BIODIVERSITY CONSERVATION THROUGH TRADITIONAL PRACTICES IN NAGALAND: A GEOGRAPHICAL ANALYSIS

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Chapter 1

Introduction

1.1 Introduction

The earth is home to a rich and diverse array of living organisms, whose genetic diversity and relationship with one other with their physical environment constitute our planets biodiversity. The biosphere or the ecosystem, as it is generally called is an evolutionary system that supports life and represents a stable equilibrium of various physical and biological factors which have been operating over all ages. The biosphere supplies the essential requisites such as light, heat, water, food and living space or habitats for all living species.

The air, water, humans, animals, plants, soil and bacteria are all invisibly interlinked in a self sustaining environment. They follow a rhythm and movement of its own which depend upon a whole set of delicately balanced cycles and thus forming a symbiotic relationship between them leading to a bewildering diversity.

The relationship between these biotic and abiotic components is so intimate that disturbance caused to any one of the components affect their relationship which slowly and ultimately leads to extinction. It is therefore, absolutely necessary that these cycle of symbiotic relationship between the organisms should be maintained unimpaired.

Biodiversity is considered as the natural biological capital of the earth. In the words of Meadows (1990), “Biodiversity contains the accumulated wisdom of nature and the key to its future”.

The term biodiversity is the shortened term for biological diversity and is variously viewed and defined in many ways but the elements of variety of genes, species and ecosystems have always been at the core of all the definitions. It can be understood as the

sum total of variety of life including plants, animals and other organisms on earth which critically forms the basis of ecological stability and life supporting system for humankind (Lanusashi, 2011).

Biodiversity in its literal sense simply means “diversity in life forms” (Mukherji, 2010). It also understood as the number or richness of different plants and animal species living in a particular region representing the wealth of biological resources available to us.

Singh (2008), defines biodiversity as “variety of living organisms of a given area, region or an ecosystem in terms of diversity of genes, species and ecosystems, at a given time span and is characterized by spatial and temporal changes”

The Convention on Biological Diversity (2003), defines biodiversity as “the variability among living organisms from all sources including inter alias, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part”.

This variability has created numerous ecological niches and habitat type making possible the survival of millions of different kinds of animals and plants, both domestic and wild, over the surface of the earth.

Biodiversity is thus, “life endless forms” as exclaimed by Darwin (1859) and is indeed, the ‘essence of life’ (Frankel, 1970). In the understanding of the indigenous people, biodiversity is much more than economic resource or of academic interests; they are life itself and have integral and spiritual value (Lanusashi, 2011).

Biodiversity is usually considered at three different levels:-

(i) **Genetic Diversity:** it refers to the variations in genetic information contained in the genetic materials of individual plants, animals and micro-organisms that inhabit the earth. Genetic diversity is needed by any species in order to maintain reproductive vitality, resistance to disease and the ability to adapt to changing environment.

(ii) **Species Diversity:** it represents the diversity of species and sub-species on the surface of the earth. Species diversity has been estimated to be between 5 and 50 million or more, though only about 1.4 million have been exactly recorded (Singh, 2002).

(iii) **Community Diversity or Ecosystem Diversity:** Community diversity relates to the different biological communities and their associations with the physical environment. It represents the collective response of species to different environmental conditions. It is expressed by the variety of habitats, biotic communities and ecological processes e.g., forests, deserts, grassland, wetlands etc.

The fundamental social, ethical, cultural and economic values of biodiversity have been recognized in most of the human disciplines, from religion to science. It is part of our daily life as it provides goods and services essential to support human livelihood and aspirations that enable societies to adapt to changing needs and circumstances. It has a number of functions on the planet earth. Some of which are as follows:

i. **Maintaining Balance of the ecosystem**: Biodiversity helps in maintaining a proper balance of the ecosystem by, stabilizing the climate, by protecting the water regime. They act as a medium for recycling and storage of nutrients and combating pollution. Further, they help in forming and protecting the soil.

ii. **Provision of Biological Resources**: The worlds Biodiversity act as a medium for providing medicines, pharmaceutical, wood products and ornamental plants. Besides, they provide food for the human population and animals and act as a medium for breeding stock for diversity of species, ecosystems and genes.

iii. **Social Benefits**: They provide social benefits in the form of recreation and tourism and also by providing cultural value and education and research.

Further, the role of biodiversity in the following areas will help make clear, the importance of biodiversity in human life:

i. **Biodiversity and Food**: It is estimated that 80% of human diet (FAO, 2015) is provided by plants alone and other mammal and bird species makes up more than 90% of global livestock production (Chan, 2015).

ii. **Biodiversity and Human Health**: Biodiversity is the foundation for human health. It plays an important role in drug discovery and medicinal resources. It is estimated that medicines from nature account for usage by 80% of the world's population.

iii. **Biodiversity and Industry**: Industries and factories around the world depend on biodiversity for providing raw materials including, fiber, oil, dyes, rubber, water, timber, paper and food.

iv. **Biodiversity and Culture**: Biodiversity acts as social and cultural identity and enhances recreational activities such as bird watching, fishing, trekking etc.

Thus, it is clear that biodiversity is the cornerstone of our existence on Earth and is the life support system of our planet- we depend on it for the air we breathe, the food we eat, and the water we drink. As a result, there is now a growing recognition that biodiversity is a global asset of tremendous value to present and future generations.

By protecting the life sustaining goods and services which biodiversity provides us, the conservation and sustainable use of biodiversity can provide significant benefits to the entire human population. In contrast, the continuing loss of biodiversity on a global scale represents a direct threat to our human health and well being and ultimately threathens our very existence on the planet earth.

However, inspite of its tremendous importance and contribution biodiversity provides, it is heartening that biodiversity is fast waning away from the face of the earth which in turn has caused serious economic and social cost to the entire universe.

The ever expanding human population coupled with development, urbanization, mining, industrialization and other human activities have created havoc on earth and its species. This tragic loss and degradation of biodiversity holds serious economic, ethical and cultural consequences for humanity and the evolution of life on earth. The symptoms of this degradation are all around us, from local deforestation to global climate change.

Biodiversity occurs within all habitats, because genetic diversity has allowed life to adapt to the harshest of environments. However, species are not spread evenly over the earth

and biological diversity is greater in some areas than in others owing to the difference and variation in temperature, altitude, precipitation, soils and their relation with other species.

Some habitats, particularly tropical forests among terrestrial systems, have a great number of species owing to their favourable climatic conditions. Tropical forests cover only 7% of earth's land surface, yet they are estimated to contain at least 50% of all species (Husain, 2006). Equally important, they are being depleted faster than any other ecological zone.

Over the past few decades, as the loss of landscapes, habitats, species and genes, has become an issue of international concern, there has been a substantial increase over the awareness and importance on the protected areas of the world notably both in size and number.

In order to protect and conserve this ever degrading biodiversity, the United Nations has identified certain regions as biodiversity "Hotspots" all over the world.

The idea of hotspots was first mooted in 1988 by ecologist Norman Myers, who defined a hotspot as an area of exceptional plant, animal and microbe wealth that is under threat. The key criteria for determining a hotspot are:

i. No. of Endemic Species i.e. the species which are found nowhere else
ii. Degree of threat, which is measured in terms of Habitat loss.

Accordingly, the Conservation International (2013) has identified 34 biodiversity hotspots all around the world. The 34 hotspots identified by Conservation International

represent 2.3% of Earth's land surface but are home to at least 150,000 endemic plant species (50% of the world's total number of plant species) and nearly 12,000 terrestrial vertebrates (42% of the world's total number of terrestrial vertebrates).

Sustainable conservation of biodiversity in its total form and its complete existence within the environment is vital for human survival and development. Alterations in the ecosystem composition, such as the loss or decline of a species, can lead to a loss biodiversity. Technological interventions and human activities have not only changed the set up and status of evolution, but have also accelerated the depletion, steep decline and deep extinction of biodiversity reserves. Hence, the need to conserve and judicially use this biodiversity sustainably has become one of the most important and challenging task for the entire humanity.

While the outburst and focus on biodiversity conservation from global to local level is of recent phenomenon, it is interesting to note that the traditional or indigenous societies all over the world has been sustainably managing and protecting their biodiversity since time immemorial.

Many traditional societies do have strong conservation ethics. These ethics are subtler and less clearly stated than western conservation beliefs, but they tend to affect people’s actions in their day-to-day lives, perhaps more than western beliefs (Posey, 1992). Thus, it is pertinent to put an effort in analyzing and studying the indigenous peoples perspective, their methods and techniques of biodiversity utilization and management which has helped them conserve and sustainably manage their biodiversity for ages.

1.2 Indigenous Peoples and Biodiversity

Indigenous people are the original inhabitants of their region and are generally found to have their own local system of rights to natural resources. They have been responsible stewards of their land and resources. They have survived and thrived in all corners of the world, sustainably using and managing their resources with their traditional knowledge and practices for thousands of years.

Indigenous peoples also called tribal, aboriginal or autochthonous peoples, national minorities or first peoples. According to Toldo (2013), they are best defined by using several criteria's, of which they may have all or part of the following criteria:

1. Are the descendants of the original inhabitants of a territory which has been overcome by conquest.
2. Are "ecosystem peoples". Such as shifting or permanent cultivators, herders, hunters and gatherers, fishers or handicraft makers, who adopt a multi-use strategy of appropriation of nature.
3. Practice a small-scale, labor-intensive form of rural production which produce little surplus and has low energy needs.
4. Do not have centralized political institutions, organize their life at the level of community and make decisions on a consensus basis.
5. Share a common language, religion, morals, beliefs, clothing and other idendifying characteristics as well as a relationship to a particular territory.

6. Have a different world-view, consisting of a custodial and non-materialistic attitude to land and natural resources based on a symbolic interchange with the natural universe.
7. Are subjugated by a dominant culture and society
8. Consist of individuals who subjectively consider themselves to be indigenous

Today, traditional Indigenous Territories encompass 22 percent of the world's land surface and they coincide with areas that hold 80 percent of the planet's biodiversity. Also, the greatest diversity of indigenous groups coincides with the world's largest tropical forest wilderness areas in the Americas (including Amazon), Africa, and Asia, and 11 percent of world forest lands are legally owned by Indigenous Peoples and communities (Sobrevila, 2008). This convergence of biodiversity-significant areas and indigenous territories presents an enormous opportunity to expand efforts to conserve biodiversity beyond parks, sanctuaries and biosphere reserves which tend to benefit from most of the funding for biodiversity conservation. Further, Alcorn (1968) in "Indigenous peoples and Biodiversity" states that "the bulk of the world's biodiversity is embodied within the limits of the indigenous territories of the tropical countries".

Almost all the hotspots in the world are in places indwelled by indigenous people. This gives an idea that the indigenous people have been protecting their biodiversity with their traditional knowledge, wisdom and practices.

However, indigenous people who practice their traditional culture are on the decline. In most areas of the world, indigenous people are coming into contact with the outside world, resulting in changing belief system (particularly among the younger members of

the society) and greater use of outside manufactured goods. Sometimes this shift can lead to a weakening of ties to the land and conservation ethics (Primack, 2006).

Given the fact that 80% of the world's biodiversity is found in indigenous territories, the idea that biodiversity conservation is impossible without the participation of indigenous communities is increasingly gaining recognition in national and international conservation circles.

David Maybury Lewis, has rightly stated, "It's as irony that while tribal peoples with few resources strive mightily to keep their ties to the earth, we, with huge resources, strive mightily to leave it behind. We need no more power for the children to live another thousand years. We need the old wisdom, those wisdoms that lie at the common fundament of all humanity. Wisdom of the different, yet common family. Wisdom of the different, yet common myths. Wisdom of the different, yet common home" (Plotkin, 2011).

Modern management techniques often overlook and disparage these indigenous systems, which are based on centuries of in situ sustainable existence, in favor of high-tech but often inappropriate and expensive systems that fail. We can learn a great deal about environment from such indigenous cultures.

Once viewed as an inferior form of knowledge, with little potential to contribute to development, traditional or indigenous forms of knowledge are finding increasing mention in the development course (Mere, 2013).

Thus, there is the need to know these traditional knowledge and practices which has helped the indigenous people protect their (world's) biodiversity for centuries.

1.3 Traditional knowledge and practices

Traditional knowledge is the information that people in a given community, based on experience and adaptation to a local culture and environment have developed over time and continues to develop. This traditional knowledge or indigenous knowledge can be understood as the basis for local level-decision making in agriculture, healthcare, food preparation, education, natural resource management and a host of other activities in rural communities. It is the knowledge that has been developed out of time tested experience which has been handed down from generation to generation over centuries and the resultant practices are regarded as traditional practices.

Traditional knowledge is mostly associated with indigenous people all around the world. Indigenous communities have accumulated a wealth of traditional knowledge through centuries of dependence on nature-including knowledge about medicinal plants, wild foods and agricultural practices, and knowledge embodied in the native seed varieties and livestock breeds that they have improve and conserved. This knowledge is used to sustain the community and its culture and to maintain the genetic resources necessary for the continued survival of the community. In the understanding of the indigenous people, traditional knowledge and wisdom forms a seamless relationship with their heritage which intimately links human survival, development and sustainability with the physical environment that surrounds them.

There is an inextricable link between indigenous culture, ethnic diversity and biological diversity. All over the world the indigenous people have protected and preserved the biodiversity with which they have symbiotic relationship. The worlds remaining areas of

high biodiversity are often found on indigenous community's lands and in their water bodies (Chauhan, 2003).

Indigenous communities have generally preserved their tradition, art, culture, agriculture and indigenous practices over centuries. Living in close relation to complex ecosystem, indigenous people have developed an understanding of the diverse reciprocal interactions of such systems within their environment. Their extensive knowledge, expertise, understanding and utilization of their local environment often has conserved and enhanced biodiversity.

Indigenous people have accumulated a whole lot of empirical knowledge on the basis of their experience whilst dealing with nature and natural resources. This traditional wisdom is based on the intrinsic realization that man and nature form part of an indivisible whole and therefore should live in partnership with each other. This ecocentric view of traditional societies is widely reflected in their attitudes towards plants, animals, rivers and the earth (Ramakrishna, 2002). There is an increasing realization that many of the traditionally valued species could play a major role in the present context of increasing population and quest for better quality of life.

The great mistake people make is in thinking and considering that indigenous people are primitive peoples. They fail to realize that they were actually, very sophisticated societies and had cultures with immense awareness and very important values. This sophistication is found in their vast knowledge and wisdom on the Mother Nature, its biodiversity, agricultural systems, traditional social and moral values etc.

In spite of the years of extensive debate on biodiversity, policy makers, academicians and environmentalists were contemptuous of the indigenous knowledge and viewed it to be unscientific and irrelevant. Rather attention was focused on the modern scientific research for the conservation and management of the biological diversity. However, recent emerging perception is fast changing with the realization of the centuries of intimate relationship between environment, sustainability and their symbiotic relationship with the indigenous peoples (Lanusashi, 2011).

Agenda 2 of the Rio Earth Summit (1992) stated that, the indigenous people and their communities have vital role in the environmental management and development because of their knowledge and traditional practices. State should recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development.

This realization is reflected in Article 8 (j) of the Convention on Biological Diversity, which states to, “respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of benefits arising from the utilization of such knowledge, innovations and practices”.

Further Article 10 (c) states, “protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements” (Handbook of the convention on

Biological Diversity). Thus, there is now a growing literature and general understanding that indigenous knowledge is more than just ancient and historical.

Although many governments have refused to recognize this connectedness and the legitimacy of the indigenous systems of resource management and property in the past, the important role indigenous and local communities play as decisive stake holders for initiatives concerning the protection and sustainable use of biodiversity has been increasingly recognized in the global environmental discourse.

In particular, the contribution that local knowledge systems can make to conservation efforts has been widely acknowledge and has become an evolving subject of national and international law (Maass, 2005).

Chauhan (2003), while emphasizing on the importance of traditional knowledge has rightly stated that the traditional knowledge should be applied in modern development strategies. He further states that biotechnology uses traditional knowledge of the indigenous peoples with modern tools of genetic engineering to get the desired results. There is a need to protect, preserve and conserve this traditional knowledge.

Indigenous knowledge is holistic, as it is intricately linked to the practical needs of use and management of local ecosystems. Although indigenous knowledge is based on observations on a rather restricted geographic scale, it provides detailed information on the whole scenery represented by the concrete landscapes where natural resources are used and managed.

As a consequence, indigenous minds not only possess detailed information about species of plants, animals, fungi and some microorganisms; they also recognize types of minerals, soils, waters, snows, landforms, vegetations and landscapes.

India, a mega diverse country with only 2.4% of the world's land area, accounts for 7-8% of all recorded species, including over 45,000 species of plants and 91,000 species of animals. It is situated at the tri-junction of the Afrotropical, Indo-Malayan and Palaearctic realms, all of which support rich biodiversity. Being one of the 17 identified mega diverse countries, India has 10 biogeographic zones and is home to 8.58% of the mammalian species documented so far, with the corresponding figures for avian species being 13.66%, for reptiles 7.91%, for amphibians 4.66%, for fishes 11.72% and for plants 11.80% (India's Fifth National Report, 2014).

India is an acknowledged centre of crop diversity and harbors hundreds of varieties of crop plants such as rice, maize, millets etc. The diverse physical features and climatic conditions have resulted in a variety of ecosystems such as forests, grasslands, wetlands, desert, coastal and marine ecosystems which harbor and sustain high biodiversity and contribute to human well-being.

Out of the 34 hotspots in the world, four are present in India. They are:

i. The Himalaya
ii. The Western Ghats
iii. North-East (Indo-Burma)
iv. Nicobar Islands (Sundaland)

Almost all the hotspots in India are inhabited by Indigenous/Tribal/Adivasis. Thus, it is evident that, the indigenous people in India have attributed significantly to biodiversity of the country making India one of the 34 biodiversity hotspot and among the 17 Mega diversity countries in the world.

It is estimated that about 2% of the world's flora and fauna are endemic to the Indo-Burma biodiversity hotspot. This hotspot is confined to just 1.4% of the earths land surface but harbours over 35% of known vertebrate species (NEPED, 2012).

The eastern Himalayas in North-Eastern India, is the western extremity of the Indo-Burma biodiversity hotspot and is a distinctly important biological entity by itself. It accounts for just 8% of India's total geographical area but contains more than one-third of the country's total biodiversity.

Nagaland as part of the North-East India falls within the great Indo-Burma biodiversity hotspot. With its indigenous tribal population, Nagaland is par an excellence an area of continuous interaction between the people and the nature with all its endowments. The state is known for its rich cultural heritage and a vast biological diversity. Like most of the indigenous people around the world, their indigenous knowledge stands rich in perception, precision and management of their environment which comes from time tested experience (Lanusashi, 2011).

Nagas are known for their strong cultural and traditional practices. For centuries they have remained dependent on the natural resources for their survival and development. Even today they have strong attachment to the nature and their surroundings which is reflected in their culture, belief and daily lives. More than 80% of the Nagas in Nagaland

are directly or indirectly dependent on forests for their food, shelter and other requirements (Census of India, 2011).

For Nagas, forest, land, rivers and natural environment are not only resources but they are also regarded sacred where the existence of God remains indwelled. This is manifested through worshipping of stone, forest, nature etc. Till the recent past, they have managed to harmoniously co-exist with their surrounding biological diversity, obtaining their requirements from the nature and at the same time conserving them in their traditional way.

Keeping the above mentioned problems, prospects and issues in purview, the authors in the present study i.e. "Biodiversity Conservation through Traditional Practices in Nagaland: A Geographical analysis", strongly advocates for employing both in-situ and ex-situ methods of conserving biodiversity in Nagaland. This study aims at achieving a meaningful understanding of the relationship between people and their environment and between the environment and development. The study aims to explore past and present taditional knowledge, techniques and practices of the Nagas in biodiversity conservation and to identify the various approaches and processes used to acquire, interpret and pass on this knowledge.

In the preceding chapters, the author give an appraisal on the geographical settings of Nagaland, its physical, ecological and socio-demographic framework which shows the ground condition of the state and leads to understand the physical environment and its biodiversity at hand. The author focuses on the status of biodiversity in Nagaland and emphasizes on the past and present emerging human-environmental relationship and

gives a detail analysis on different biodiversity belt in Nagaland. The study further stresses on the Naga perception of biodiversity and traditional practices and methods of conservation. Finally, the author addresses the issue of development and its impact on biodiversity and gives a detail analysis on the modern acts and laws and its implication on biodiversity conservation in Nagaland. In conclusion a new model of biodiversity conservation in Nagaland called the DIPi model is presented and proposed based on the findings of the present research along with various research findings which is followed by some pertinent suggestions and recommendations for biodiversity conservation in Nagaland.

