development is necessary, proper implementation and mitigation of the developmental activities are essential. For a development to be called sustainable it should bring into consideration of all the three pillars of sustainable development i.e. social, economic and environment. Any development that overlooks any of these three aspects cannot be considered sustainable. Chapter 5 tries to understand the development and environmental situation and suggests measures towards sustainable development of the area. At present most of the developmental activities in Nagaland seem to be haphazard, leading to environmental problems. Very recently the people as well as the Government of Nagaland are coming to the realization that if unless the trend is checked, future will be bleak. Though Government of Nagaland is doing its share in pursuing sustainable development as well as conserving the rich biodiversity of the state, exceptional credit is to be given to the people as most of the conservation initiatives are carried out by the people who depend on forest for their livelihood through Community Conserved Area (CCA). Community Conserved Area is not a new phenomenon for the Nagas. Though the name was different with different tribes and villages, Nagas were known to set aside a community forest where jhuming or other agricultural activities were prohibited. At present more than 500 CCAs are known to exist. A study of Nagaland's CCAs conducted by TERI and the Forest Department of Nagaland found that almost one-third of Nagaland's

villages have constituted CCAs and as many as 82% of these 407 CCAs have completely or partially banned tree felling and/or hunting within the CCAs and enforce various regulations for forest protection (TERI, 2015). Nagaland as a whole and Zunheboto in particular with its scenic beauty coupled with socio-economic ethos has a great potential for improving the development of tourism specially Ecotourism and Cultural tourism. Nagas' being a community based society there is a strong tradition of village councils and community participatory initiatives. Therefore, any development or conservation efforts or initiatives should be community based having a participatory approach. Keeping this in mind sustainable development with social, economy and environment as its pillars has been suggested for the study area.

Chapter 6 sums up all the preceding chapters and brings out the results and findings with further suggestions and conclusion.

6.1 Findings

1. Though not much change is seen in the crop production and yield, there has been change in harvest time. The farmers bewailed that the harvest time is becoming late as they used to harvest at the end of August and early September. But now they harvest in mid and late September of the year. This trend has been evident since two to three years before and can be attributed to climate change.
2. It is observed that with the passage of time, production in terms of rice and other crops (vegetables) has seen changes. When rice yield is good other

crops yield is less or fails and vice versa. This is a recent trend, since in olden days this phenomenon was not prevalent.

3. Jhum cultivation is wholly dependent on monsoon rain. Erratic rainfall has been a hindrance to the farmers, for deciding the time of sowing and harvesting. In 2014, monsoon started late which led to poor yield in paddy and in 2015, it rained till the end of September, which made it difficult to harvest, and the already ripened rice germinated from the plant leading to less harvest.
4. Traditionally preserved seeds are being replaced by hybrid seeds, supplied seed and market seeds which pose a threat to the future of traditional seed and agro-biodiversity.
5. In the course of field survey, villagers lamented that the seeds they preserved traditionally are infested by storage grain pests which are of recent occurrence making it difficult to store and preserve seeds for the next sowing season. The reason behind this can be the harvesting and storing of seeds at a time when moisture content in the air is high or there is rise in temperature. Pest population increases at higher rate at higher temperature, which can be linked to global warming.
6. Area under jhum cultivation is decreasing even though there is increase in number of households of jhum cultivators in the district, mainly because of decrease in labor force.

7. Invasive/exotic plants and weeds which are not found in some villages are now wrecking havoc in their field. The farmers have knowledge to handle old indigenous weeds but have less knowledge on handling the new invasive/exotic weeds.
8. Use of more sophisticated tools for hunting and fishing has lead to decrease in wildlife in the district.
9. In the course of field survey majority of the respondents or a member of the family has respiratory/chest problem. This is caused mainly by smoke inhalation during jhum burning, improper ventilated kitchen as well as dust pollution.
10. Though landslide in the study area is caused mainly by the soil and slope nature of the area, landslides are mostly triggered by human activities such as clearing forest for construction purpose and mainly road construction. Taking into account the questionnaire response and field surveys, majority of the landslides in the district occurs along the road especially newly constructed roads.
11. Scarcity of water is yet another problem faced by the people in the district. This is one of the many reasons why people practice jhum cultivation in the district. Dry season starts from November and lasts till February. This is due to the presence of very few perennial rivers in the district. Moreover with the decrease of forest cover ponds, rivers and other water sources get

dried up in winter. It is observed that villages having vast forest cover have abundant water than those with less forest cover.