1.4 Study Area

For the proposed research work, Nagaland is selected as the study area. It is one of the easternmost parts of India, and is also the meeting point of South and East Asia with high hills and mountains having a deep forest, known for its rich Biodiversity.

Nagaland, the eastern most part of India is located between 25°06′and 27°04′ latitude and 93°20′ and 95°15′ longitude and has a population of 1,980,602 persons (Census of India 2011) with a total forest area of 8,62,845 Ha (Nagaland Basic Facts, 2007). The state is comprised of 11 districts each having their own distinct culture, dress and dialect, 93 administrative circles, 52 blocks and 1428 villages (NLD Administrative Report, 2014).

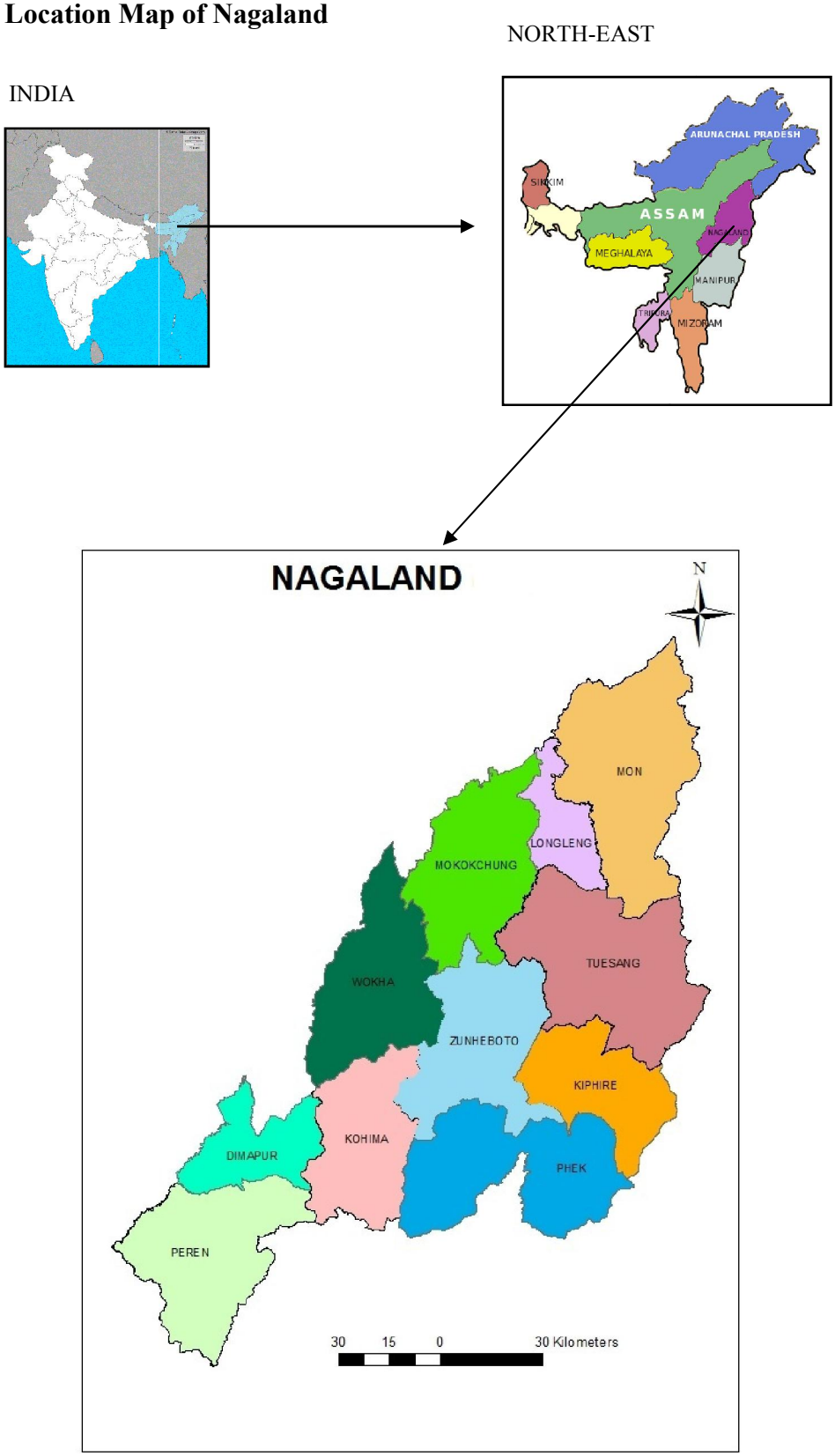
The climate conditions of the state vary from tropical to temperate climate. The ideal physiographic and climatic conditions and the geographical location which extends from Indo- Malaya to Indo-Burma, an extension of Eastern Himalayas represent a significant Bio-geographic Zone making Nagaland, one of the hotspots of the 34 “Mega

Biodiversity" regions of the world. The state located in the Indo-Burma belt is known for its rich cultural heritage and traditional practices.

For centuries Nagas have sustained from simple methods of farming, having close relationship with forest and nature. Their deep sense of environmental ethos, values and belief helped in preserving the Biodiversity in various ways. Most of the people live in villages and agriculture is their main occupation. Principal crops include rice, corn, millets, pulses, tobacco, oilseeds, sugarcane, potatoes and fibers. The important handicrafts of Nagas are woodcarving, bamboo works and pottery. Nagaland is rich in bamboo and canes and naturally Nagas are expert in basket making.

The state boasts the presence of the tallest rhododendron in the world, the tallest rice plant, rare orchids such as Tiger orchid, *Cymbidium tigrinum, Bulbophyllum rothschildianum*, new banana species in the world, *Musa nagalandiana*, bamboo such as *Bambusa nagalandeana, Bambusa alemtemshi etc.* The natural ecosystem of Nagaland also support a diversity of rare and threatened animals such as the Hoolock gibbon, Tiger, Clouded Leopard, Elephants etc. There is also a rich diversity of bird life such as, the endangered Blythe's Tragopan, Mrs Hume's bar tailed pheasant etc. and the rivers and lakes support a rich and diverse aquatic life including the rare Mountain Drought Fish. Besides, the presence of many endemic flora and fauna such as, Rhododendron *watii*, Rrhododendron *elliottii*, Bella rat Snake, Blythe Tragopan, various orchids, Bamboo, etc adds to the richness of biodiversity in the state.

Figure 1.1 Location Map of Nagaland



1.5 Statement of the Problem

Nagas are known for their strong cultural and traditional practices. For centuries they have remained dependent on the natural resources for their survival and development. Even today they have strong attachment to the nature and their surroundings which is reflected in their culture, belief and daily lives. More than 80% of the Nagas in Nagaland is directly of indirectly dependent on forest for their food, shelter and other requirements. For Nagas, forest, land, rivers and natural environment are not only resources but they are also regarded sacred where the existence of God remains indwelled. This is manifested through worshipping of stone, forest, nature etc. Till the recent past, they have managed to harmoniously co-exist with their surrounding biological diversity, obtaining their requirements from the nature and at the same time conserving them in their traditional way.

Traditionally, Nagas also maintained strict environmental ethos and values carefully managing their forest, land, rivers and agricultural activities through careful observation of taboos to enable protection and conservation of various species of biodiversity. The Nagas relied on their simple method of conservation of biodiversity effectively through traditional knowledge that has been handed down by their forefathers. The recent alarming rate of destruction of biodiversity is mainly due to unethical commercialization of biodiversity and its resources. However, the traditional knowledge and wisdom regarding the preservation of biodiversity is fast waning among the present generation. Further, the new acts and laws and various Governmental programmes do not give much importance to the age-old traditional wisdom in which the most vital elements of conservation of biodiversity lie.

1.6 Objectives

1. To study and analyze all forms of traditional knowledge and practices for conservation of biodiversity.
2. To assess the merits and demerits of traditional way of conserving biodiversity, and the variability in its continuity in modern days.
3. To study the impact of modernization on biodiversity.
4. To strategize conservation of traditional knowledge and practices.

1.7 Hypothesis

1. The Naga traditional ethos and practices have a close understanding of the nature and environment.
2. The Naga traditional belief that nature is the mother Earth has direct implications on man- nature harmonious co- existence.
3. Modernization and commercialization are a threat to biodiversity.

1.8 Methodology

The research work is based on the following methods and procedures which is in consistent with Cohen et.al. (2000)

1.8.1 Primary Data Collection

Based on the nature of research, questionnaires were prepared and used to accumulate, analyze and explore traditional knowledge in biodiversity conservation from local people who are the real holders of traditional knowledge.

The methods used for primary data collection were interviews and observations as these methods are viewed as significant sources of obtaining evidence in the present type of studies. Some theoretical perspectives of interviews and observation are discussed below:

Interview

Interviews are interpretive research methods aimed at understanding and interpreting subjective views. It is a system which allows both parties to understand and explore the significance of the questions and answers involved.

The use of interviews in research signifies a move away from the traditional view that humans are subjects to be manipulated and towards regarding knowledge as generated between humans through conversations (Cohen et al., 2000). An interview involves “an interchange of views between two or more people on a topic of mutual interest” (Kvale, 1996) through verbal interactions. The purpose of the research interview is to gather information in an attempt to find out what people know, value or think because as a research tool, the interview is very flexible (Sangion, 2007).

Various types of interviews have been identified in the literature (LeCompte, 1993). However, the ones that are applicable to this research are the ones identified by Cohen et al. (2000) as structured, unstructured, nondirective and focused interviews.

Structured Interview: It is the kind of interview where questions are prepared in advance and organized in a well defined format.

Unstructured Interview: It is more flexible as the questions are open-ended allowing for more freedom.

Non-Directive Interview: In such kind of interview, the interviewer has minimal control although the respondent has freedom of expressing themselves fully whenever they choose.

Focused Interview: This type of interview allows the researcher to exercise control over the interview process in guiding the respondent to respond within a focus theme.

Focus group Interview: It consists of a selected group of people who are brought together to discuss a particular theme or topic and whose responses form the data that can be used as a representation of the group.

Observation

Observation provides the researcher with the opportunity to accumulate rich data and develop an in-depth understanding of his environment as it allows the researcher to "collect live data from live situations" (Cohen et al., 2000). Observation works well with interviews as together they provide a greater understanding of the context investigated. Like interviews, observations can be highly structured, semi structured or unstructured

depending on what the researcher wants to achieve in the observation. Highly structured observation is one in which the researcher has determined in advance what they will be looking for in some systematic manner. Semi structured observation on the other hand, is one in which the researcher has general issues to look for in a less systematic manner. Unstructured observations are more contextual in nature where the researcher carries out the observation and decides its relevance to the research.

Sampling technique

Stratified random sampling technique was used for the proposed research basing on the fact that almost all the tribes in Nagaland have similar traditional knowledge and practices. As such, a total of 55 villages were selected and visited with each district represented by five villages.

1.8.2 Secondary Data

Secondary data was generated from a variety of books, journals, magazines, office reports, newsletters, etc. Different Central, State and local departments, websites and libraries were consulted during the course of research.

Geographical Information System (GIS)

Garmin etrex 10 was used for locating the altitude, latitude and longitude of the villages visited. Arc GIS 9.2 and ERDAS (Classic viewer) was used for generating Maps and other necessary information.

1.9 Questionnaire analysis

A total of 275 people were interviewed from 55 villages from all over Nagaland thereby making sure that all the important villages from both traditional and modern perspective were selected and represented in the study. Each 11 district of Nagaland is represented by 5 villages and each village by 5 respondents.

The respondents include village elders, village chairman, gaonburas, elderly women, teachers and students. Women (20%), Students/Teachers (20%), men and women between 45-65 years of age (20%) together comprise of 60% of the respondents. The remaining 40% of the respondents comprise of village elders who are above the age of 65 years (Fig.1.1).

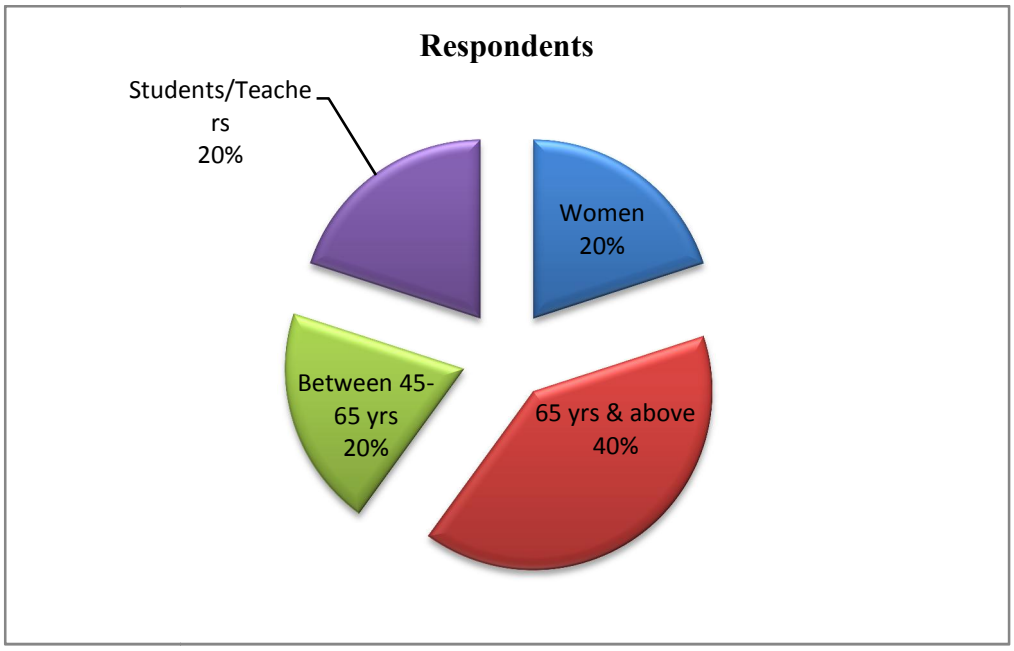


Fig.1.2 Respondents analysis

From the interview and observation it is evident that almost all the villages have a village reserve forest either in the form of Community forest, Village forest or Clan forest. While few of the community forest are recognized by the government most of the forests are still protected by the traditional village council. The traditional knowledge and its associated traditional practices are still prevalent in almost all the villages to some extent tough the respondents admit that the traditional practices are in decline.

Again 90% of the respondents agree that traditional knowledge and practices needs to be incorporated in modern biodiversity and other environmental framework, policies and strategies. While 6% of the respondents feel that traditional practices might not work with modern strategies but they also strongly agree that traditional knowledge and practices needs to be documented and kept for future generations. The remaining 4% of the respondents were not certain about the role and consequences of the application of traditional knowledge and practices in biodiversity conservation and hence they were undecisive of their opinions.

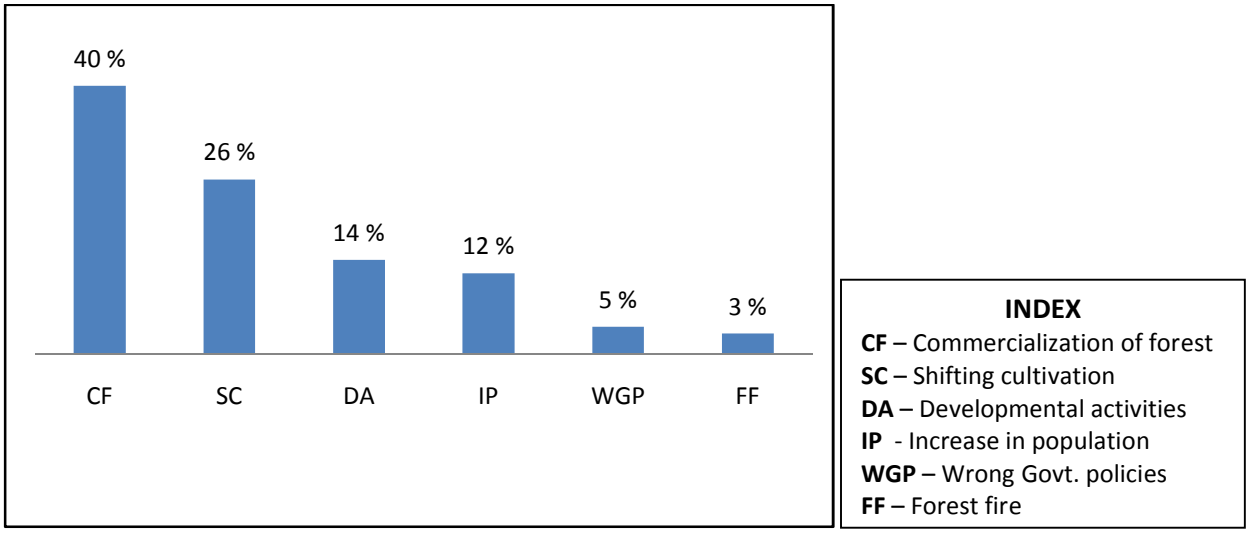


Fig.1.3 Respondent's analysis for decline of biodiversity in Nagaland (in percentage)

Further figure 1.3 depicts that, 40% of the respondents feel that commercialization of forests in the form of timber extraction, logging, fire wood collection, plantation (teak, rubber, kokon etc) for economic gains etc has been the major factor leading to the decline of biodiversity in the state. While 26 % of the respondents say that it is shifting cultivation that has degraded the biodiversity to a large extend.

14% of the respondents fell that various developmental activities such as Doyang Dam, Tuli paper mill and other factories has led to the lost of biodiversity in the region. On the other hand 12 % of the respondents feel that it because of the ever increase in population that has contributed to the loss of biodiversity. 5 % and 3 % of the respondents attributed the reason to, wrong governmental policies and annual forest fires respectively.

Table 1.1 Name of villages covered for the purpose of the study

Sl.No.	District	Name of Village	Latitude and Longitude
1	Zunheboto	1. Asukhomi	26 °04’11.74’’N – 94°31’12.98’’E
		2. Mukhami	26°07’30.89’’ N– 94°24’18.13’’E
		3. Lumami	26°12’31.12’’ N– 94°28’32.73’’E
		4. Shena (Old)	26°00’56.52’’N – 94°23’.19.41’’E
		5. Satoi village	25°49’52.25’’ N– 94°34’25.49’’E
2	Kiphire	1. Kiphire village	25°52’05.71’’ N– 94°47’00’’E
		2. Thanamir	25°46’37.83’’ N– 94°57’15.92’’E
		3. Longkhimong	25°46’23.00’’ N– 94°51’04.58’’E
		4. Shotemi ‘A’	26°00’50.26’’ N– 94°42’37.35’’E
		5. Phunglonger	25°43’55.92’’ N– 94°51’49.26’’E
3	Phek	1. Phek village	25°41’53.54’’ N– 94°27’36.94’’E
		2. Meluri Village	25°40’16.97’’N – 94°36’48.99’’E
		3. Phusa chodu	25°36’17.30’’ N– 94°15’20.41’’E
		4. Khezakheno	25°30’49.83’’ N– 94°12’32.32’’ E
		5. Chozuba Village	25°43’38.53’’ N– 94°19’56.99’’E
4	Mon	1. Jaboka	26°41’24.61’’ N– 95°01’13.90’’E
		2. Chui	26°41’31.61’’ N– 95°01’07.90’’E
		3. Longwa	26°39’36.80’’N– 95°12’41.71’’E
		4. Tobu Village	26°21’09.92’’N – 94°56’02.13’’E
		5. Wakching	26°41’51.75’’ N– 94°50’53.28’’E
5	Longleng	1. Yaongyimchen	26°40’21.54’’ N– 94°44’37.04’’E
		2. Yongam	26°33’01.58’’ N– 94°50’56.35’’E
		3. Yachem	26°31’32.37’’ N– 94°43’21.83’’E
		4. Yongya	26°35’36.56’’N – 94°48’46.37’’E
		5. Kangching	26°38’40.12’’ N– 94°42’57.79’’E
		1. Wamaken	26°42’33.25’’ N– 94°39’00’’E
		2. Sungratsu	26°23’26.17’’ N– 94°33’02.04’’E

6	Mokokchung	3. Chuchuyimpang	26°20’00’’N – 94°33’09.04’’E
		4. Ungma	26°17’42.68’’ N– 94°30’06.49’’E
		5. Longkhum	26°17’32.98’’N – 94°24’04.78’’E
7	Tuensang	1. Helipong	26°12’45.81’’ N– 94°44’58.31’’E
		2. Tuensang Village	26°15’44.84’’ N– 94°48’58.65’’E
		3. Pangsha	26°11’02.68’’ N– 95°05’38.11’’E
		4. Yangpi	26°23’58.08’’ N– 94°46’18.98’’E
		5. Noksen Village	26°22’23.62’’N – 94°42’42.34’’E
8	Wokha	1. Chukidong	26°06’25.18’’N– 94°39’21.03’’E
		2. Tsungiki	26°06’15.94’’ N– 94°20’26.10’’E
		3. Mongphio	26°10’19.19’’ N– 94°03’57.73’’E
		4. Bhagty	26°15’13.43’’ N– 94°11’57.06’’E
		5. Lakhuti	26°17’37.01’’ N– 94°14’53.41’’E
9	Kohima	1. Khonoma	25°39’15.40’’N – 94°01’20.46’’E
		2. Kigwema	25°36’18.30’’N – 94°07’38.77’’E
		3. Khuzama	25°32’06.07’’N – 94°08’04.98’’E
		4. Tseminyu	25°55’24.02’’ N– 94°13’04.08’’E
		5. Tesophenyu	25°58’18.11’’ N– 941°23’4.32’’E
10	Dimapur	1. Pherima,	24°45’17.92’’N – 93°53’49.32’’E
		2. Molvom,	25°42’04.58’’ N– 93°50’54.73’’E
		3. Zhuikhu,	25°42’06.77’’ N– 93°53’08.76’’E
		4. Seithekima,	25°47’11.56’’ N– 93°48’06.72’’E
		5. Sovima	25°50’26.59’’ N– 93°45’46.73’’E
11	Peren	1. Jalukie old,	25°35’07.15’’ N– 93°40’51.85’’E
		2. Punglwa,	25°39’23.16’’N – 93°50’03.85’’E
		3. Tening,	25°20’48.03’’N – 93°39’34.80’’E
		4. Beisumpuikam,	25°41’38.50’’N – 93°32’24.52’’E
		5. Benreu,	25°34’24.13’’ N– 93°51’30.17’’E

1.10 Significance of the Study

Being a part of the 34 biodiversity hotspot zones in the world, inhabited by indigenous peoples, the state has a large potential to contribute significantly in the global pursuit for biodiversity conservation. Beside, the people of the region are strongly attached to the traditional ethos, beliefs and practices through wich they were able to conserve and sustainably utilize the available resources in their everyday lives. On the other hand, modernization and developmental forces are jeopardizing the entire socio-physical environment set-up. Therefore, the intended research will be able to critically evaluate the ongoing biodiversity conservation process in Nagaland both from the traditional as well as from the modern perspectives. It will make an effort to add new dimension to the conservation process for the policy makers and for academic discourse by presenting the problem through geographical analysis.

Apart from adding new dimensions to the conservation processes for the policy makers and for academic exercise, the study will definitely remain a source of inspiration particularly for the younger generations who are intended to take up the research in this field of study. Above all, none has done research on biodiversity conservations on this part of India's North-East region from a geographical point of view.

1.11 Review of Literature

Since time immemorial conservation of natural resources has been an integral part of diverse cultures in different ways. The traditional worship practices show the symbiotic relationship between human beings and nature. Indigenous community all over the world lived in harmony with the nature and conserved its valuable biodiversity. Singh, (2008) in his book *"Environmental Geography'* defines biodiversity as "the variety of living organisms of a given area or a region or an ecosystem in terms of diversity of genes, species and ecosystems, at a given time span and is characterized by spatial and temporal changes". The *Oxford dictionary on Geography* by Susan Mayhew defines biodiversity *"as the varied range of flora and fauna*". In the Convention of Biological Diversity (1992), biodiversity has been defined as the variability among living organisms from all sources including inter alias, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part.

Thus, biodiversity has become synonymous with life on earth. Therefore, the survival and well being of the human being depend solely on the sustainability of the global biodiversity. However, inspite of its vital importance to human development and survival, there is an alarming growth of rate of destruction of global biodiversity, and as a result of it many species are disappearing from the face of the earth. This is mainly due to human intervention and partially due to natural process.

According to the UN Food and Agriculture Organization (FAO) about 75% of the world's crop plant and varieties have become extinct in this century alone and around 50,000 varieties disappear every year. Sharma and Khan in the book *"Environmental*

conservation depleting resources and sustainable development" say that high human and animal population exert tremendous pressure on natural biodiversity and due to overexploitation many species of high economic value have entered into the category of threatened or endangered species. They further add that indigenous people have often been the victims of ethnocide. Himraj Dang's *"Human Conflict in Conservation: Protected Areas – The Indian Experience"* also throws light along similar lines that in the designing development strategies that are sustainable, conservation of wilderness areas plays a special role. He elaborates further that the natural and relatively undisturbed habitats are important not only for the in-situ maintenance of genetic resources, but also for maintaining certain natural, aesthetic and cultural values in their own rights. Dang's view is also endorsed by R.K.Rai, A.C.Mohapatra and N.P.Goel, (1992) in the book *"Environment Management Physio Ecological Facts"*, where they analyze the human civilization which is at crossroads that whether man should decide to destroy themselves and all the accumulated heritage of the species over the millennia or man may decide to be reasonable and emphatic to our bases of sustenance and progress towards new heights. Their study also reveals that though a part of a complex matrix of life support system on this planet, the human destiny is inevitably and undeniably in his own hands. *"Perspective in Environmental Studies"* by Kaushik (2007) assets how experimental growth of human population coupled with ways to attain high standard of living through technological advancement has resulted in wide spread contamination of the environment at global level.

Many laws governing the biodiversity conservation have also been enacted from time to time including, The Biological Diversity Act (2002), by the Government of India.

Besides the formal laws, there were many traditional conservation practices of indigenous communities in many parts of the world, which contribute to the conservation and protection of biodiversity. Ramakrishnan (2002), in his book *"Traditional Ecological Knowledge for Managing Biosphere Reserves in South and Central Asia"* stated that traditional societies all over the world maintain a variety of complex multispecies agro ecosystem and operate under varied levels of intensification. He further stated that it is not only the mere presence of biodiversity and the functional role it had for many of the traditional systems of agriculture that is significant here, but the manner in which traditional societies manipulate this biodiversity for altering ecosystem functional attributes and landscape integrity. Traditional societies have co-evolved with their environment, modifying nature but actively maintaining it in diverse productive state, based on locally evolved traditional knowledge, socio-cultural practices/religious beliefs since antiquity. However, these traditional societies are no longer immune to changes occurring all around, all the time due to globalization/westernization. Many ecologically and socially sound traditional norms or religious beliefs of local communities have been weathering away mainly because of either greed or compulsions of the community as a whole or of its certain sections or due to outside interventions. One of the most conspicuous effects of ecosystem perturbation has been the depletion of biodiversity. Thus, the need for the conservation of biodiversity is of vital importance for the sustainability of human being and its activities.

Traditional societies have accumulated a wealth of local knowledge, transmitted from generation to generation. Experience has taught them how the water, trees and other natural resources should be used and managed to last a long time. By acknowledging and

making use of people's knowledge we shall also promote the principle of equity of knowledge, in the opinion of Pandey (2000). Equity of knowledge between local and formal sciences results in empowerment, security and opportunity for local people. Equity of knowledge also provides opportunity for local people to participate in the management of local affairs with global implications. It also provides the opportunity for self-determination. The process of acquisition, transmission, integration and field application of traditional knowledge on tree- growing with formal science promises to enhance the productivity and efficiency of managing the natural resources. Human ecological perspective is vital in crafting the sustainability for natural resource management. There has been a concern that care needs to be taken to distinguish valuable knowledge from myth. This may be useful from a different perspective as well that the useful knowledge is not lost. According to Arunachalam (2001), identification of science behind traditions is a more constructive endeavor than entering into the 'indigenous vs. scientific' or 'traditional vs. western' arguments. Again, in the words of Agarwal, (1997**)** scientists need not encounter traditional knowledge systems uncritically, just as local people need not approach formal science uncritically. Politically strident advocates of local knowledge systems as well as formal science have done more harm than good by defending the exclusive truth claims on the part of their discipline. *"Exclusive Truth Claims- Assertion of Epistemological privilege- are now not tenable either on the part of science or local knowledge systems" says* Pandey (2000). In the journal *"Traditional Knowledge for Biodiversity Conservation"* by Deep Narayan Pandey, states that local knowledge i.e, Traditional knowledge systems have been found to contribute to sustainability in diverse fields such as biodiversity conservation and maintenance of

ecosystems services, tropical, ecological and biocultural restoration, sustainable water management, genetic resource conservation and management of other natural resources. He further states that, traditional conservation ethics are still capable of protecting much of country's decimating biodiversity, as the local communities have even a stake in the management of natural resource. Naveh (1995), is of the opinion that, in view of accelerating biological and landscape degradation, a better understanding of interactions between landscapes and the cultural forces driving them is essential for their sustainable management. We need environment and Cultural Revolution, aiming at the reconciliation of human society with nature. Sarkar (2006), in his book "*Land and forest rights of the tribal's today"* states that the environment has catered to people's needs and they, in turn, through various mechanisms such as customs regulating distribution, cultural traditions, religious myths and beliefs and other forms of social control saw to it simultaneously that their needs were met and the environment was not destroyed. He further states that the forests provided them not only with their basic requirements of food, fuel, fodder and fertilizer but also their recreational, religious, social and cultural needs. Because all these needs were met by their immediate surroundings, the forest dwellers developed a vested interest in its preservation. The 1992 Convention on Biodiversity states that every contracting party should respect, preserve and maintain knowledge, innovations and practices of traditional and local communities and promote the wider application with knowledge, innovations and practices and encourage the equitable sharing of the benefits.

The North East region of India with a good number of aboriginal tribes, offers an excellent scope and potential to study the traditional system of Biodiversity Conservation. The *"Ferns of Nagaland"* by Jamir (1988), highlights the shifting agriculture practiced

by the Naga people has greatly depleted the natural fertility of land and its valuable forest resources. Taher (2002), in the book *'Geography of North East India'* reveals that the region which receives the heaviest rainfall in the world is endowed with rich Biodiversity is slowly degrading due to human interference and lack of scientific planning management. Ganguly (1996), in the book *'Sustainable Human Development in the North East region of India'* is of the view that the region's natural resources are being overused at a fast rate. Biodiversity is being lost and the dependence of the rural and tribal masses on the biomass in their neighborhood to meet many of their daily needs is in jeopardy. He says that an alternative model of sustainable and people central development can be achieved through the empowerment of the community and provisions of opportunity for larger participation of women's in the society and decision making process.

The Nagas believed that the trees and stones had life and was thus conserved for many such reasons. Along with other tribals of the world, the Naga culture is under threat from many circles because of which their society is now turning to a different phase of development. It is highly regrettable to note the fast disappearance of the beautiful Naga cultural heritage due to influence of Westernization on traditional value system. Their folk songs, dance and ceremonies, art, dress, ornaments, institutions etc. speak about the beautiful Naga society and culture *"Naga Society and Cultur*e", Jamir, (2005). Ranjit Tigga, in his journal *"Biodiversity and adivasi/indigenous peoples in India in the light of Article 8(j)"* states that the tribals consider their land sacred; to them it is a gift from God as it is mentioned even in their folk lore's and songs.

Although the traditional method of Jhum Cultivation has adverse effects, it is still necessary as it assures a measure of food security for most of the people (NEPED, 2007)**.** It further states that in ecologically-sensitive and hilly terrain like Nagaland, application of modern technologies has limitations. Jhum on the other hand, is the base for development and application of low input technologies like "low-external agricultural input technology", the sustenance of agro-biodiversity of Nagaland may be attributed to the Jhum practice.

Nagas and their forest have an intimate relationship. Traditionally, they have been dependent on the forest for their food, fuel, housing and medicine. All aspects of their economic, social, cultural and religious life are closely linked to the forest in such a way that it becomes the very life support system of the Nagas.

The above literature and studies are from different perspectives which are at different levels. The authors very strongly advocate for employing both *in-situ* and *ex-situ* methods to conserve Biodiversity. This aspect needs special attention because efforts of scientific institutions will meet real success only when traditional knowledge is applied. Such aspects when applied in the present study area will certainly be successful in the conservation of biodiversity on a sustainable basis.

Chapter 2

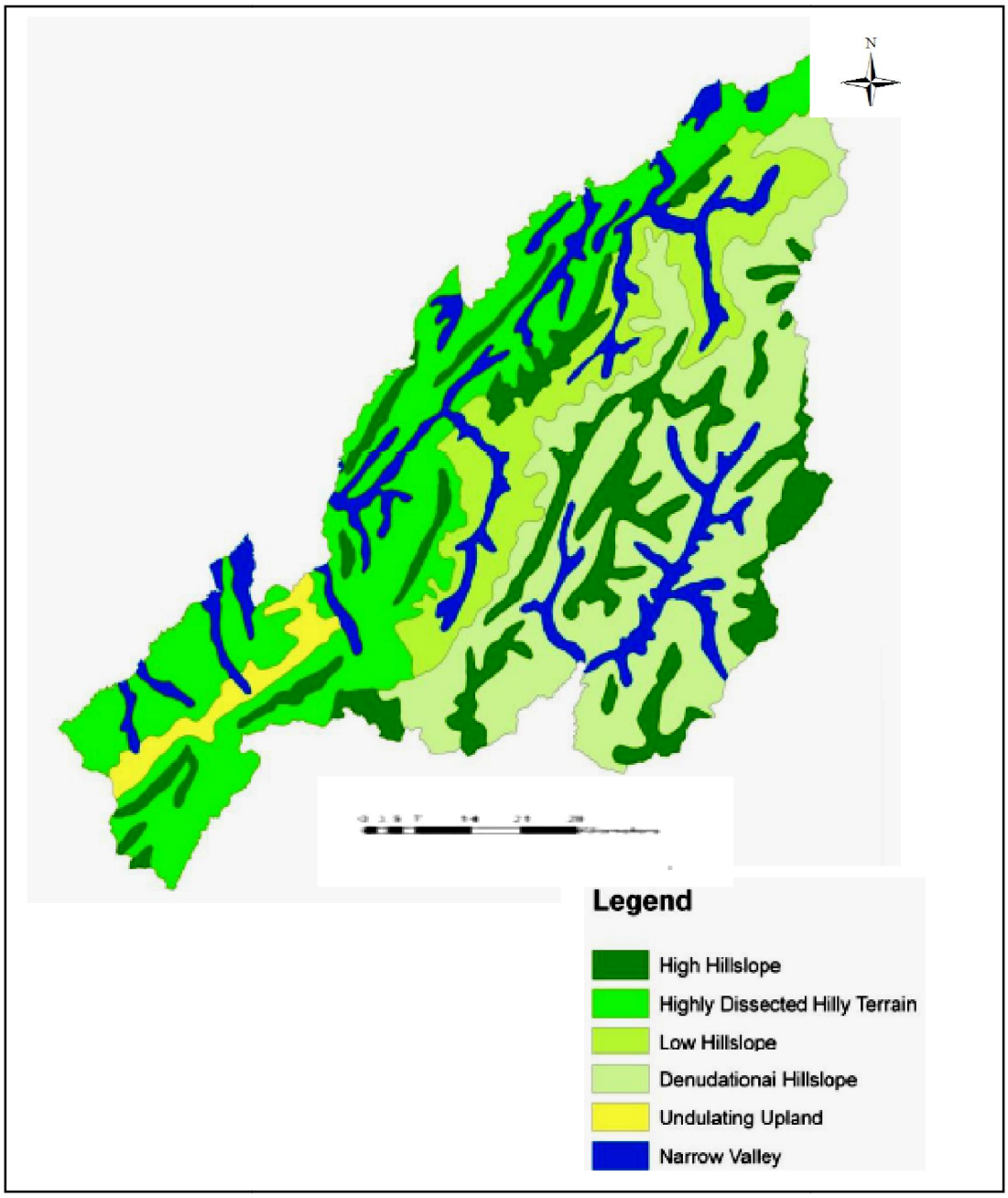
Geographical settings

2.1 Physical and Ecological Settings

Nagaland, the 16th state of the Indian union is situated in the extreme North-Eastern part of India extending between 25°06′and 27°04′ latitude and 93°20′ and 95°15′ longitudes and forms an integral part of the Indo-Burma biodiversity hotspot. The state covers an area of 16, 579 sq.km and is inhabited by homogenous community of 16 Naga tribes who are primarily cultivators. It is divided into 11 administrative districts viz., Kohima, Dimapur, Mokokchung, Wokha, Peren, Tuensang, Longleng, Kiphire, Mon, Phek and Zunheboto. It has 114 sub-districts, 26 towns and 1428 villages (Provisional Census of India 2011). Nagaland is bounded by Assam on the west, Manipur and Assam on the South, Myanmar on the East and Arunachal Pradesh and Assam on the North.

The state is largely mountainous in terrain, with several ranges which break into many spurs and is bordered on all sides by hills running into North-South parallel folds with altitude varying from 150m to 3841 m above sea level. The hills take the form of serrated ridges and are separated from one another by deep valleys through which streams and rivers make their way (Souza, 2001). Patkai and Barail are the two important mountain ranges in Nagaland, with Saramati s the highest peak standing at a height of 3,841 meters above sea level followed by Mt. Japfu at 3,048 meters. Doyang, Dikhu, Tizu and Dhansari are the principal rivers flowing through Nagaland.

Fig.2.1 Physiography of Nagaland



(Source: Science and Technology, Nagaland)

Topographically the landscape can be divided into three divisions, namely:-

(i) The foothills with undulating to rolling topography up to 900m and having warm sub-tropical climate.

(ii) The lower ranges and the mid slopes with varying degrees of slope and having sub-mountain and moderate warm climate.

(iii) The hills and mountainous region above 1500m altitudes having cool and pleasant climate.

Table: 2.1 District Profile of Nagaland

Sl. No	District	Area in Sq.Km	Population	Density per sq.Km	Major Tribes
1	Dimapur	927	378,811	409	All tribes
2	Kiphire	1255	74,004	65	Khiamungan, Yimchunger, Sema
3	Kohima	4041	267,988	183	Angami
4	Longleng	1066.8	50,484	90	Phom
5	Mokokchung	1615	194,622	121	Ao
6	Mon	1786	250,260	140	Konyak
7	Peren	2300	95,219	58	Zeliang
8	Phek	2026	163,418	81	Chakesang
9	Tuensang	4228	196,596	78	Sangtam,Chang, Yimchunger
10	Wokha	1628	166,343	102	Lotha
11	Zunheboto	1255	140,757	112	Sema

(Source: Statistical Handbook of Nagaland, 2013)

Table: 2.2 Area under different land uses in Nagaland (in Hectares)

Sl.No	Classification	2009-10	2010-11	2011-12	2012-13
1	Geographical area	1657900	1657900	1657900	1657900
2	Forest	862930	862930	862930	862930
3	Land under non-agricultural uses	86672	86974	92663	92683
4	Barren and uncultivable land	2496	2496	2496	2496
5	Land under miscellaneous tree crops & groves not included in net sown area	96789	103062	91930	93723
6	Cultivable waste land	42550	52377	67435	70219
7	Follow land other than current fallow	101353	100301	98080	99393
8	Current fallow	58940	54825	49320	50127
9	Total cropped area	481316	452471	474339	488522
10	Area sown more than once	121000	96190	94970	108300
11	Net irrigated area	72670	-	379369	88410
12	Gross irrigated area	77670	-	92040	92450

(Source: Statistical Handbook of Nagaland, 2013)

2.1.1 Climate

Nagaland experiences a typical monsoon climate with variants ranging from tropical to temperate conditions largely influenced by altitude, latitude and location. It receives heavy rainfall during the monsoon. The annual precipitation varies from 2000mm to 2500 mm covering about 7 months from May to October. Rainfall is generally less in the south-west Nagaland and it increases gradually towards the east. Violent storms are common over the hills in April, May and June and rainfall is heavy from June to September. Winter is dry and moderately clod whereas summer is warm and hot. Occurrence of frost in later part of December or early January is noticed in large tracts at higher altitudes but snow occurs only in limited areas of the state. The average summer temperature varies from 16 c to 36 c and winter temperature varies from 4 c to 24 c.

2.1.2 Drainage System and River Basins

Nagaland is dissected by a number of seasonal and perennial rivers and rivulets. 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 Burma.

Doyang: It is the longest river in the state originating from the Japfü Hill near the southern slope of Mao in Manipur and moves in a south west direction passing through Kohima district and flows northward into Zunheboto and Wokha District. It passes through a great part of Wokha District and flows south westerly into Dhansiri in Sibsagar district of Assam. The main tributaries of Doyang are Chubi River which flows southward from Mokokchung district and Nzhu River, originating from Nerhema area of Kohima district and flows through Miphong in Tseminyu area and finally pours itself to Doyang.