12. Traditional knowledge on forest management and sustainable agricultural practice are fast fading. Nagas have oral tradition, where all knowledge regarding social, economic and ecological aspects are passed on through oral narration. However, with little or no interest from the younger western influenced generations and with the passing away of the older generations, the traditional knowledge is dying away.
13. Under the constraints, particularly the very nature of topography prompts the people to migrate to plain, fertile and fast developing district like Dimapur district. Unless the measures are taken up in all earnestness, tendency to migrate or the outflow of people from the district will continue even affecting the demographic profile of the district. Retention of people needs to be stressed by putting more efforts to develop the district.
14. From various field observations and interviews, one understands that larger numbers of population are ignorant of the various programmes of State and Central government as well as other agencies. Though VDB has been operational for more than three decades, its performance is not up to the mark in most of the villages visited. There are also skill and knowledge issues in implementing the schemes and programmes. The Village Councils and VDBs should be equipped with the functioning of the programmes and their responsibilities in implementing the programmes. These can be done

through proper training and exposures to the developed or the positively developing villages.

15. Most of the interviewed individuals are of the view that the NGOs in the district are not effective. They feel that the NGOs should and can play a vital role in the overall development in the district.
16. Jhuming/Shifting cultivation from very ancient times has made the state difficult to have vast virgin forest. However, in spite of practicing jhum for many years, there are community forest and CCAs in almost all the villages. Therefore, these areas can be promoted as new sustainable alternatives through Ecotourism and Sustainable Tourism Development for sustainable livelihood.
17. Though some villages have successfully started and achieved better livelihood and sustainable tourism, many are unaware of the potentials. But, many of the visited communities lamented that in spite of their awareness of the potentials and benefits of tourism, they do not get any help from the state government. Most lament that, since the village communities depend on the forest and its produce for their daily need, it is not easy to force the villagers to stop collecting from the forest. Therefore, at least in the initial stage of tourism development state government should give the assistance.
18. Hunting is considered one of the reasons for decline in wildlife in the state, but in the course of field work, it was learned that every village visited

maintains the tradition of allowing every wildlife to breed without disturbance or killing, during their breeding season.

19. In course of field work and interviews many villagers were not aware of the environmental issues as well as the importance of conservation.

20. The autonomy given to the people of Nagaland under Sixth Schedule in their administration, legislation and financial matters, which was served to protect them from domination and exploitation from external forces, seems to be going in a different direction. People are taking advantage and abusing the land by exploiting the natural resources

6.2 Recommendations and Suggestions

- Very few of the government projects, developmental activities and policies are based on improving the quality of jhum, but rather on eradicating it. Encouragement of plantation of exotic plants by the government is rather a threat to the biodiversity and environment. Encouragement of improving the quality of jhuming such as increasing jhum cycle, prevention of soil erosion, pollarding and coppicing, growing of nitrogen fixing trees such as Alder and planting of native plants instead of exotic ones, is the need of the hour.
- The Sumi Nagas like other Nagas have unique environmental management practice which is fast diminishing with the change in social and economic life of the people. Management of land and environment through traditional knowledge and modern techniques should coexist. There is a need for encouragement and development of Terrace Rice Cultivation with proper irrigation system. People's age long

knowledge of maintaining the soil fertility and organic fertilizers practices has a better scope for not only increasing the production but also for sustainable management of land and environment.

- Environment and Development go hand in hand, and thus not only environment constrains developmental activities, but developmental activities also affect and constrains the environmental quality. The area under study must come up to its highest level of development in order to be on par with the mainland India. And for this Environmental Management and Sustainable Development become an absolute necessity. The primary aim of environmental management is to facilitate economic development without environmental damage. In other words, it should be 'Sustainable Development'. Although modern environment management is done by technically trained people with advanced techniques, there is a need to use indigenous and traditional methods of environmental management.
- Conservation is not a new thing in Naga society. Nagas have been protecting and conserving natural environment directly or indirectly and intentionally or unintentionally. Conservation efforts have always been community based. Therefore, any development activities or conservation efforts have to be based on community, having a participatory approach.
- Strategies for Sustainable Development should be formulated and implemented taking into consideration the social, economic and environment aspects of development. Under social aspects- education, livelihood and health of the people should be improved. Under Economy- improvement in agricultural system, increase of jhum cycle, proper use and implementation of government funds and schemes and developmental plans in line with traditional and culture of the people.

Under environment- Traditional environment management, modern conservation technology/techniques and community based environment protection and conservation should be persuaded.

- The above strategies can be achieved through the creation of awareness, encouraging traditional and indigenous knowledge of agricultural and forest management, integration of modern technology and traditional environment management techniques and mitigation and monitoring of various developmental activities.
- In order to achieve or succeed in any of the plans and strategies, co-operation and combine efforts from all the sections of society is indispensable.
- The various Non Governmental Organizations can play a more vital role in educating the people on various environmental issues and encouraging sustainable development in the state.