Dikhu: River Dikhu which has a total length of about 160 kms originates from Nuroto Hill area in Zunheboto district. The river traverses towards north along the border of Mokokchung and Tuensang districts. The main tributaries of river Dikhu are Yangyu of Tuensang district and Nanung in the Langpangkong range in Mokokchung district. The river flows further northward and leaves the hill near Naginimora and finally merges with the Brahmaputra River in the plains of Assam.

Dhansiri: Dhansiri flows through the southwestern part of the state through Rangapahar-Dimapur Plains of Dimapur District. This river receives almost all the western and southern drainages of Nagaland. Its main tributaries are river Dzuza and Diphu. At the extreme southwest of the state, it assumes a northwardly course forming a natural boundary with North Cachar Hills of Assam which finally drains into the Brahmaputra.

Tizu: The Tizu River forms an important drainage system in the eastern part of the state. It originates from the central part of the state and runs through a northeast direction flows through Zunheboto, Phek district and empties itself in the Chindwin River of Myanmar. The main tributaries of River Tizu are river Zunki, Lanye and Likimro.

Milak: Milak is another important river which flows through Mokokchung District. One of its main tributary is Tsurang.

Zungki: The Zunki river which is the biggest tributary of Tizu, starts from the northeastern part of Changdong forest in the south of Dikhu and flows in southerly direction towards Noklak, Shamator and Kiphire and finally joins Tizu below Kiphire.

2.1.3 Geology

Geologically the terrain of Nagaland is made up of tertiary rocks belonging to Barail, Disang-Tipam series of Miocene age. Barails consists of alternating layers of sandstones and shales with carboniferous intrusions or even coal seams. Ultra basic intrusions are parts of the state. The underlying Disang series represents unfossiliferous shales, slates and phylites. The large variation in the altitudes has given rise to diversity in climate and vegetation within the small state. These coupled with the geological formations and high to moderate rainfall have attend the process of formation of various kinds of soil. Soil is

generally fertile except on extreme slopes. It is acidic (ph 4.8 to 6.5) in reaction, rich in organic carbon (2.94 %), but poor in available phosphorous (2 kg/ha) and potassium (120 kg/ha). Basically the soils of Nagaland have been broadly grouped into four orders viz. Entisol, Oxisol, Mollisol and Spodosol.

i. Entisol:-The alluvial soils occurring in the valleys have been grouped under this order. These soils are characterized by organic epipedom, low organic matter and lighter colour. This comprises the most important soil type for agricultural production.

ii. Oxisol: - Strongly weathered lateritic soils and non-laterised latosols have been grouped under this category. This soil order occurs over foothills and lower ranges on the west, more or less up to an altitude of 750 mts. These soils occur in a prolonged dry period or rain shadow area and are prominently under degraded grass and bamboo forests.

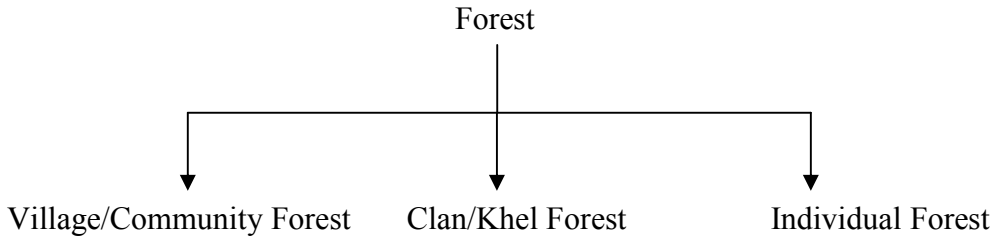
iii. Mollisol: - These soils occur over cold and temperate areas with temperate forest type and characterized by a mollic epipedom, high organic matter and high base saturation. The sub-surface also has high base saturation and caption exchange capacity than the oxisol and entisol.

iv. Spodosol: - these soils occur over high altitudes with humid and temperate climate but under coniferous vegetation. This soil is characterized by a sub-surface horizon with high caption exchange and high base saturation.

2.1.4 Forest

The traditional society of the Nagas revolved around land and forest and often so they were considered as one. They perceived the forest as a source of livelihood, providing means for sustenance such as medicines, wild fruits and vegetables, herbs, timber, firewood, fodder for animals etc. besides it act as a ground for hunting (individual as well as community), gathering and farming.

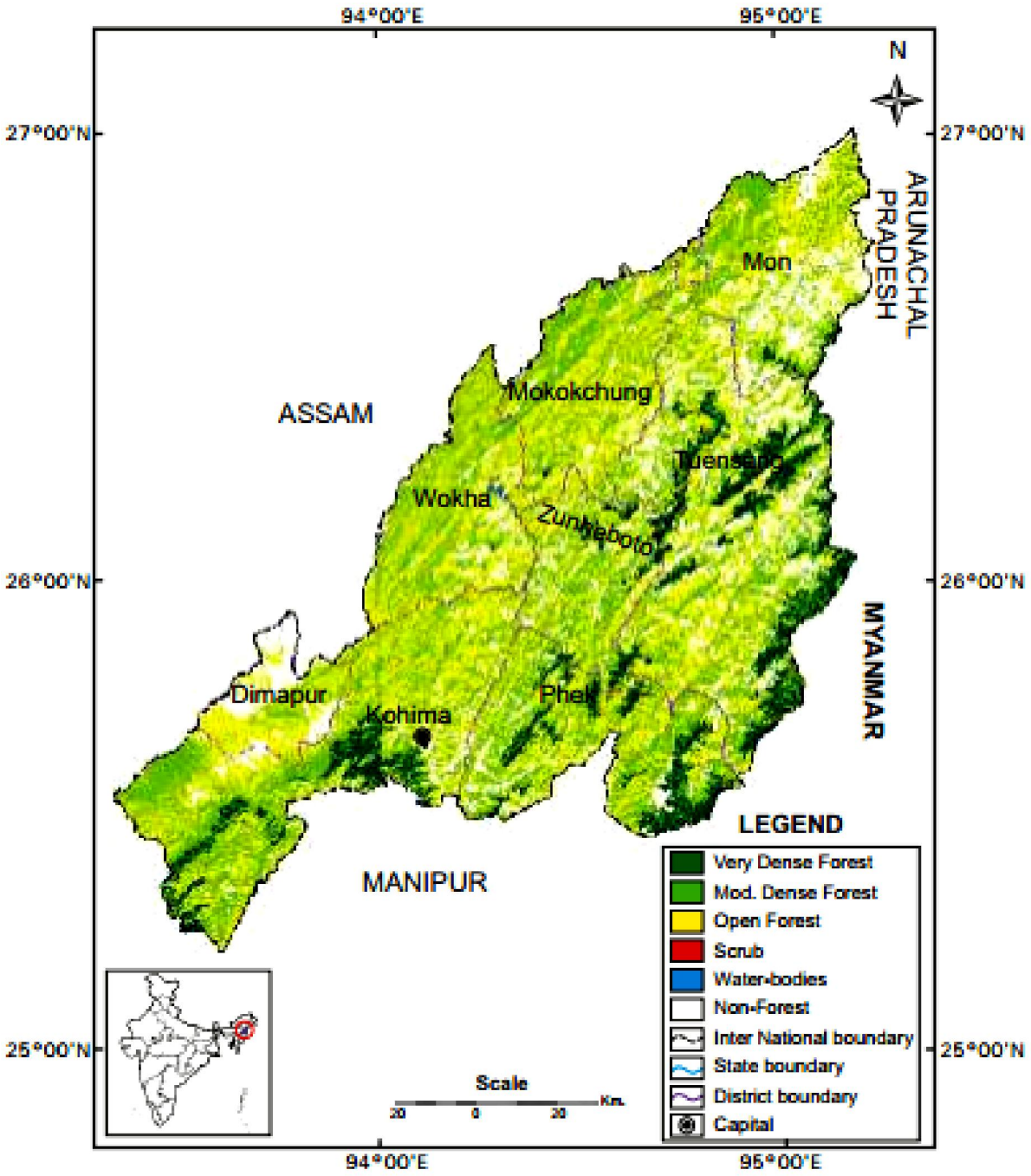
In Nagaland, the forest and land tenure system is governed by the customary traditional laws built around the identity, integrity and distinctive units of the village community, clan and families who own the forest traditionally. Access to forest and forests products are governed and monitored by these customary traditional laws thereby recognizing the rights of the individual owner but also making provision for certain common rights. Every village has got its own demarcated land and forest. Ownership of forest can be categorized as below:



The recorded forest area of the state is 9,222 km^2. Reserved Forests constitute 0.93 %, Protected Forests 5.51 % and Unclassed Forests 93.56 % of the total forest area. About 55.62 % of the state's geographical area is under recorded forests.

The forests cover in the state, based on interpretation of satellite data is 13,044 km^2, which is 78.68% of the states geographical area. In terms of forest canopy density classes, the state has 1,293 km^2 very dense forest, 4.931km^2 moderately dense forest and 7,094 km^2 open forest. The distribution of forest cover of the state is shown in figure 3 and 4 (FSI, 2013).

Fig: 2.2 Forest Cover Map of Nagaland



(Source: Forest Survey of India, 2013)

Table: 2.3 District wise Area under forest

Sl. No	District	Reserved Forest	Purchased forest	Protected forest	Degraded forest	Wildlife forest	National park	Total
1	Kohima	-	3926.01	923.00	76180.00	-	-	81029.01
2	Peren	-	267.00	-	-	-	20202.00	20469.00
3	Mon	-	7345.05	-	32000.00	2357.00	-	41702.05
4	Mokokchung	-	4548.79	428.00	24000.00	-	-	28976.79
5	Zunheboto	-	40.00	645.50	18000.00	-	-	18685.50
6	Wokha	-	693.12	598.85	24000.00	-	-	25291.97
7	Phek	-	761.59	20731.77	35100.00	-	-	56593.36
8	Dimapur	6226.00	812.38	973.18		470.00	-	7508.38
9	Tuensang Longleng kiphire		852.69		75000.00	642.00		77467.87
Total		6226.00	19246.63	24300.30	284280.00	3469.00	20202.00	357723.93

(Source: Forest Survey of India, 2013)

Table: 2.4 Status of Forest in Nagaland

Sl.No	Particular	Forest Area	% to Total Forest Area
	Legal Status		
1	a)Reserved Forest	6226.00	0.72
	b)Purchased Forest	19247.00	2.23
2	Protected Forest	51679.00	5.99
3	Wild Life Sanctuary	3469.00	0.40
4	National Park	20202.00	2.34
5	**Village Forest**		
	a)Accessible Forest	477827.00	55.37
	b)Degraded Forest	284280.00	32.94
	Total Village Forest	762107.00	88.32
	(1+2+3+4+5)	**862930.00**	
	Ownership		
1	State	100823.00	11.76
2	Private	762107.00	88.24
	Total	**862930.00**	**100.00**

(Source: Forest Survey of India, 2013)

Table: 2.5 Status of National Parks & Wildlife Sanctuary

Sl. No	National Park/Sanctuary	Location	Area in Sq.Km	Important Fauna
1	Intangki National Park	Peren	202.02	Mithun, Smbar, Barking deer, Flying Squares, Sloth beer, Elephant, Hornbill etc.
2	Fakim Wildlife Sanctuary	Kiphire	6.42	Tigers, Hoolock Gibbons, Tragopan Pheasant eyc.
3	PuliBadze Wildlife Sanctuary	Kohima	9.23	Kaleej pheasant, Tragopan pheasant, Mithun etc
4	Rangapahar Wildlife Sanctuary	Dimapur	4.70	Tiger, Beer, Deer, Tragopan etc.
5	Ghosu Bird Sanctuary	Zunheboto	-	Migratory birds
6	Singhpum Wildlife Sanctuary	Mon	23.57	Tiger, Beer, Deer etc

(Source: Forest Survey of India, 2013)

Table: 2.6 Altitude-wise Forest Cover of Nagaland 2013

Altitude-wise Forest Cover (Area in Km^2)				
Altitude Zone	**VDF**	**MDF**	**OF**	**Total**
0-500m	0	1,089	1,984	3,073
500-1000m	16	1,352	2,462	3,830
1000-2000m	587	2,047	2,462	5,096
2000-3000m	682	240	100	1,022
Above 3000m	13	8	2	23
Total	**1,298**	**4,736**	**7,010**	**13,044**

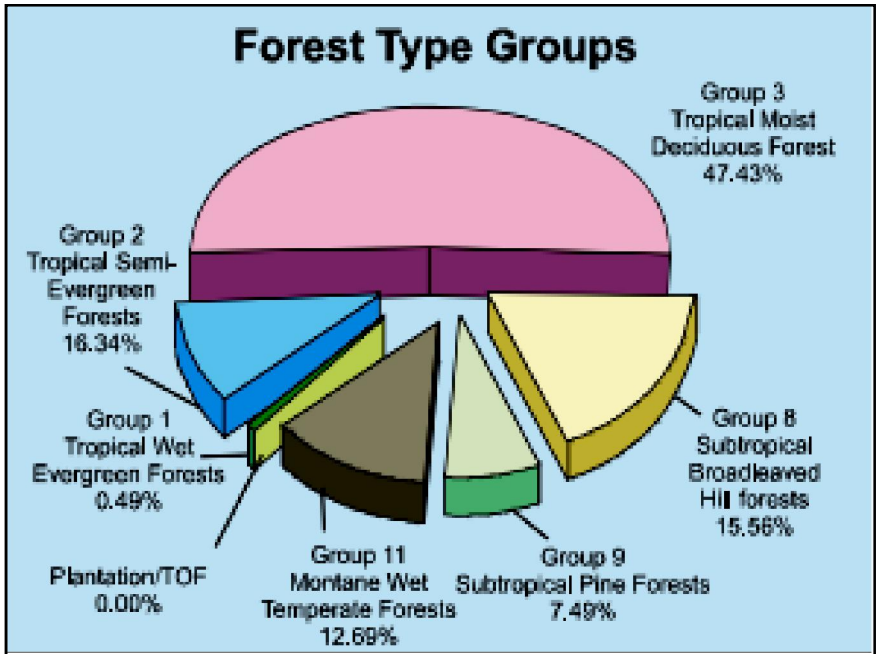
(Source: Forest Survey of India, 2013)

The state has six different forest types as per champion and Seth's classification system (1968), belonging to six type groups i.e

1. Tropical wet evergreen
2. Tropical semi evergreen
3. Tropical moist deciduous
4. Subtropical Broadleaved Hill
5. Subtropical Pine and
6. Montane Wet Temperate Forests.

Distribution of forest cover in different forest type of groups found in the state is given in figure below:

Fig.2.3 Forest Type Group of Nagaland



(Source: Forest Survey of India, 2013)

2.1.5 Forest and its significance

Forest is defined as, “a large area of trees and undergrowth” (Waite, 2010). Allen and Sharp defines a forest as, “a community of trees and associated organisms covering a considerable area: utilizing air, water and minerals to attain maturity and to reproduce itself: and capable of furnishing mankind with indispensable products and services”. To a traditional Naga, ‘Forest is the provider and sustainer of life, the storehouse of wealth and protector of wildlife”.

Forest has shaped the life, habitat and economy of the people all over the world since time immemorial. It serves and performs a number of functions including ecological, recreational and economic activity. Forest is an important medium for inducing rainfall and is the most vital medium for underground water storage. Besides, it helps in controlling flood, surface run off and ground water recharge, soil conservation, sustained precipitation, contributes in monitoring air pollution and various climatic extremes. It is also one of the most important renewable resource.

Forest has always played a pivotal role in the life of the Nagas. Forest is considered as a gift from the Creator and is conceived as sacred. They regard certain forest areas as a place of worship and thus, such forest areas were treated with utmost respect and sacredness. To cultivate or cut trees or even plucking flowers /leaves from these worship places of forests were considered taboo. Besides, it is a tradition to respect ever diversity of life in the traditional society of Nagas. Thus, Nagas has always revered and respected every element in the forest and have used them astutely for ages.

Nagas envision the forest as the habitat of wildlife and their place for breeding and even regarded it as the protector of wildlife. Further the villagers visualize forest as the store house of wealth having great aesthetic value. Dense forest were considered and believed to be the abode of spirits.

The Ao Nagas had the concept "Ait" (enchanted ground), which can be basically called the "cradle of biodiversity". These places are believed to vested with supernatural beings and possess metaphysical powers (detail description in Chapter 4). Hence, people usually don't hunt, cultivate or cut trees in these places. Thus, such Naga traditional beliefs and practices have significantly helped in conserving the forest ecosystem and biodiversity through collective action and common consent in the past.

2.1.6. Naga dependence on Forest

Forest provides a wide range of opportunity and choice to a Naga. However, the first major area of dependence on forest is food, which takes place in the form of hunting, fishing and gathering of wild fruits and leaves. Forest acts as a medium for Community hunting and fishing, which has a significant role in the traditional life of a Naga.

Even today, in most of the interior parts/villages of Nagaland, collecting and plucking of wild fruits and vegetables, edible flowers and leaves from the forest are a daily chore practiced mainly by the Naga women.

Again, a plant which may not be edible to a particular community or tribe might be edible to another. Thus, the variety of plants, trees, herbs and tubers with food value that are found in the forest might be far too many to identify and list.

A very large number of wild plants are used as vegetables- various species of wild spinach, Wild Yams, Nicker beans (*Entada gigas*) etc are largely eaten in times of scarcity. Besides wild turmeric, sorrel, nettle-tops, tree tomato, ginger and many varieties of ferns and fungoids are found and consumed by the Nagas. Chief food item of Nagas such as, "Anishe' (made of Yam leaves), 'Axone' (made of soyabeans), bamboo shoot (made of young bamboo) etc are some of the indigenous Naga food item derived from forest.

Apart from food, Nagas traditionally depended on forest for building their house, fodder for their cattle's, medicine, timber, agricultural implements, musical instruments, furniture, ropes, mats, plates and cups, baskets and other daily needs.

Nagas are known for their work in weaving, basket making, craftsmanship and Woodcarvings etc. For all these works they extract their raw materials from forest. For example, headbands for carrying loads, bowls, mugs and containers etc., finely shredded bamboo thongs and bark of "anem sung" were used. They practiced the art of dying by using Indigo cultivated in their homestead gardens and leaves of 'Osaak' derived from Masaktong (*Strobilanthus flaccidfolius*) tree.

Bamboo is inextricably linked to the traditional lifestyle of the Nagas and had a ideal range of uses such as for making walls of houses, floors, for ceiling, spears, handles for tools, water containers, mats, baskets, spoons, traps, cups etc as well as its young ones were used for making bamboo shoots.

Thus, it is observed that Nagas from time immemorial have enjoyed the freedom to use their forests and hunt its animals which has given them a greater conviction to protect and

preserve them, and remains even today, deep in their hearts that the forests belong to them.

2.1.7 Decline of Forest cover in Nagaland

Although conservation of forest and biodiversity has been traditionally inherent to Naga mindset, currently this has largely been weakened. Due to the intrusion of modern culture and weakening of traditional practices, the forest today, is under great threat. The increased pressure of the forest based industries and the ever increasing population are playing havoc with the forest in Nagaland.

Today, due to reckless and uncontrolled cutting of forests in the name of development, timber, continued jhum cultivation coupled with monocrop culture, plantations and annual fire in vast tracts of land, is making the forests degraded and barren, as a result of which most of the original characteristics of the forests have started diminishing. The state has been experiencing a gradual decline in forest cover over the past 2-3 decade. The forest cover of the state, 86.8 % of the total geographical area in 1989 is degraded to 78.68%in 2013.

District wise forest cover change and change percent since 1991 and 1989 is shown in **table 2.7 and table 2.8** respectively.

Table 2.7 District wise Forest Cover change since 1991-2013 in sq.km

District	1991	2003	2005	2009	2011	2013
Dimapur	3,339	355	406	401	392	427
Kohima Peren		2,929	2,845	2,865	2,923	2,897
Mokokchung	1,420	1,407	1,425	1,395	1,349	1,360
Mon	1,520	1,401	1,322	1,294	1,239	1,203
Phek	1,804	1,611	1,686	1,711	1,767	1,692
Tuensang Longleng Kiphire	3,660	3,384	3,491	3,340	3,232	3,126
Wokha	1,479	1,449	1,449	1,414	1,378	1,354
Zunheboto	1,099	1,073	1,095	1,044	1,308	985
Total	**14,321**	**13,609**	**13,719**	**13,464**	**13,588**	**13,044**

(Source: Forest Survey of India, 1991-2013)

Table: 2.8 Forest Cover Change of Nagaland (1987-2013)

Year	VDF	MDF	OF	Total	Percentage
1987	6379	7972		14,351	86.56
1989	4632	9724		14,356	86.59
2003	57	5,650	7,902	13,609	82.09
2005	236	5,602	7,881	13,719	82.75
2009	1,274	4,879	7,293	13,464	81.21
2011	1,293	4,931	7,094	13,318	80.33
2013	1,298	4,736	7,010	13,044	78.67

(Source: Forest Survey of India, 1987-2013)

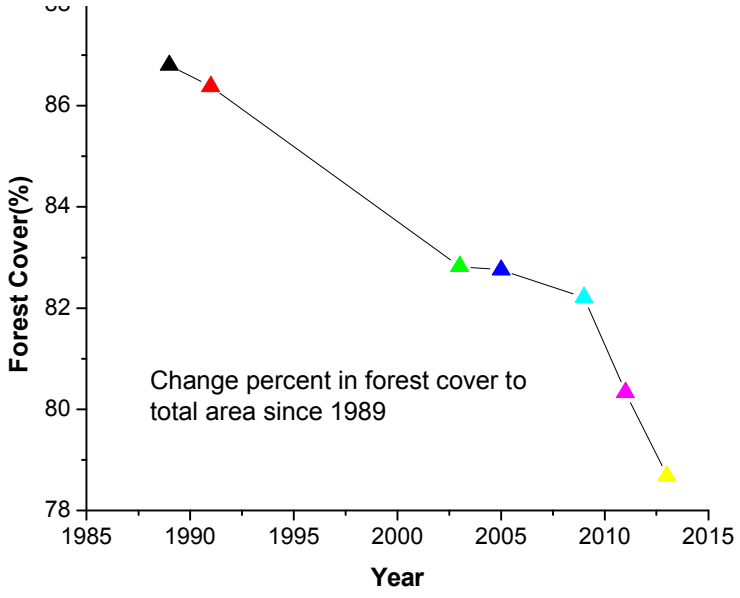
Table 2.9 Change percent in forest cover to total area since 1989

State	1989	1991	2003	2005	2009	2011	2013
Nagaland	86.8	86.38	82.09	82.75	82.21	80.33	78.68

(Source: Forest Survey of India, 1989-2013)

From the above forest cover change table, it is evident that the forest cover in the state is under serious threat. From 86.56 % of the state's total geographical area in 1987, it has come down to 78.67 % in 2013, i.e., within a span of 26 years the people of Nagaland has degraded their forest cover by 7.89 % of the total geographical area. Further, there is a huge decline in the Very dense forest cover from 6379 sq.km in 1987 to 1,298 in 2013.

Fig. 2.4. Graph showing the decine in forest cover (1989-2013)



The Forest Survey of India has cited that, the main reason behind the decline in forest cover of Nagaland is mainly due to biotic pressure and shortening of Shifting Cultivation cycle. However the undertaken research findings underline the following as major determinants for the decrease in forest cover:

1. Modern developmental activities
2. Introduction of industrial and economic plants by various government agencies between 1970 and 1980 (which is mono centered).
3. Introduction of large scale plantations such as teak and rubber plantations by the business community, the rich and bureaucrats since the late 1980's (mono centered).
4. Intensive logging for timber and firewood
5. Shifting cultivation
6. Increase in demand for non-timer forest products (NTFP) such as cane, bamboo, agar, barks, resin, bulbs, thatch, medicinal plants etc.

The above mentioned factors have contributed largely to the degradation of forest cover in the state over the past two to three decades.

2. 2. Socio-Demographic Profile

As per the Provisional Population Totals of Census 2011, the total population of the state stands at 1,980,602. The population of Nagaland increased from 3.69 lakhs in 1961 to 19.89 lakhs in 2001 and 19.81 lakh in 2011. The fall in total population of the state in 2011 is attributed to the fact that there were major anomalies in the 2001 census report and hence, the decline. The population grew at a rate of 5% per annum during 1971-81, 5.6% per annum during 1981-91, 6.4% per annum during 1991-2001 and -0.4% per annum during 2001-2011.

People living in rural areas constituted 71.03% of Nagaland's population in 2011, as against 90% in 1971 (Census of India, 1971-2011). This is an indication of the migration taking place in the state from rural to urban areas. The rural population stands at 1,406,861 (71.03%) and the urban population stands at 573,741 (28.97%) with Mon (15.35%) and Dimapur (34.38%) district having the highest number of rural and urban population respectively.

The population density of Nagaland has increased from 22 persons per sq. km to 119 persons per sq. km during the period from 1961-2011. The important features of the state's demography are revealed by figures in the table 2.2.1

Table 2.10 Demographic profile of Nagaland

Sl. No	Particulars	1961	1971	1981	1991	2001	2011
1	Total population (‘000)	369	516	775	1210	1989	1981
2	Decennial growth of population (%)	-	39.88	50.05	56.08	64.41	-0.47
3	Density of population (per sq. km)	22	31	47	73	120	119
4	Percentage of rural population	94.80	90.00	84.48	82.79	82.26	-
5	Level of urbanization (%)	5.20	10.0	15.52	17.21	17.74	-
6	Growth of urbanization	16.6	10.4	8.9	5.6	5.4	-
7	Literacy rate (%)	17.91	27.40	42.57	61.65	67.11	80.11
8	Literacy rate: male (%)	27.2	35.02	50.06	67.52	71.77	83.29
9	Literacy rate: female (%)	13.0	18.65	39.89	61.65	61.92	76.69
10	Sex ratio (feamales per 1000 males)	933	871	863	886	909	931
11	Percentage of workers	-	-	48.23	42.68	42.74	-

From the above table 2.2.1, it can also be seen that the literacy rate, which was 17.91% in 1961, increased to 80.11% in 2011. A positive element here is the female literacy level, which was 13% in 1961 increased to 76.69% in 2011. Among the districts, Mokokchung has recorded the lowest gap between the male and female literacy rate at 1.81 points.

The sex ratio in terms of females per thousand males for Nagaland had declined from 933 in 1961 to 863 in 1981. From 863 in 1981, it raised to886 in 1991 and further rose to 931 in 2011. This is a welcome feature as far as the demographic pattern of the state is concerned and is an indicator of the status of women in the state. The state’s socio-cultural practices have to some extend contributed to the success of reversing the sex ratio apart form affirmative interventions from the government and other social bodies.

The decadal growth rate of population in Nagaland during 2001-2011 is 0.47%. The growth rate of urban population is 67.38% which is much higher than the national growth rate of 31.80%. In contrast, the negative growth rate has been recorded at 14.59%.

However, the gap between the male and female literacy rate in Nagaland (6.60 points) is not as wide as the national level (16.68 points).

Table: 2.11 Population trend in Nagaland

Year	Person	Decadal Variation	% of Decadal Variation	Male	Female
1901	101,550	(-)	(-)	51,473	50,077
1911	149,038	(+) 47488	(+) 46.76	74,796	74,242
1921	158,801	(+) 9763	(+) 6.55	79,738	79,063
1931	178,844	(+) 20043	(+) 12.62	89,536	89,308
1941	189,641	(+) 10797	(+) 6.04	93,831	95,810
1951	212,975	(+) 23334	(+) 12.30	106,551	106,424
1961	369,200	(+) 156225	(+) 73.55	191,027	178,173
1971	516,449	(+) 147249	(+) 39.88	276,551	240,365
1981	774,930,	(+) 258481	(+) 50.05	415,910	359,020
1991	1,209,546	(+) 434616	(+) 56.08	641,282	568,264
2001	1,990,36	(+) 780490	(+) 64.53	1,047,141	942,895
2011	1,978,502	(-) 11534	(-) 0.58	1,024,649	953,853

Nagaland experienced a sudden growth of population between 1981 and 1991. Many experts revealed that these rise in population has had an adverse impact on the cycle of shifting cultivation and thereby has degraded the forest cover and biodiversity of the state to a large extend.

However, the main reason for this drastic increase in population during this period lies mostly in the fact that many of the villages which were not included in the 1981 and earlier census due to security reasons and poor road connectivity were included in the 1991 census.

Hence, the unprecedented growth of population is attributed to many factors including irregularities of national census. Therefore population growth is not the sole factor for drastic change in the biodiversity of the state.

The workforce constitutes 42.74% of the population in Nagaland. Though in absolute numbers, the total number of workers has increased from 5.16Lakh in 1991 to 8.49Lakh in 2001, the percentage of workers to the population has remained at 42.7%. However, among the workers, the share of main workers has fallen from 42.29% to 35.62%, while the share of marginal workers has increased from 0.39% in 1991 to 7.12% in 2001. The near stagnant proportion of workers and increasing share of marginal workers is indicative of increased prevalence of unemployment and disguised unemployment in the State. In Mon, Tuensang and, Zunheboto, Wokha and Dimapur, there was a fall in the percentage of workers in the districts over the period 1991-2001. Among the workers, 68.03% were engaged in agricultural activities while only 2.12 % were engaged in household industry and 29.18% constituted other workers during 2001.

2.2.1 Socio - Economic and Horticultural Activities

Since time immemorial Nagas have depended on land, water and forest for their sustenance. They relied heavily on agriculture, forest and natural resources to meet their daily livelihood requirements.

As such, they had the knowledge to sow, harvest, plant, cut and hunt at the right time and period whole throughout the year. All their socio economic activities were depended on the phase of the sun, moon, sky, chirping of birds etc.

Due to the unique land ownership and management system of the Nagas, there is little or no alienation of the people from their land and resources (NEPED, 2006).

Even today, Nagaland is predominantly an agricultural state. The state has an interesting land-use: 80.48% forest cover; 13.44% agriculture; and the rest are habited areas like towns and villages or rivers and streams.

According to state records, the total area under agriculture in a given area in Nagaland accounts to 222,787 ha, representing 13.44% of the total land area of Nagaland. There are two main agricultural system practiced in Nagaland, namely, Shifting cultivation and Terrace rice cultivation. Besides, Wet rice cultivation and Home gardens are also practiced by certain section of the Naga society.

1. **Shifting cultivation:** This is the most common agricultural system practiced in Nagaland and is also called as Jhum cultivation. mixed cropping is practiced in this fileds with rice as the main crop although in some cases maize and millet dominate the fields.
2. **Terrace rice cultivation:** This type of cultivation is practiced along the slopes. Abundant rainfall or proper irrigation is an important and decisive factor. Along with rice, the land is used for cultivation of vegetables like potato, garlic, cabbage etc. This practice is dominant in Kohima and Phek district of Nagaland.
3. **Wet rice cultivation:** This type of cultivation is carried out in the rainfed lowlands of Nagaland. It is a practice where bunds are constructed to divide the plot into a number of smaller sections and the crop is planted within the smaller

sections. Rice is the chief crop followed by wheat, mustard etc. It can be seen in the low lying areas like Dimapur, Jaluki, Tizit etc.

4. **The Home garden:** This is a traditional practice found to be practiced by most of the Naga tribes. The home gardens is generally located close to the house and is used for growing vegetables, fruits and other food crops required for the family. A wide variety of crops are grown throughout the year in homegardens including potato, cabbage, chilli, tomato, beans, carrot, onion, garlic etc.

Agriculture has been the mainstay of the people since time immemorial. Rice is the main food crop of the state. The traditional varieties of rice, their performance, sowing and harvesting season is shown below:

Table: 2.12 Traditional varieties of rice, sowing and harvesting season

Sl. No	Class of Rice	Sowing season	Harvesting season	Average Yield (Mts/Ha)
1	Glutinous Rice	March-April for Jhum	August-September for jhum	1.5-20
2	Brown Rice	June-July for TRC and WRC	November-December for TRC and WRC	1.6-2.5
3	Aromatic Rice			1.6-2.5

Other important food crops are maize, millets, Job's tears, potato, chilly, mustard, sesame, sugarcane etc. In the northern district of Mon, yam and Taro also continues to be the most important food crops.

Table: 2.13 Agricultural Crops and Season of Nagaland

Sl.No	Type	Crop	Season
1	Cereals	Dry land rice,W/TRC rice, sorghum, Small millets, Wheat, Maize, Jowar, Jobstear, Bajra, Ragi, Barley and Oats	Kharif
2	Pulses	i. Arhar, Urd, Naga dal, Cowpea, Beans, Horse gram ii.Black gram and, Pea, Lentil, Gram, Kholar/Rajmash	Kahrif Rabi
3	Oilseeds	i. Groundnut, Soyabean, Perilla, Castor, Sunflower, Seasmum ii.Rape seed/Mustard, Linseed	Kharif Rabi
4	Commercial and other crops	Sugarcane, Cotton, Jute, Potato, Tea, Tapioca, Colocossia, Mesta and Ramie	Kharif

The Net State Dmoestic Product (NSDP) of Nagaland is only 0.19 % of the total NSDP of India[4]. However, in quantitative terms, the NSDP of Nagaland at 2004-2005 constant prices was Rs. 5421 crores, which hasgrown at a compounded annual growth rate of 8.8 % to Rs. 7339 crores in 2008-09. The percapita NSDP in 2008-09 was Rs. 38,921. Agriculture remains the highest grosser, contributing 21% to the NSDP in 2008-09 (Fig.), followed by industry, real estate, transport and communication, though highest rise has been in the secondary sector comprising of construction, manufacturing, electricity, gas and water supply.

In Nagaland, 60% of the population is engaged in agricultural activities[5] (Cultivators nd labourers), with 1% of the workers engaged in household industries and 39% in other livelihood activities in the state Fig. 1.2. (Statistical Handbook of NLD, 2013)

Fig. 2.5 Distribution of NSDP across sectors, 2008-9

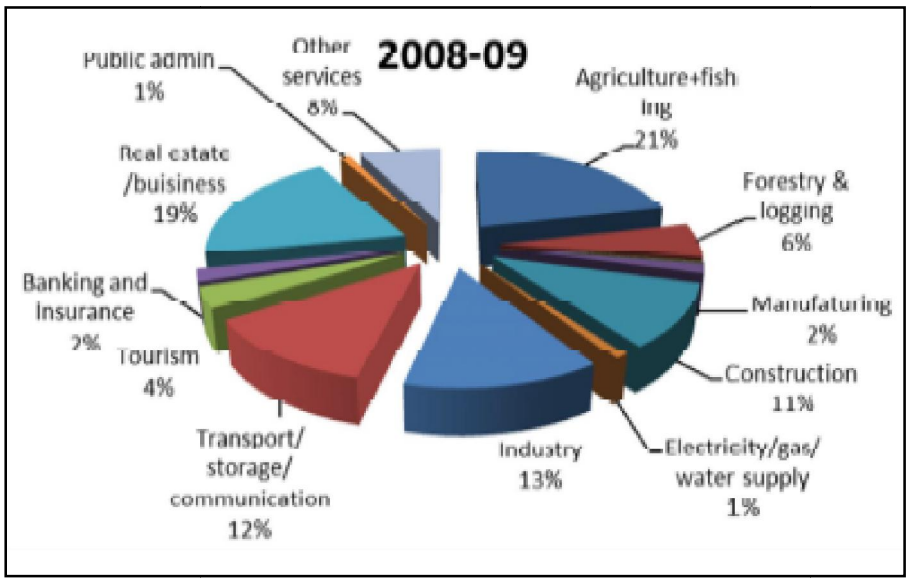
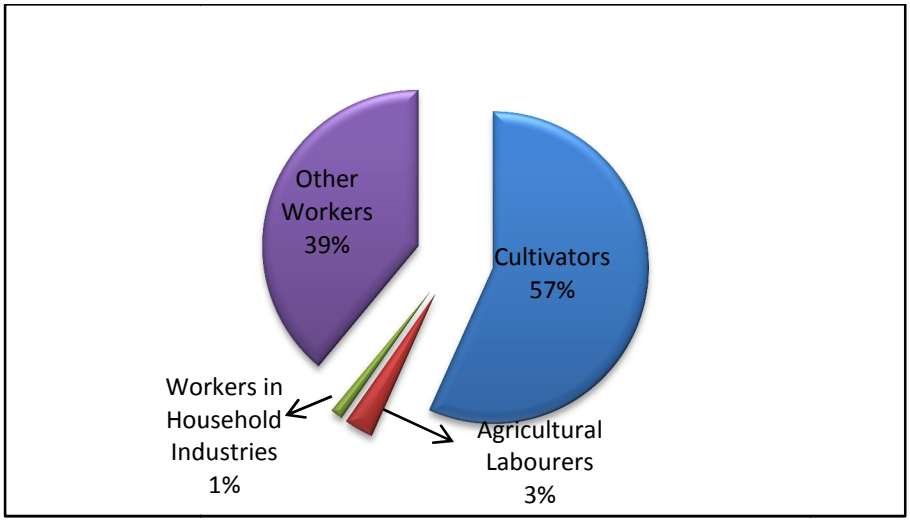


Fig.2.6 Distribution of Main workers in the state



(Source: Statistical Handbook of NLD, 2013)

Horticulture has been in practice in Nagaland in the form of 'kitchen garden' for ages. It was more or less a mandatory practice for each and every Nagas household to keep and maintain a 'kitchen garden' where around 10-20 horticultural crops, fruits and vegetables

were cultivated. These kitchen gardens were maintained mostly by the women folk and hence they had more knowledge on what seed to plant and grow in a kitchen garden.

Nagaland agro-climatic conditions are quite conducive for cultivation of fruits, vegetables, plantation crops, flowers and spices. The total projected horticultural crop area in the year 2013-2014 is 52759 ha with 260149.4 metric tons of projected fruit production.

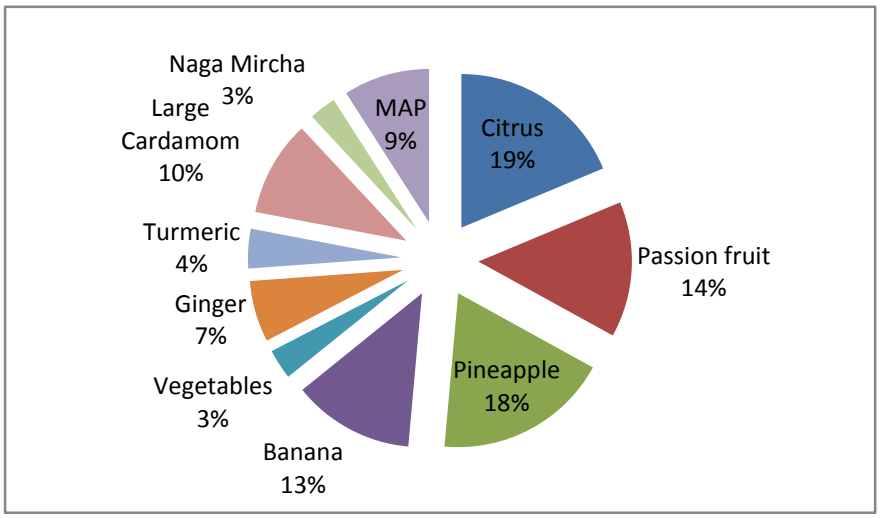
The main fruit are Citrus, Pineapple, Passion fruit, Banana, Vegetables, Ginger, turmeric, Large Cardamom, Naga Mircha and MAP. The statement showing the area covered, production and productivity of various horticultural crops from the 10th Five Year plan to 2013-2014 is given in the table below:

Table: 2.14 Horticultural crops and their future projections

Crop	Area (Ha)				Total Area (Ha)	Projected Productivity (MT/Ha)	Total projected Production
	10th FYP	11th FYP	2012-2013	2013-2014			
Citrus	4013	4952	500	410	9875	4.21	41573.75
Passion fruit	3640	3300	300	300	7540	1.98	14929.2
Pineapple	4245	4363	700	400	9708	8.90	86401.2
Banana	3292	2636	500	322	6750	8.80	59400
Vegetables	15050	4540	1050	1681	1681	5.20	8741.2
Ginger	2215	1930	3350	3400	3400	6.90	23460
Turmeric	0	1100	2000	2200	2200	5.20	11440
Large Cardamom	1600	2665	550	500	5315	0.39	2072.85
Naga Mircha	0	1898	600	1500	1500	4.00	6000
MAP	2680	1800	150	160	4790	1.28	6131.2

(Source: Department of Horticulture, Annual Report, 2013-14)

Fig.2.7 Horticultural crops and projections



(Source: Statistical Handbook of Nagaland, 2013)

Besides, Nagas are engaged in hunting, fishing, animal husbandry, weaving, basket making etc. and trading of local products is very common among all the tribes of Nagaland.