6.3 Conclusion

Man is an important part of the biotic component of the environment and simultaneously is also an important factor of the environment. Thus, man plays important roles in the natural environmental system in different capacities such as biological or physical man, social man, economic man and technological man. All the natural functions of human beings such as birth, growth, health and death are affected and determined by the natural environment in the same manner as the cases of other organisms. But man being most developed and advanced animal, both physically and mentally and hence technologically, is capable of making substantial changes in natural environment so as to make it suitable for his own living. Humans in their quest for comfort have been developing in every aspect

of life through inventions, discoveries and innovative ideas. But as man learned to know that it can use natural resources to meet their needs, there has been drastic change in perspective and actions made by human on natural environment. The role of most primitive biological or physical man in the functions of natural environmental system was fundamentally that of user of environmental resources. Thus, man played the role of a factor of the environment, but as the skills and technology of man developed with cultural development, his roles towards natural environment also changed progressively such as from user through modifier and changer to destroyer of the environment. With development in science and technology man has not only exploited and polluted the earth's environment but is also filling the space with satellites which is termed as space junk. Though development is essential yet one should not forget the environmental ethics. Development should be done in such a way that the needs of the present are met without compromising the future generation.

Environment is the source of life on earth and it not only directs but also determines the existence, growth and development of mankind and all its activities. As the basic law of ecology goes, that everything is connected to everything else and that one cannot change just one thing in nature. So, as environment and development also are connected and related to one another. Environment and development issues and the links or relation between them are of vital significance. It is, therefore, essential to have a close understanding of the inter-relationship between environment and development for formulation and implementation of any strategy that safeguards all concerned aspects. Hence, this research has attempted to connect social, economic and environment aspect of Nagaland in general and Zunheboto district in particular.

Nagaland as far as economic development is concerned is still in infant stage. Though the State has seen and experienced development in terms of infrastructures, the district still has enormous task ahead in order to cope up with the other developed districts of India. It is to be noted that Nagaland with its rich and high potentialities is still struggling with basic amenities and infrastructure. As discussed, the cause of this underdevelopment can be attributed to improper implementations of various schemes and various environmental constrains. Zunheboto like any other parts of the world has started experiencing global environmental problems, such as environmental degradation, global warming, climate change etc which need to be addressed immediately. In course of interviews almost all the villages visited, shared on the rise of temperature and its impact on crop production. There is a need for sustainable development that can be achieved through environmental management and conservation. A proper environmental management system will help in generating a healthy environment, which will lead to a healthy economy for the present and for the future generations. One needs to develop keeping in mind the environmental ethics, that we are a part of the environment and by harming and destroying the environment, we are harming ourselves. What we inherit, we inherit from the past, what we can gift to the future generation is a better environment.

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Plate 2.1: Felling of trees for jhuming



Plate 2.2: Burning of jhum



Plate 2.3: Burnt and ready for sowing



Plate 2.4: Sowing (broadcasting) of Paddy



Plate 2.5: Harvesting



Plate 2.6: Storing of paddy in granary



Plate 2.7: Storing of paddy in bamboo weaved basket



Plate 2.8: Mix cropping



Plate 2.9: Traditional tools used in Farming



Plate 2.10: Terrace cultivation in Tizu valley



Plate 2.11: Tea plantation



Plate 2.12: Kiwi plantation



Plate 2.13: Gathering for MGNREGS work



Plate 2.14: Construction of village gate, agri- link road, village roads, etc



Plate 2.15: Apuki at Lazami Village



Plate 4.1: Invasive plants found in Zunheboto



Plate 4.2: Pine Plantation in Suruhuto, Zunheboto district



Plate 4.3: Teak plantation in Dimapur



Plate 4.4: Rubber Plantation in Dimapur



Plate 4.5: Raw rubber production



Plate 4.6: Roundup used in the study area



Plate 4.7: Spraying of roundup around houses in Lumami village, Zunheboto District



Plate 5.1: Nanga Greener Zone CCA



Plate 5.2: Traditional seed preservation



Plate 5.3: Sixty year old preserved Khatara Paddy (Lazami village)

Appendix

Questionnaire for Socio-economic and Environmental Status

Dear friend(s),

I am a PhD scholar in the Department of Geography, Nagaland University, doing research on “Pattern of Socio-economic Change and its Impact on Environment in Nagaland with Special Reference to Zunheboto District”. This thesis is for the partial requirement of the Degree of Doctor of Philosophy.

The study will provide information of the current socio-economic and the environmental quality of Nagaland and Zunheboto district. The main importance of the study is to show how and in what rate the socio-economic change is impacting the natural environment of the study area. I, therefore, oblige your concern and sincerity in responding the following Questions. I assure you that **the information provided by you will be completely anonymous and confidential.**

In case of any query and concerns about the survey, please do not hesitate to contact me on the address given below.

Thanking you in anticipation.

Yours faithfully,

Avitoli Kinny,

PhD Scholar,

Department of Geography,

Nagaland University.