All the physical and socio-demographic aspect has a direct or indirect impact on the environment/biodiversity of Nagaland. Whilst the physical and topographic features of Nagaland has been a boon to the states biodiversity, other socio-demographic characteristics has had a negative impact on nature. It is evident from the above data's that in the quest for greater economic benefits, coupled with increasing population, the state is experiencing a drastic decline in its forest cover. The introduction of various alien horticultural crops, economic plants such a rubber, teak, kokon etc in the name of afforestation has only left a negative impact on the biodiversity of the state.

Chapter 3

Status of Biodiversity in Nagaland

3.1 Introduction

Nagaland harbors very rich and unique bio-diversity and falls within the Indo-Burma Biodiversity Hotspot bordering the species rich Indian and Indo-Chinese Zoogeographic Sub-region. The state's immense biodiversity encompasses ecosystems, populations, species and their genetic makeup. This diversity can be attributed to to its varying physiographic and geo-climatic conditions favourable for luxuriant growth of vegetation varying from tropical rain forest to alpine vegetation and from evergreen forest to sub-tropical climatic region.

Though there is no official documentation of biodiversity of Nagaland, it is estimated that the state supports approximately 2,431 species belonging to 963 genera and 186 families under angiosperms. Gymnosperms also register their presence with 9 species, under 6 genera from 5 families. The faunal diversity in the state is also rich with rare birds and animals. There are about 32 species of mammalian fauna, 65 species of avian fauna, 42 fish species belonging to 10 families and 24 genera, and 9 species of reptilian fauna (Sate of Environment Nagaland, 2005) many of which are endemic to the region, and several are rare and endangered.

The zoological survey of India, Kolkata has reported 700 species of vertebrates, 704 insects including 490 butterflies (Lepidopterans) and 110 other invertebrate species occurring in the state. Very little is known about the extent of diversity of micro-organisms, particularly the bacteria and viruses.

The state's rich biological diversity is also reflected in the diversity of crops present in the state, with as many as 167 varieties being cultivated in *Jhum* fields, and over 360 varieties of rice (State Report, 2002).

Nagaland's biodiversity is boosted by the presence of the world's tallest Rhododendron tree, standing at a height of 30.79 meters and 2.41 meters in girth (Guinness Book of World Records, 2007), the tallest paddy *Melhte kenyeLah* in the world, which is eight and half feet tall with 1 kg to 800 gram yield of paddy per plant (Guinness Book of World Records, London, 1998 till Date) and one of the world's hottest pepper in the world "Naga Jolokia" or "Bhut Jolokia" which held a Guinness World Record in 2007 as the World's Hottest Chilli.

Besides, it is the home to endemic rhododendron species such as Rhododendron *wattii* and Rhododendron *elliottii*, found in Khonoma and Dzukou valley, endemic bamboo species such as*Bambusa Nagalandea, Bambusa alemtemshii, Bambusa mokokchungeana, Cephalostachyum longwanum,* rare and threatened orchids such as *Cymbidium Tigrinum, Bulbophyllum rothschildianum, Ranenthura imschootiana* etc.

Further, Nagaland harbors threatened animals and birds like the tiger, elephant, Holoock Gibbon, Sloth Bear, Spotted Linsang, Tiger Civet, Blythe's Tragopan, Mrs. Hume's Bar Tailed Pheasant and is also the home to three different species of bees.

Recently, a new species of banana, *Musa nagalandiana* was discovered at Mukhami village, under Zunheboto district by a group of researchers from Nagaland University, a new snake species in India, Bella Rat Snake, *Maculophis bella* formerly referred to as

Elaphe leonardi was discovered in the Fakim Wild life Sanctuary and a new species of Horse Hair worm (*Chordodes combiaerolatus)* has been reported from Visewama village in Kohima district (Nagaland Post, 2014).

Plate No.3.1 *Musa nagalandiana*- Endemic and New to science

Plate No.3.2 Bella Rat Snake (*Maculophis bella*)- New to India

Plate No.3.3 Horsehair worm (*Chordodes combiaerolatus*) New to Science.

Plate No.3.4 Naga Gingseng (*Paris polyphylla*)

Plate No.3.6 Tallest Rhododendron in the World standing at a height of 30.79 meters.

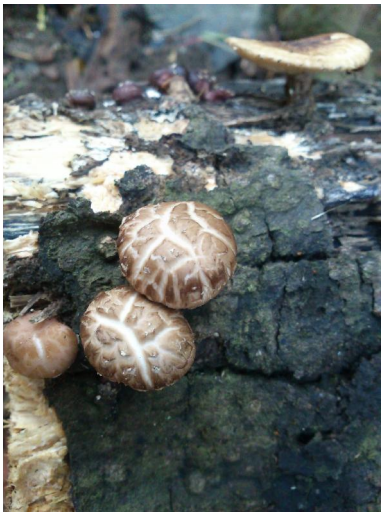


Plate No.3.5 Mushroom *(Lentinus)*

Table 3.1 Endemic Taxa of Nagaland

Sl.No	Family	Species
1	Apiaceae	*Chaerophyllum orientalis, Pimpinella, P. flaccida*
2	Begoniaceae	*Begonia watti*
3	Berberidaceae	*Berberis micropetala, Berberis wardii*
4	Fumariaceae	*Corydalis boweri*
5	Menispermaceae	*Cyclea wattii*
6	Orchidaceae	*Coelogyne hitendrae*
7	Poaceae	*Calamagrostis nagensis, Capillipedium nagense, C. pteropechys and Themeda huttonensis*

Table.3.2 Mammals of Nagaland

Serial No	Common Name	Scientific Name
1	Asian Elephant	*Elephas maximus*
2	Gaur (Indian Bison)	*Bos gaurus*
3	Jackal	*Canis aurius*
4	Tiger	*Panthera tigris*
5	Sambar	*Rusa unicolor*
6	Leopard	*Panthera pardus*
7	Barking Deer	*Muntaiqus muntijak*
8	Wild Boar	*Sus scrofa*
9	Sloth Bear	*Melursus ursinus*
10	Serow	*Capricornis sumatraensis*
11	Hoolock	*Hoolock leconedys*
12	Common Langur	*Presbytis entellus*
13	Macaque	*Macaca spp.*
14	Leopard Cat	*Filis bengalensis*
15	Himalayan Squirrel	*Deremomys lokriah*
16	Pangolin	*Manis crasicaudata*
17	Civet	*Civettictis civetta*
18	Wolf	*Canis auririus*
19	Fruit Bat	*Cynoptirus sphinx*
20	Porcupine	*Hystricomorph hystricidae*
21	Hispis Hare	*Caprogus hispisdus*
22	Slow Loris	*Nycticebus causeang*
23	Otter	*Lutra lutra*
24	Wild Dog	*Cuon alpinus*

25	Orange Billed Himalayan Squirrel	*Cirrus unicolor*
26	Mongoose	*Herpester spp.*
27	Musk Deer	*Moschus moschiferous*
28	Binturong	*Arctictics binturong*
29	Jungle Cat	*Filis chaus*
30	Mole Rat	*Bandicota bengalensis*
31	Indian Hare	*Lepus nigricolis*
32	Martin	*Martis spp.*
33	House Mouse	*Mus musculus*
34	Field Mouse	*Mus booduga*
35	Goral	*Naemorheders goral*
36	Clouded Leopard	*Niofolis nibulosa*
37	Palm Civet	*Paguna larvata*
38	Wood Cat	*Rattus blaufardi*
39	House Cat	*Felis catus*
40	Fulvous Fruit Bat	*Tousettus leschinuitas*
41	Indian Fox	*Vulpes bangalensis*

Table 3.3 Birds of Nagaland

Serial No	Common Name	Scientific Name
1	Greyheaded Fishing Eagle	*Ichuophaga nana*
2	Crested Serpent Eagle	*Pilernia cleala*
3	Bearded Vulture	*Gypactus barbatus*
4	Forest Eagle Owl	*Bubo nipalensis*
5	Collared Pigmy Owlet	*Tus bakkameena*
6	Collared Scope Owl	*Laucidium brodei*
7	Tragopan	*Tragopan blythii*
8	Kaleej Pheasants	*Lophura leucemelona*
9	Common Hill Patridge	*Arboraphila torqueola*
10	Common Pheasants	*Phasianus colchichus*
11	Red Jungle Fowl	*Gallus gallus*
12	Peacock Pheasants	*Polyplectron bicalcaratum*
13	Pintailed Green Pigeons	*Treron apicauda*
14	Rutous Turtle Dove	*Streptopolia orientalia*
15	Marrnbacked Imperial Pigeon	*Ducula badia*

16	Emarald Dove	*Chalcophapa indica*
17	Himalayan Jungle Nightjar	*Caprimulgus indicus*
18	Indian Roller	*Coracias bengalensis*
19	Chestnut Threaded Bee-eater	*Morapa leschanaulti*
20	Bluethreated Barbet	*Mengalaima lineata*
21	Great Barbet	*Megalaima virens*
22	Great Pied Hornbill	*Buceros bicornis*
23	Rufousnecked Hornbill	*Aceros nipalensis*
24	Goldenbacked Throated Woodpecker	*Dimopium shorii*
25	Darjeeling Pied Woodpecker	*Picoides darjellensis*
26	Redaered by Woodpecker	*Lythipicus pyrrhotis*
27	Bluenapped Pitta	*Pitta nepanlensis*
28	Mrs. Gould's Sunbird	*Aethopyga gapldinale*
29	Nepal Yellow Backed Sunbird	*Aethopyga nipalensis*
30	Black Throated Sunbird	*Aethopyga saturata*
31	Fire tailed Yellow Backed Sunbird	*Aethopyga ignicauda*
32	Long tailed Broadbill	*Psarsomus dalhouiae*
33	Red Drumped Swallow	*Cecropes daurica*
34	Tyflers Swallow	*Hirunderustice tyleri*
35	Balcknapped Ariole	*Oriolus chinesis*
36	Himalayan Tree Pie	*Dendrocitta formosee*
37	Bronzed Drongo	*Dicrurus aeneus*
38	Large Brown Thrush	*Zoothera menticola*
39	Lesser Racket-tailed Drongo	*Dicrurus remifer*
40	Greater Racket-tailed Drongo	*Dicrurus paradiseau*
41	Black Drongo	*Dicrurus macrocecus*
42	Grey Drongo	*Dicrurus leucephaeus*
43	Clouded Leopard	*Niofolis nibulosa*

Table 3.4 Reptiles of Nagaland .

Serial No.	Common Name	Scientific Name
1	Monitor Lizard	*Varanus*
2	Tortoise	*Testudinidae*
3	Python (Reticulated)	*Python*
4	King Cobra	*Ophiophegus Hannah*
5	Common Cobra	*Naja naja*
6	Common Krait	*Bungarus caeuleus*
7	Banded Krait	*Bungarus fasciatus*
8	Viper	*Viperidae*
9	Bella rat snake	*Maculophis bella*

Table: 3.5 Rare and threatened plants

Sl.No	Species	Family	Status
1	*Acranthera tomentosa*	Rubiaceae	Vulnerable
2	*Begonia watti*	Begoniaceae	Endangered or possibly extinct
3	*Chaerophyllum orientalis*	Apiaceae	Indeterminate
4	*Crotalaria meeboldii*	Fabaceae	Indeterminate
5	*Cycelea watti*	Menispermacese	Endangered or possibly extinct
6	*Cymbidium eburneum*	Orchidaceae	Vulnerable
7	*Cymbidium tigrinum*	Orchidaceae	Rare
8	*Gleditsia assamica*	Fabaceae	Indeterminate
9	*Kalanchoe roseus*	Crassulaceae	Endangered
10	*Livistona jenkinsiana*	Arecaceae	Endangered
11	*Michelia pinduana*	Magnoliaceae	Rare
12	*Ophiorrhiza gracilis*	Rubiaceae	Indeterminate
13	*Ophiorrhiza griffithii*	Rubiaceae	Indeterminate
14	*Ophiorrhiza tingens*	Rubiaceae	Vulnerable
15	*Ophiorrhiza wattii*	Rubiaceae	Endangered
16	*Pimpinella evoluta*	Apiaceae	Possibly extinct
17	*Pimpinella flaccid*	Apiaceae	Indeterminate

18	*Pollia pentasperma*	Apiaceae	Indeterminate
19	*Renanthera imschootiana*	Orchidaceae	Endangered
20	*Senecio rhabdos*	Asteraceae	Rare
21	*Silene vagans*	Caryophyllaceae	Indeterminate
22	*Vanda coerulea*	orchidaceae	Rare

Other endangered animals and mammals include elephant, Sloth Bear, Spotted Linsang, Tiger etc. Again, various birds and animals such as the Gaur or Indian Bison, Hornbills and Tortoise found in habitats like Intangki National Park (presently known as Nagaland Zoological Park) and Fakim Wildlife Sanctuary and other hilly areas is facing extinction from Nagaland.

Nagas, being intricately involved with the forests for their sustenance, be it agriculture, timber, small, timber, day to day use items or medicinal plants etc. These forest products are also their main source of economy. Therefore, when the main stay of the people is dependent on forest, destruction of forests is imminent and thereby endangering many valuable species. Coupled with it, excessive primitive method/ practice of cultivation (i.e. Jhum Cultivation), unplanned development, introduction of mono horticultural crops, plantation and reckless deforestation is having a lasting impact on the biodiversity of the state. In addition, the use of modern guns and weapons in hunting, bombing and poisoning of rivers for fishing, thereby replacing the age old method of hunting and fishing, has only added to the alarming destruction of biodiversity year by year.

Beside, the decline of traditional knowledge and practices, change in people perception of the biodiversity has contributed largely to the decline of biodiversity in the state.



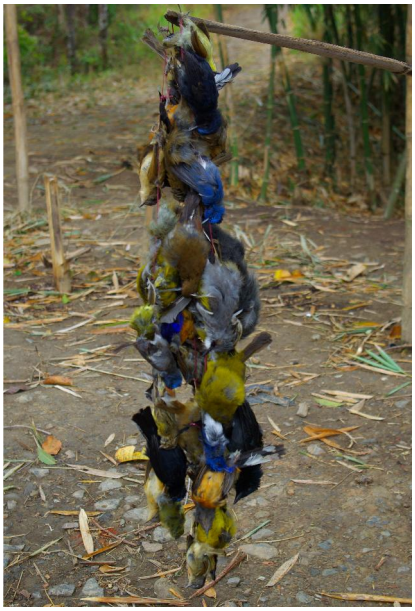



Plate No. 3.7 Introduction of modern guns and weapons has led to drastic decline of state's biodiversity

3.1.1 Biodiversity Conservation in Nagaland

Biodiversity conservation in Nagaland has become a major concern due to habitat destruction caused by increased farming and shifting cultivation practices, urban expansions due to increased population, developmental activities, large scale logging and other extractive activities such as mining and stone quarrying. These activities have resulted in the loss of huge forested areas which are home to various fauna and flora species, some of which may have disappeared without ever being discovered.

In Nagaland, hunting, jhum cultivation, fire wood gathering etc are as old as the people that inhabit the land. Through ages, not only have they hunted wild animals and birds but they have derived every basic need from the forest. With this scenario, one wonders how and for what reason and whether the Nagas have protected their biodiversity. The answer is a simple yes.

Whatever be the reason, Nagas have been conserving their forest and biodiversity since time immemorial. Biodiversity conservation took place in the form of "Sacred forests", Community Forest Conservation and various other taboos, genna, and religious belief associated various individual plants, trees and animals (Discussion in Chapter 4).

Till the 19th century, Nagas lived a life centered around nature viz. hunting, gathering, subsistence agriculture, food, medicine etc. However, with the onset of British occupation in the late 19th century, things changed dramatically. Modern education, Christianity and western ideas supersede the age old traditional practices and religious belief system of the Nagas. No doubt Christianity and introduction of modern education

paved a better way for Nagas but also left a negative impact on the traditional social and cultural practices of the Nagas.

The concept of declaring Community Biodiversity Conservation Area (CCA) in Nagaland can be traced back to as early as the 18th century. This is evident from the fact that the villagers of Phulonger under Kiphere district declared "Murong Community Conservation Area" in 1818 and the "Yingnyu Shang CCA was declared in 1842 by Youngphang villagers in Longleng district.

Community Conservation Areas can be defined as "natural and modified ecosystems with little or no human influence that provides significant biodiversity, ecological services, social and cultural values which are voluntarily conserved by indigenous peoples and other local communities through customary laws or other efficient means that intentionally or unintentionally leads to biodiversity conservation".

Likewise, there are many CCA's that are 50-100 years old. There are as many as 776 CCA's in the five districts (Tuensang, Mon, Phek, Kiphire and Longleng) of Eastern Nagaland alone (NEPED, 2012). Out of which some are recognized by the state government while many are yet to be recognized. At present, declaration of CCA'S by the village community over the existing traditionally protected or conserved forest is a common feature in almost all the villages of Nagaland. In other words, the traditional forest which were conserved and protected by the villagers for centuries for reason best known to them are now being declared and converted into CCA's.

Hunting of wild animals, collecting of fire wood, timber etc. is prohibited within the CCA's. These conservation areas are protected by the age old Naga customary laws and

is controlled and maintained by the village councils. This practice of designating certain forest within the villages as CCA's or simply village/community forest has significantly contributed to the protection and conservation of biodiversity in the stae. Thus, we can say that Nagas are a century ahead of the rest of the world in realizing the importance of biodiversity and preserving them for future.

It is to be noted that many traditional forests and CCA'S in the central, southern and western part of Nagaland were destroyed during 1945 to 1990. Naga Freedom Movement was at its peak during this period, as a result, there was countless conflict between Indian Army and Naga Freedom fighters. These conflicts lead to burning down of large number of villages and surrounding forest by the Indian Army which is one of the main reasons behind the lack of traditional dense forest cover in this part of the state till today.

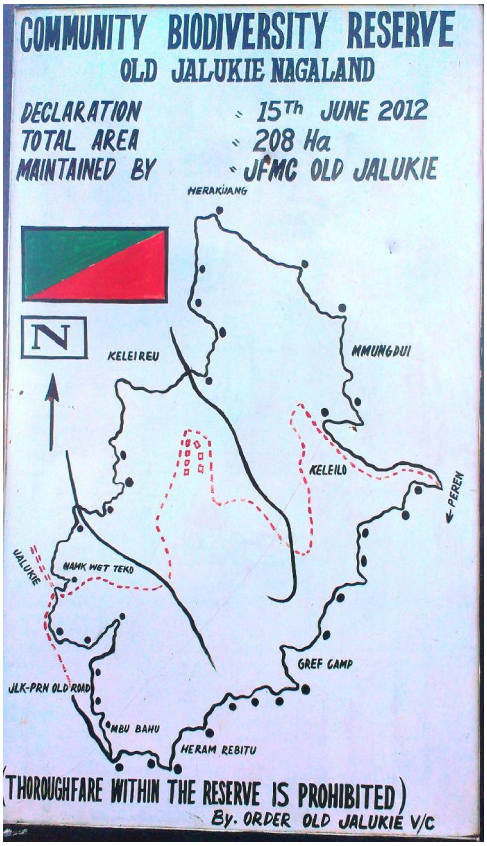
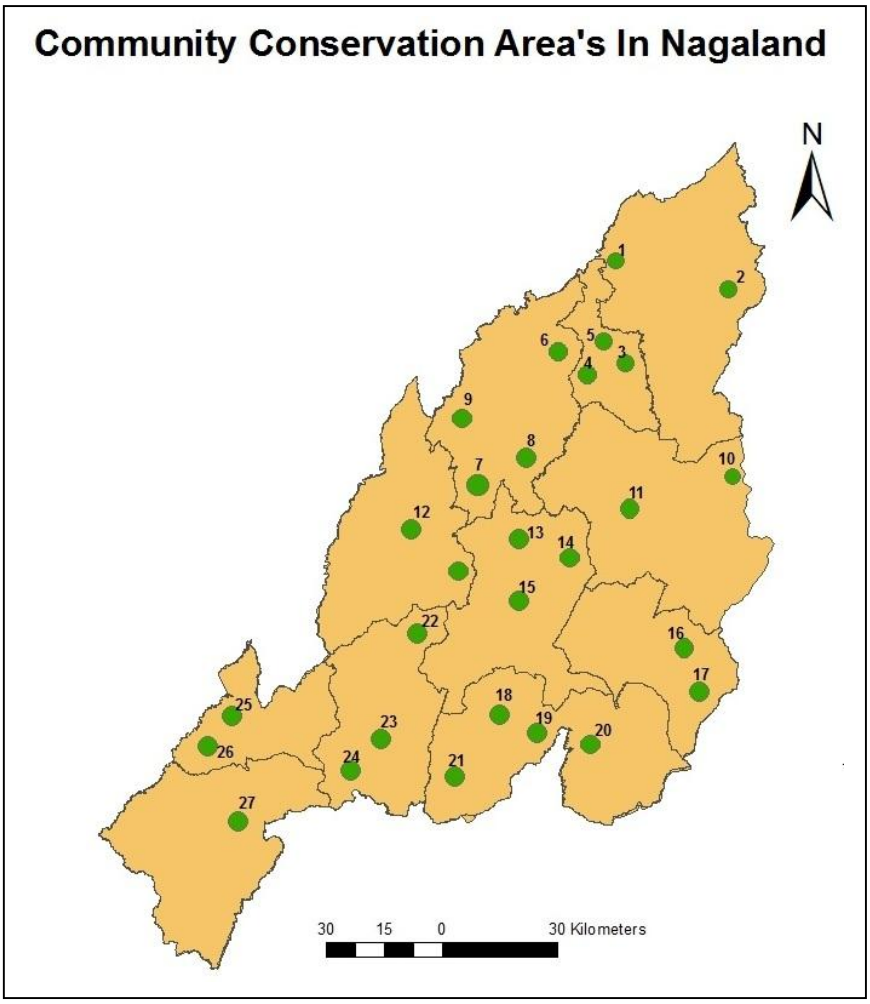


Plate No.3.8 Community Biodiversity Conservation Efforts in Nagaland.

Fig. 3.1 CCA's in Nagaland



Index

1. CCA in Naginimora
2. Kaiviou CCA in Longwa
3. Shali Yungnyu CCA in Yongam
4. Onem CCA in Yachem
5. Khuha Yungnyu CCA in Yongyah
6. Kanglatu CCA in Changtongya
7. CCA in Longkhum
8. Meinkong CCA
9. CCA in Changki
10. CCA in Pangsha
11. Helipong CCA
12. CCA in Baghty
13. CCA in Chishilami
14. CCA in Tizu
15. Ghosu Bird Sanctuary
16. Fakim Wildlife Sanctuary
17. Saramati CCA
18. CCA in Lazuphu
19. CCA in Chizami
20. CCA in Kikruma
21. CCA in Zanzibu
22. CCA in Sendenyu
23. CCA in Kigwema
24. CCA in Khonoma
25. Nagaland Zoological Park
26. Intangki Reserve Forest
27. CCA in Old Jalukie

3.1.2 Identification of different biodiversity belt

Biodiversity is generally associated with the forest cover of a region. The denser the forest cover, the higher the possibility of richer biodiversity. This can be found true by the fact that all the 18 mega biodiversity region of the world are found in region having dense and rich forest cover.

No doubt, the favorable physiography and climatic conditions of Nagaland has contributed largely to the abundance of forest cover and biodiversity. However, the traditional beliefs and practices that Nagas practiced has also attributed largely to the biodiversity richness in the state.

In fact, today most of the dense forest cover and rich biodiversity in Nagaland is found in places/villages/districts where the people still have a strong attachment to their traditional beliefs and practices.

The biodiversity of a particular place, region, or landscape is influenced by climate, topography, and geologic history, as well human and non-human disturbances. Some of the factors influential in the distribution of biodiversity in the state is discussed below:

i. Human factors: Population density**,** Cultural Practices**,** People perception of environment and their dependence on the forest.

ii. Physical Factors: Temperature, Rainfall, Soil type, Topography etc.

iii. Forest cover and its continuity: The density of forest cover and longevity of the forest system.

iv. Spatial distribution of species: The presence of endemic, rare, threatened and endangered plant or animal species as per IUCN Red Data list and the presence of bio-corridors.

Thus, basing on the above factors, six biodiversity belts has been identified throughout the state. They are:

i. Longwa-Pangsha-Thanamir-Shilloi biodiversity belt
ii. Makham-Helipong-Yingnyu-Longkhum biodiversity belt
iii. Khezakeno- Dzulakie-Tening biodiversity belt
iv. Tuli-Tamlu-Naginimora biodiversity belt
v. Sendenyu-Baghty Biodiversity belt
vi. Rangapahar-Intangki biodiversity belt

i. Longwa-Pangsha-Thanamir-Shilloi biodiversity belt:

This belt is the longest and perhaps the richest biodiversity belt in the state. It stretches from Longwa in Mon towards Pangsha in Tuensang through Thanamir in Kiphire to Shilloi in Phek. This belt borders Aruunachal Pradesh, Myanmar and Manipur and forms the eastern most part of Nagaland. Dikhu is the principal river of this belt. It is a narrow belt but harbors rich biodiversity. The forest and vegetation cover is represented by Evergreen forest along the Longwa range extending towards Pangsha and joins the Broad leaved evergreen forest around saramati range. Pine and Rhodhodendron forest are abundant in this belt and at higher altitudes in ridges of saramati sub-alpine and alpine vegetation dominates.

Not only is this belt rich in biodiversity but is also very rich in mineral and natural resources. This belt is often regarded as the "Treasure of Nagaland". Some of the important characteristics of this belt are discussed below:

This biodiversity belt is home to a myriad of plant species and perennial flowering plants that offers a veritable utopia for bees. Bees such as Rock bee (*Apis dorsata*), *Apis cerana*, Stingless bee (*Trigona/Melipona* species) have built their home in the seemingly inhospitable and rugged mountains, and coexist in perfect harmony with the village folks in many of the hamlets of this belt.

Longwa is perhaps the only place/village in the world where a house is situated between two countries i.e India and Myanmar. The crazy Longwa bamboo *Cephalostachyum longwanum,* new to science and endemic to Nagaland is named after this village.

Thanamir in Kiphire is known as the "Apple village" of Nagaland. It is also the gateway to Mt. Saramati, the highest peak of Nagaland.

The famous Shilloi Lake in Phek district is situated in this belt. The lake has the shape of footprint and the color of the water appears to be grey and is surrounded by dozens of lakes. The lake is believed to be the abode of spirits and hence hunting, fishing, and cutting of trees and collecting of firewood surrounding the lake is prohibited.

Further, "Singphan Wildlife Sanctuary" in Mon and "Fakim National park" (Recognised by the Government) in Kiphire adds to the biodiversity richness in this belt.

There are around 80-100 (approx.) Community Conservation Area (CCA) in this belt. One of the oldest CCA'S in Nagaland, The Murong Community Conservation Area (1818) in Phulonger village lies in this belt.

The Saramati Community Conservation Area is the largest Joint CCA in this belt and includes forest belonging to 18 villages under Kiphere district. This conservation programme was started as early as in the year 1949 (NEPED, 2012). This CCA'S have contributed largely to the rich biodiversity in this belt.

Some important mammals and birds in this belt include, Asiatic black bear, Gaur, Leopard, Hoary bellied Himalayan Squirrel, Indian Muntjak, Large Indian Civet, Diard's Worm Snake, Sunbeam Snake, Burmese Phyton, Wild Boar, Barking Deer, Mrs. Hume's Pheasant, Great Hornbill, Red-necked Keelback etc. There are also a variety of fish and other species which are yet to be identified and documented.

The presence of large traditional forest where the sun does not penetrate adds to the richness of biodiversity in this belt. The people living around this belt, to a large extent still depend on indigenous knowledge and strongly hold on to their age old traditional practices, which have played a significant role in conserving the biodiversity within the belt.

ii. Makham-Helipong-Yingnyu-Longkhum biodiversity belt

This is another biodiversity belt with dense forest and plenty of rare and threatened species floras both gymnosperms and angiosperms. This belt stretches around Makham village in Zunheboto district towards Helipong in Tuensang district to Yingnyu Shang in Longleng district and cuts through to Longkhum in Mokokchung district. Doyang and

Dikhu are the main river of this belt. Forest and vegetation cover is represented by broad-leaved evergreen forest around Helipong, Evergreen forest towards Yingnyu and Ongpangkong range till Longkhum village in Mokokchung district. Tracts of bamboo forests are also found in this belt.

The Ao Naga legend that they originated from *Long-Trok* (Six Stones) at Chungliyimti village (inhabited by the Sangtam Naga tribe at present) is located in this belt.

This belt is characterized by the presence of Helipong Khong joint biodiversity conservation area under Tuensang district, Yingnyu Peak and subsequently the Yingnyu Shah CCA which was started in 1842 in Longleng district, and a long stretch of dense forest cover up to Longkhum in Mokokchung district. Meinkong Reserve Forest Area which is an initiative of 3 villages (Chuchuyimpang, Sungratsu and Longmisa) under MKG district is located in this belt. Green zone project, a project for conserving biodiversity under the initiative of Ecological Security of India between Longsa and Ungma village has been launched in this belt since 2009.

Another important feature of this belt is the absence of shifting cultivators in certain villages and the increase in jhum cycle. Chuchuyimpang village recorded 0% shifting cultivators in 2014. Besides, villages such as Ungma, Longmisa, Longkhum, Sungratsu etc have a Jhum cycle of 13-15 years and many forests are left untouched by shifting cultivation.

A new banana species in the world *Musa nagalandiana* was first discovered from this belt at Makham village in 2014 under Zunheboto district. It is a rare and endemic banana plant of Nagaland.

Besides, endemic and rare bamboo species such as, *Bambusa mokokchungeana, Bambusa alemtemshii*, various species of Orchids, different species of fauna and avi-fauna are found in this belt (endemic).

Some important fauna and avi-fauna of this belt include, Barking Deer (*Cervulus muntjac*), Sambar (*Cerbus unicolor*), Wild boar (*Sus crestatus*), Sloth bear (*Scenarctos*), different species of Squirrels, Grey Peacock Pheasant, Kaleej Pheasant (*Cophhura leucomelonos*), different species of Bulbul, Indian Drongo Cuckoo (*Surniculus lugubris*), Hornbills, Cliff Swallow, Red legged Amur Falcon (Falco amurensis) etc.

This belt host a number of sacred forests (in the form of "alitara" and "ait") such as the Meyutsungba apok, Ashini ait etc., and scared places of worship such as the Ansulong, Longlangba long etc. the presence of these sacred forests and places have attributed largely to the rich biodiversity of this belt.

iii. Khezakeno- Dzulakie-Tening biodiversity belt

It narrowly stretches from Southern most part of Phek district towards Japfu peak in Kohima district and down to Mpai, Tesen and Tening villages in Peren district bordering Manipur. This belt is mostly covered by broad-leaved evergreen forest and evergreen forests.

This is a belt rich in traditional knowledge, culture and custom and is the most beautiful biodiversity belt of all. The forests in this belt are mostly traditional forest and have deep attachment to the people. The rich biodiversity in this part of Nagaland is due to the fact that the people in this belt practices terrace cultivation, leaving them with ample scope to

protect and preserve their forest. The practice of planting *Alder Nepalensis* (Nitrogen fixing plant) in agricultural fields is prominent in this belt.

CCA is a recent phenomenon in this belt but each and every individual village has their own respective reserve forest. This belt boasts of the famous "Dzukou valley" that harbors rich flora diversity. Though the flora of Dzukou valley is yet to be documented it is believed that there are a vast variety of species in this valley.

Tallest Rhododendron in the world in Mt. Japfu, endemic rhododendrons such as *Rhodendron Wattii* and *Rhododendron elliottii* are found in this belt. Kigwema Biodiversity Village, Khonoma Green village, etc are located in this belt.

Khonoma Tragopan Bird Sanctuary initiated by the Khonoma villagers has contributed largely to the Tragopan bird population in this belt and in the state.

This belt is characterized by the presence of Dzulakie River which flows underneath the ground that adds to the beauty and richness of biodiversity.

Khezhakeno village in this belt is the legendary place of origin for many Naga tribes and is an important migration route of many other Naga tribes. Over 1500 different species of trees, crops, plants, herbs, shrubs and grass were identified in this village alone (Lucy, 2009).

iv. Tuli-Tamlu-Naginimora biodiversity belt.

This belt starts from Dibuai village and runs towards Tuli in Mokokchung district to Tamul division in Longleng district and ends around Naginimora division in Mon. This belt is characterized by dense forest, moist everegreen forests and moist deciduous forest

around tuli and naginimora area. Tropical wet evergreen and semi-evergreen forests type in tamlu and degreaded and bamboo (Poor Man's Timber) forest cover are found around tzurangkong range in MKG district covering tuli. It is the home for endemic bamboo species *Bambusa Nagalandiana* and *Bambusa alemtemshii*, besides there are a variety of other bamboo species.

Bamboo has always played an important role in the traditional life of the Nagas. Most of their basic requirements are made of bamboo. Till date, as many as 1500 commercial applications of bamboo have been identified (Infomag, 2011-12). Bamboo is also a favourite for many animals like elephants, pandas, deer's, gaurs etc.

The Dibuia- Waromung corridor lies in this belt, which harbors an enormous amount of biodiversity. Besides, there is the roosting place for "Amur Falcons", in Changtongya. Though the programme for protecting Amur Falcons was started in the year 2011 in Nagaland, the people of this region were already protecting this bird for more than 2 decade. Amur falcons are called "Kotaklar Ozu", meaning "Heavenly bird". They believed that these birds were sent from heaven and thus, this birds were sacredly protected.

This belt is the home to River Crocodile (*Crocodylus palustris*), Turtle (*Lepidochelys olivacea*) and Land Tortoise (*Chelone imbricata*). Leopard (Panthera pardus), Royal Bengal Tiger (*Panthera tigris*) and Elephant (*Elephas maximus*) are also found in great numbers.

Various aquatic resources like, *Gara naganensis, Crossochilus latius, Channa orientalis*; varieties of crabs like the *Rau, Pithia, Gagal, Chital, Ari* etc; varieties of lizards like the

Monitior Lizard (*Varanus*), Flying Lizard (*Draco vessicolor*) etc are abundantly found in this belt.

The forest in Kangching village under Longleng District is one such forest where people get lost inside the forest even today.

V. Sendenyu-Baghty Biodiversity belt

This is belt extends from Tsemenyu under Kohima district to Baghty in Wokha district. This is comparatively a small biodiversity belt but has very rich fauna and avi-fauna. Doyang River and its tributaries surround this belt. Doyang dam is situated in the upper part of this belt. Large tracts of traditional forest under this belt have already been submerged by the construction of the Doyang dam. The forest type is represented by Northern tropical evergreen forest and overlaps with moist deciduous forest along the baghty-merapani region.

This biodiversity belt is famous for having the world's largest Amur Falcon roosting place in Baghty. According to a villager from Baghty village, "every year around 20,000-30,000 approx. Amur Falcons visit the village". Recently, this place has received international attention under the flagship "Friends of Amur Falcon", initiated by Nagaland Wildlife and Biodiversity Conservation Trust (NWBCT) and supported by various other national and international non-governmental organizations. Besides, Sendenyu Community Reserve forest, located near Tsemenyu town in Kohima district is one of the biggest community protected forest in the region.

The forest cover in the lower part of this belt bordering Merapani in Assam is extremely dense. Many traditional trees as old as 500-700 years are found in this belt. Certain

villages like Mongpio in this belt do not practice rice cultivation because every year their fields get destroyed by wild animals and birds.

Important fauna and avi-fauna of this belt include Leopard, Black Bears, Elephant, Tigers, Jungle Cats, Wild Pigs, Flying Squirrel, Himalayan Crestless Porcupine, Slow Loris, Kalij Pheasant, Red Jungle Fowl etc.

vi. Rangapahar-Intangki biodiversity belt

This biodiversity belt is situated between Peren and Dimapur Districts. This belt is covered by tropical wet evergreen and semi-evergreen forest type and merges with tropical moist deciduous forest along the Jalukie-Medziphima towards Kohima district. This belt is important because of the presence of many endemic and endangered flora and fauna. However, this biodiversity belt is under serious threat from population explosion, urbanization and subsequent deforestation.

Intangki reserve forest and Nagaland Zoological Park are located in this belt. Deforestation and land encroachment along with urbanization have left its mark in this belt so much so that Rangapahar Reserve Forest, which was once a dense reserve forest, has been reduced to the present Nagaland Zoological Park.

Conservation efforts in this belt is a recent phenomenon, however the response from the villagers in preserving the forest and flora and fauna is very encouraging. Subsequently, Old Jalukie village which started conserving its biodiversity in the year 1986 and taken up by the government on 15th June 2012 was awarded The Indian Biodiversity Award 2014.

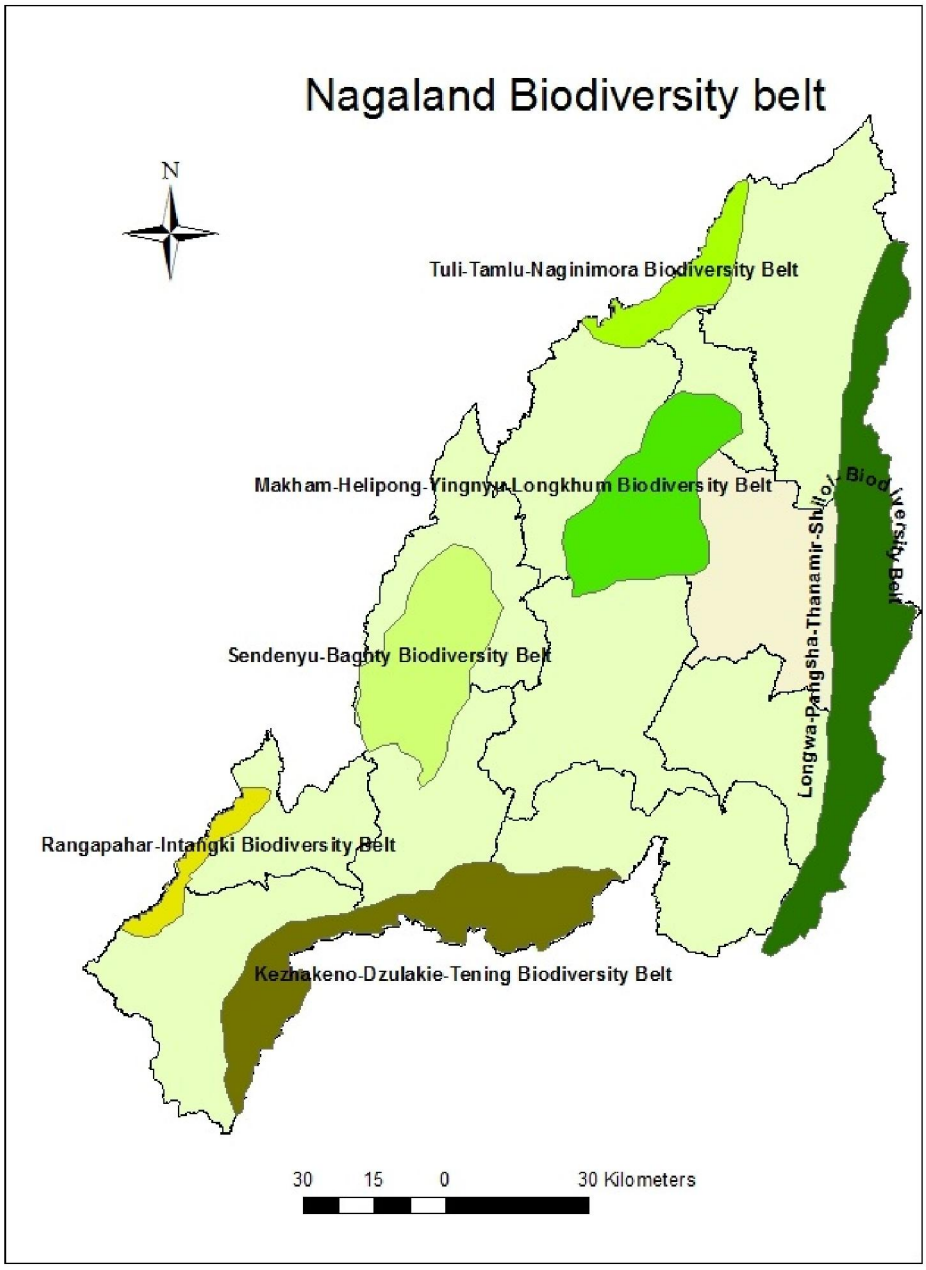
This belt is known for the occurrence of various endemic plants along with rare and threatened animals. The Department of Forest, Government of Nagaland, is putting much effort to protect and preserve this belt form being damaging further.

This belt is the home of the endangered Indian Bison, Royal Bengal Tiger, Great Indian Hornbill, Oriental Hornbill, Brown hornbill etc.

Besides, favourable topographic and climatic conditions, the sudy from the different biodiversity belt in Nagaland indicate that, biodiversity is richer in places where traditional practices are still strong; where people maintain a close relationship with the environment; and where there are less developmental activities.

Thus, it is evident that the traditional knowledge and practices of the Nagas has contributed significantly to the past and present status of biodiversity in the state. It is therefore of utmost importance to study and analyse the traditional practices of the Nagas, their relationship and perception about their surrounding environment and the impact of modernization and development on the biodiversity of the state.

Fig. 3.2 Biodiversity Belt of Nagaland



3.2 Man – Environment Relationship

Man, to a large extent, is a product of his environment. His physical as well as his entire lifestyle is conditioned by the environment in which he is placed (Chandoke, 1994). Environment is the source of life; it not only directs but also determines the existence, growth and development of mankind and all its activities. The word environment is formed of two words, i.e., 'environ' and 'ment' meaning 'encircle' or 'all round' and etymologically it means 'surroundings". Thus, environment is a complex of many variables comprising the living as well as non-living organisms and their interrelationship with each other.

A passage in the "nature of geography" concerning the semantic problems of the words "natural" and "nature" concludes that such terms are needed to express the contrast between the part of reality which is independent of man and that part which is "human" because the relations between the world of man and the nonhuman world are of greatest concern in geography (Hartshorne, 1992).

H.M. Saxena asserts that, geography right from the beginning, deals with the man-environment relationship in spatial context and today it has become an interdisciplinary science concerned with the surface of the earth and its natural environment as well as the human intervention which has changed the physical and cultural landscape over years. He further states that, "the whole fabric of geographical study is based on man-environment relationship, or in other words, geography is the study of the relationship between man and environment. According to him, the concept of man-environment relationship has been developed during the initial stages of the development of geography and still forms the basis of geographical knowledge and research"

While the relationship of humans to their earthly environment is a core concept in geography, an equally important idea is that the relationship has a certain distribution in space. Geographers recognize that the quality of life layer varies from place to place in terms of richness or poverty of life forms capable of being supported.

Conventionally, the hyphen linking humankind and environment has represented relationship between two variables, one independent and the other dependent, one active and the other acted upon. The link is thus unidirectional. When the environment is inert and acted upon, then there are 'no necessities but everywhere possibilities' and the human being 'as masters of the possibilities' is the judge of their use and vice versa (Sinha, 1993).

While most of the other disciplines have started to study this relationship only after recent alarming rise over environmental problems, geographers have developed certain concepts like determinism or environmentalism, possibilism, neo-determinism etc. in their early writings and have also explained the impact of nature on man and vice versa. The study of these concepts is still relevant for better understanding of the changing pattern of man-environment relationship (Saxena, 1999).

3.2.1 Environmentalism/Determinism

Geographers have inherited the idea of environmentalism from Greek philosophers that nature is all powerful and not only directed but determined all the human activities. Alexander Von Humbolt (1869-1859), is considered as the pioneer of determinism in geography. Carl Ritter (1979-1859), has propounded the influences of environmental factors not only on human activities but also on human character. Similarly, Charles

Darwin seeks to explain and link between the origin of species with environment in his theory “Origin of Species”. According to Buckle, “Man modifying nature and nature modifying man, yet it is nature itself which determines when and how man shall be so active, in other words natural powers are in every instance dominant, the determinism is complete”

Determinism is one of the most important philosophies which persisted up to the Second World War in one shape or the other. Deterministic major source for explanation was that the nature of human activity was controlled by the parameter of the physical world within which it was set. In other words environment plays the major role in determining the behaviour patterns of man on the earth’s surface. The essence of the determinists is that the history, culture, living style and stage of development of a social group or nation are exclusively or largely governed by the physical factors of environment. Man is generally considered a passive agent on which the physical factors are constantly acting and thus determining his attitude and process of decision making (Hussain, 2004,).

Frederic Ratzel (1844-1904), proposed the concept of terrestrial unity and described the complex interrelationship between physical variables like altitude, topography, climate and vegetation and also their impact on man. Ellen Semple states “Man is a product of the earth’s surface. This means not merely that he is a child of the earth, dust of her dust, but that the earth has mothered him, fed him, set him tasks, directed his thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him problems of navigation or irrigation and at the same time whispered hints for their solution”. On the other hand, Griffith Taylor (1880-1963), was even more careful to

gather accurate data about environment and to relate these to his idea of human habitability. He believed that "environment sets the limit of human development".

Besides, several other geographers and scholars have fully or partially supported the concept of environmentalism. But with the growth of knowledge, development of science and technology, it was realized that man can use nature for his comforts.

Thus, Tatham rightly states that "although environment undoubtedly influences man, man in turn changes his environment and the interaction is so intricate that it is difficult to know when one influence ceases and the other begins". Thus, a new concept known as "possibilism" came into existence.

3.2.2 Possibilism

Vidal de la Blache is considered as the founder of the concepts of possibilism. According to him, "nature is never more than an adviser". Possibilism in geography developed as reaction to extreme generalizations of environmental determinists that led to a counter thesis, of possibilism, which presented the man as an active rather than a passive agent (Hussain, 2004). Hagget has defined it as follows, "Possibilism, in contrast to environmentalism, stresses the freedom of man to choose alternative patterns of behaviour despite geographic location".

The possibilists show with great precision that society "interposes practices, beliefs and rule of life between nature and man". The possibilists also argue that it is impossible to explain the difference in human society and the history of the society with reference to the influence of physical environment. They hold that man himself brings influence to bear on that environment and changes it. To the possibilists, nature is never more than an

adviser. There are no necessities but everywhere possibilities. Borrow, the prominent ecologists, asserted that geographer's role is to investigate and understand the nature of transition from natural to the cultural landscape.

Thus man chooses, but only from the range which nature presents him. However, the possibilists approach has also been criticized by many contemporary thinkers. Thus a new concept in the form of 'neo-determinism' emerged in geography.

3.2.3 Neo-determinism

Griffith Taylor put forward the concept of "neo-determinism" or "Stop and Go determinism" in which he admitted the impact of nature on man but also recognized the human skill, mental ability, scientific development and technical knowledge, through which man can use nature to a certain extent according to his needs. According to this concept, nature provides opportunities for man on which he can act but at the same time man is not free from the control of nature. In no environment are the possibilities limitless and for every choice price must be paid but within these, the limits of freedom to choose exists (Saxena, 1999). "Griffit Taylor was largely right when he wrote that, "the task of geography is to study the natural environment and its effect on man, not all problems connected with man or the cultural landscape. Man follows nature's programme if only he is wise, presuming he can act foolishly, which admits the possible contention that within broad limits set by environment man can choose, at the very least". Taylor concedes that, the choice between what is wise and what is foolish. But wisdom and folly are human concepts. The natural environment knows nothing of them. In nature there is only the possible and impossible. Finer categories are manmade.

Man and environment are both active and acted upon. Thus, man-environment relations are based on mutual interaction and mutual transformation. Francis Bacon quote, “nature can be conquered only by obeying her”. Thus, the impact of nature should be assessed in its totality rather than single factor determinist’s point of view.

Perhaps the debate over which concept is more competent might continue on for ages but whatever the concept may be, the truth is that there has and will always be a certain relationship between man and his environment in one form or the other.

Indigenous/tribal people also understand the law of nature and have always shared an intimate relationship with their environment. Anthropologists and social activists have observed that tribal’s and other forest dwellers generally protect not only individual trees but also forests, and even their entire ecosystems because they have deep rooted vested interests in doing so. Such vested interests are usually institutionalized in the form of well established practices enforced by various social control mechanisms. This is because, for the tribal’s and many other forest dwellers, their forests are essential for their survival.

This view is expressed in the following words by Menon Fernandes and Viegas as:

“All the data at our disposal showed that traditionally the tribal’s had a vested interest in the preservation of forests. They had, therefore, developed a culture that ensured a proper balance between human and ecological needs. Forests were treated as a renewable resource and as a life support system that had to be preserved. In order to achieve this, in some cases they preserved entire ecosystems, in other instances they banned the use of axe and sickle on species that were economically important, restricted the use of other useful species through social control mechanisms, and ensured equal distribution of

varieties that could be cut without restriction. The ecosystem and banned species were linked to the continuity of the tribe through their totem and myths, thus, making the preservation of forests coincide with the conservation of their village or tribe".

In Antiquity every tree, every spring, every stream, every hill had its own genius loci, its guardian spirit. These spirits were accessible to men, but were very unlike men; centaurs, fauns, and mermaids show their ambivalence. Before one cut a tree, mined a mountain, or dammed a brook, it was important to placate the spirit in charge of that particular situation, and to keep it placated (White, 2003).

3.2.4 Nagas and their relationship with the environment

Like the rest of indigenous or tribal people all over the world, Nagas had held a holistic view towards understanding the nature, which helped them in maintaining a close balance between people and ecological needs in such a way that both are protected and preserved. Nagas relation with the nature/environment is not merely for material and common purposes alone, but it is of a socio-religious one. Their daily activities are intrinsically linked with the nature.

Their relationship with nature is reflected profoundly in their beliefs, myths, folklore and folksongs and in their attitude towards nature. Their religion taught them to believe, govern and act towards nature not just by a principle of sustainability for survival sake but by a moral sanction against waste or greed. The balance in the cosmic order was maintained through careful precautionary and ecological approach by absorbing taboo and totemic relationship with the nature (Bendangangshi, 1997).

Every Naga tribe has different culture, customs, dialect and behavior, yet the cultural patterns and their belief are almost the same. The common origin and migration of the Nagas, their history, culture, tradition and common way of life are all mostly attached towards the nature. Their folksongs, folklores, dance and ceremonies, arts, dress, ornaments, institutions etc. speaks about their rich association with the surrounding environment.

Since time immemorial, Nagas have always shared an intimate and complex relationship with the environment. From the forest, they derive their basic needs for survival, i.e., food materials like fruits, nuts, vegetable leaves, various types of tubers and roots etc. It is also a source for their shelter, collection of raw materials for their huts, firewood, bamboo, rope, grass for housing, farming, grazing of cattle, herbal medicine for health etc. and several other valuable forest products. In turn they protect the forest with their indigenous knowledge and also enrich its fertility through various traditional practices and beliefs.

Nagas live in villages and firmly upholds the doctrine that “one never abandons one’s village, home and clan” (Shimray, 2014). The development and upkeep of the village life and the care for environment is always within the purview of their traditional values, ethos and customs that was handed down for generation (Martemjen, 2012).

The complexities of man–environment relationship among Nagas are clearly reflected in their dynamic livelihood activities. The Naga indigenous socio-cultural lifestyle is intricately linked with the environment that forest, water and land forms an inalienable

part of their life. They perceived the biological components of the environment and humans as an integral part of the natural ecosystem.

Their deep sense of environmental ethos, beliefs and practices has helped in preserving their environment in various ways and at the same time they could effectively utilize the resources to meet their ends. Besides, they have a strong sense of physical and spiritual attachment with the nature, so much so that their socio-cultural and economic life revolves around their nature of which they are an integral part.

To Nagas, every land, forests, rivers, mountains, hills, plains and valleys are identified through unique individual names to the people, having its own meaning and significance. They understand, express and perceive the entire ecosystems as a means of livelihood and are a Common Property Resource (CPR) for the people to use astutely.

The Nagas and their relationship with the environment can be divided into two eras for better understanding, viz., Pre-Christianity Era and Post Christianity Era.

3.2.4.1 Pre-Christianity Era

In the Naga worldview the earth is a “Living Earth”, and all living and non-living elements on earth has its purpose (Lkr, 2014). They worshipped nature and believed that man, God, animals, aquatic creatures and plants symbiotically co-existed together. The Naga ethos of integration of all lives on earth is so strong that everything is inclusive and is one entity.

Before the advent of Christianity, Nagas believed in different Gods for different social and spiritual needs such as God for home, for wealth, for forest, for rivers and lakes, for

rocks and mountains etc. This indigenous religion of the Nagas had a clear concept of the creator of mother earth known by different names to different tribes. The *Sema* tribe calls the supreme God *Alhou,* the *Lotha's* called it *Potso,* the *Angami's* call it *Ukepenuopfu,* the *Ao's Lijaba*, *Rengma's* refer to it as *Sunggigu* or *Anyiza* and the *Phom's* call it *Vangyoung Ongpa*. Nagas believed that this benevolent God is the creator of the earth and deity in control of the nature. Besides, they literally believed in the existence of spirits, magic, ritual and fusion of human with the natural world.

For Nagas, the land is not only the mother, but also the source of life and is sacred. Everything springs forth from the earth, the trees, the rivers, the flowers, fruits, grains and so on. People live by what the earth provides, the vegetables, animals, the land for agriculture and its produces (Longchar, 1995,). Accordingly, their mode of communication with God most was through some natural agents like birds or plants and animals. Every aspect of their lives was governed and circumscribed by cultural values, norms, ethics and beliefs which has molded and bonded the Naga society.

The ancient Naga mythology says that in the beginning when the earth was young and wholesome there was no distinction between birds and animals nor between them and humans. Every Naga tribe has its own legend and belief system of their origin which are either related to living creatures like plants and animals or even objects like stones, caves etc. The Angami Naga legend says, they spring forth from ancestors who emerged from the "bowels of the earth" (Hutton, 1921,). Similarly, the Ao Nagas believed that they emerged from "Longtrok" meaning "six stones", which is found even today at "Chungliyimti". The Chang legend says that their ancestors lived at "Changsang" during the creation of the universe, "a big hole in the earth" (Thong, 1997).

The Nagas symbiotic relationship with nature is evinced through their strong beliefs in deities, legends, observance of taboos and worshipping of places such as water bodies like lake, marshy areas and stones, and some particular place or forest which they believe to be the abode of spirits and gods. Their relationship with the nature is so intimate that many of the places or villages or people are named after some particular trees, plants, flowers, rivers, lakes, stones etc (Table 3.2.5.1).

Longchar (1995), tracks the nature of Naga-Environment relationship to a religious affair. He affirms that, rocks and boulders, trees, rivers etc are not just empty objects, but are religious objects. The voices and songs of birds and animals speak of a religious language; the eclipse of the sun and of the moon is not simply a silent phenomenon of nature, but it speaks to the community often warning of an impending danger and misfortune.

Nagas shared a kin relationship with the nature which is so evident in their history, culture and tradition. Their insights regarding the origin and evolution of animals, fishes, birds and plants strengthened their relationship with the environment and has thus, helped in the conservation of the vast biodiversity that surround them.

One such belief in the *Ao* community is the origin of Catfish. One day three women went to forest to collect bamboo shoots for pickle. On the way back one was swept away at a ford. The other two went in search of her and found her body caught in a fish trap a little lower down. She had half turned into a catfish. That is why catfish carry tattoo-marks to this day and are not eaten by women. The Lotha Nagas believed that catfish and monkeys were formed of little children.

Table: 3.6 Name of place/person/village/river and their meaning associated with biodiversity

Sl.No	Name of Place/Person/river/village	Meaning
1.	Zunheboto	Derived from "Zunhebo" flower (*Leucoseptrum*)
2.	Long -Trok	Six stones(The Aos' myth says that they emerged from these six stones at Chungliyimti)
3.	Khonoma	Named after "*Gaultheria*" Flower, local name "Khwunyu"
4.	Chuchuyimlang	Named after a bamboo "Chuchu" in Ao dialect
5.	Longmisa	Name after "Longmi", a variety of bamboo
6.	Setikima	Named after an ancient pipal tree
7.	Ozukum	"ozu" meaning Bird and "Kum" meaning "born out of"
7.	Kichu	Sparrow
8.	Mekrisunuomi	Descendants of Mushroom
9.	Chase	Descendants of chase tree
10.	Tendymoa (Nameof a Person)	First fresh leaf
11.	Chukitong Village	Named after "Chukitong Tree" (Amla tree)
12.	Koio Village	Named after "koio" tree (Togo tree)
13	Nungying village	Named after a huge rock "Nungying"
14	Waro tzubo	A pond named after 'Crow'
15	Aremtsubo	A pond in the forest
16	Tzusu river	Named after a type of 'Cloud'
17	Pongidong Village	Named after 'Kappok' tree
18	Chumchamo	'Chum' meaning 'plant' and 'Chamo', meaning 'Rich'
19	Thyiigvuchunyu	Animal charmers

Likewise, the Naga tribes belief vary regarding the origin of earth, birds, plants and animals etc. but the concept is almost the same among all the tribes. It is also believed that certain birds, other animals and fishes have a special link with human being and hence, are highly venerated even today

Among the Nagas, Ao, Sangtam, Rengma, Phom, Lotha, Sumi and Chakesang tribes practiced "Lycanthropy", in which it is commonly believed that a person is having a spirit in the form of a tiger. Any incident or accident or injury that happens or may occur to the tiger has a direct bearing on the person and even death. In some cases, "the spirit could be in the form of a large snake".

It is commonly found that the general construct of the Naga folksong and folklore is associated with the nature expressing their love and appreciation for nature. Life was in its totality and originality without mass environmental destruction (Shikhu, 2007).

The balance between people and ecological needs was maintained through observation of strict taboos and genna. The observance of taboos and genna helped the Naga society in protecting the whole nature from destruction without which there would have been large exploitation of natural resources. Besides, totemism has a strong ethical and ecological significance for the Nagas. "Totem animals and plants are taboo and not liable to be killed or eaten except during a relatively rare and regularized religious festival. The creation is looked upon as something to be cared for, protected and preserved, not as something for wanton destruction for the satisfaction of one's greed" (Takatemjen, 1997).

3.2.4.2 Post Christianity-Era

Lynn White (1967) states, "The victory of Christianity over paganism was the greatest psychic revolution in the history of our culture. It has become fashionable today to say that, for better or worse, we live in the post-Christian age". Further, white adds, "Certainly the forms of our thinking and language have largely ceased to be Christian, but to my eye the substance often remains amazingly akin to that of the past".

Needless to say, that the greatest revolution in Naga society was brought about by the Christian missionaries along with modernization and Indian annexation and occupation. It is of no doubt that these influences brought about economic development and social progress, political consciousness, new religious values putting down reprehensible customs, abolishing headhunting, warfare and slavery, and enhancing the people's consciousness of their historical destiny and human dignity. Simultaneously, however, it also had a disastrous effect on the whole life of the Nagas as a result of alien culture, politics, morality, attitude and practices demoralising the Naga traditional values (Shikhu, 2007).

The gospel of Christ reached Nagaland by the "mid 19th century and due to its impact, cultural life of the people began to take different shape threatening the beauty of the Naga culture. Thereafter, the confrontation between Christianity and the rigid Naga culture and custom had been continuing since then. To practice cultural activities was considered as a sin and un-Christian. As a result, the rich cultural heritage of the Nagas was forced to abandon gradually" (Jamir, 2005). Imnayongdang has rightly stated that "Christianity has also brought great change to the Naga culture. The tribal festivals and superstitions, belief and myths are replaced by Christian festivals and Christian faith, although some of the

traditional Naga festivals are still observed". The impact of Christianity on the Naga society is tremendous and their way of life has changed to a great extent.

After the advent of Christianity, Nagas were no longer able to hold both Christian values and traditional values together any longer. "It is true to say that the Naga traditional belief and practices could not hold the forces of Christianity. As a result, a total change was brought to their society due to the impact of Christianity within a short period of times" (Jamir, 2005). Christian ideology brought in a counter partner in supernatural for the natural thus, lowering the value of natural (Varah, 2013).

Along with Christianity, a new world view made up of western culture, politics, science and technology, medicines, schools and literature were introduced in the region. Slowly Nagas began to view nature without any religious significance. It promoted dualism between the spiritual and the material, making the things of this material world of little importance, or even regarding as evil (Longchar, 1995). The transition from traditional to modernity in Naga society has been rapid. Modernization has destroyed our traditional values such as the concept of egalitarianism, exploited our rivers, hills, plants and animals. And so, Shaolm which existed between the Nagas and nature is no more! With the destruction of the nature around us, the birds have refused to sing (Takatemjen, 1997).

Until the arrival of modern education and institutions, Nagas economic, social, religious and cultural activities revolved around nature and were closely intertwined with their livelihood and culture. They survived and lived by adapting to changes in their immediate environment for ages. By embracing Christianity they gave up certain traditional ideas,

beliefs and practices as a result their relationship with the nature has changed dramatically. Today, most of the sacred places, forests, lakes, stones, plants and animals are destroyed and polluted.

As Nagas philosophy of nature and man stems directly from their association with the environment, it inevitably influences the way they act, think and perceive. To do away with our traditional values would be a disaster. It is only through such a synthesis that we will be able to respond to the problems we are facing today in our land in a holistic manner whether they be social, ecological or economical (Takatemjen, 1997). Thus, Nagas should find a way to mask the traditional values, the Christian values and the modern scientific knowledge in order to respond meaningfully to the problems of our land today.

Chapter 4

Conservation of biodiversity through traditional practices