Ph. No. 09862466582.

Email: avikinny@gmail.com

I. General Information

1. Name of the respondent: _____
2. Sex:_____
3. Age:_____
4. Education:_____
5. Profession/Occupation:_____
6. Present address:_____
7. _____
8. Permanent
address:_____

II. Housing

9. Own/rented/other:_____
10. Brick/bamboo/others:_____
11. Lighting:_____
12. Sources of water:_____
13. Fuel used:_____
14. Other facilities (TVs/cars/refrigerators
etc.):_____
- _____

III. Land Related Information

15. Total land owned by the family:_____ (hectares/acres/sq.km/local unit used)

16. Irrigated land:_____ (hectares/acres/sq.km/local unit used)

17. Cultivated land:_____ (hectares/acres/sq.km local unit used)

18. Other land:_____ (hectares/acres/sq.km local unit used)

IV. Agriculture and Allied Activities

19. Crops

cultivated:_____

20. Domesticated

animals:_____

21. Type

of

cultivation:_____

22. No. of family members employed in agriculture full time:_____

23. No. of family members employed in agriculture part time:_____

V. Socio- Economy Related Information

23. No. of members in your household: _____

24. No. of male and female in the household: _____

25. Education qualifications of the household members:

26. No. of family employed in Govt. service: _____

27. Family monthly income:

☐ Below Rs. 5,000 ☐ Rs. 5,000-10,000 ☐ Rs. 10,000- 15,000 ☐ Rs. 15,000-20,000

☐ Rs. 20,000-25,000 ☐ Rs. Above 25,000

28. Total number of schools and colleges in your village/town: _____

a. No. of Primary school: _____

b. High school: _____

c. College: _____

d. Others: _____ (if any, please mention the name)

29. Any medical facility in the village/town: ☐ Yes ☐ No

If yes, please mention the name: _____

30. What are the diseases, the population of your village/town mostly suffers from?

31. Type of road connected to your village/town:

☐ Black topped ☐ Kutchha road ☐ Footpath

32. How is the condition of the road?

☐ Good ☐ Very good ☐ Bad ☐ Very bad

33. How is the functioning of Village council/VDB/ Municipal council?

☐ Good ☐ Very good ☐ Bad ☐ No functioning at all

34. Any development activities by the Govt. /VDB/ Municipal council? ☐ Yes ☐ No

If yes, please mention the activity:

VI. Environment Related Information

35. Do you feel the pattern of weather is generally changing?

☐ Yes ☐ No ☐ Don't know

36. If yes, why do you think this might be?

37. Please look at the following list of environmental issues, and tick the three issues that concern you the most in your area/village/town:

- ☐ Air pollution ☐ Pollution of rivers ☐ Climate change
- ☐ Using up of natural resources ☐ Extinction of species ☐ Overpopulation
- ☐ Deforestation

38. Now please indicate how much you agree or disagree with the following **general statements** by **ticking one box on each row**:

	Agree	Neither agree nor disagree	Disagree
a. Humans have the right to modify the natural environment to suit their needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Humans are severely abusing the planet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Plants and animals have the same rights as humans to exist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Humans are meant to rule over the rest of nature.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. The balance of nature is very delicate and easily upset.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Nature is strong enough to cope with the impact of the fast developing activities in Zunheboto district	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

39. Is there any protected/ reserved forest? ☐ Yes ☐ No

If yes, please mention them:

40. Have you heard or know of virgin forest in your area? ☐ Yes ☐ No

41. Do you notice any difference of crop production in your area?

☐ Increased ☐ Decreased ☐ No difference

42. Cultivators in your locality use any fertilizers/pesticides/ weedkiller?

i. Fertilizers used: _____

ii. Pesticides used: _____

iii. Weedkiller used: _____

43. Do you face water scarcity in you locality? ☐ Yes ☐ No

If yes, please mention the months and reason:

44. Have you noticed any difference in the **quantity** of water in rivers, ponds, lakes etc. in the pervious 5-10 years? ☐ Yes ☐ No

If yes, please tick: ☐ Increased ☐ Decreased

46. Have you noticed any difference in the **quality** of water in rivers, ponds, lakes etc. in the pervious 5-10 years? ☐ Yes ☐ No

47. Does Landslide occur in your area? ☐ Yes ☐ No

If yes, please tick where it occurs often:

☐ Roadside ☐ Cultivated area ☐ Populated area ☐ Others

48. Whether there is increase or decrease in the number of plants and animals that are being seen/observed in your locality in the last 10 years. Please mention the name of the plants and animals.

49. Any community based fishing/hunting in your locality? ☐ Yes ☐ No

If yes i) How many times in a year? _____

ii) What are the methods?

50. Please give your comments/suggestions/opinion on the topic or the questionnaire.

Name of the Respondent with Signature:

Date:
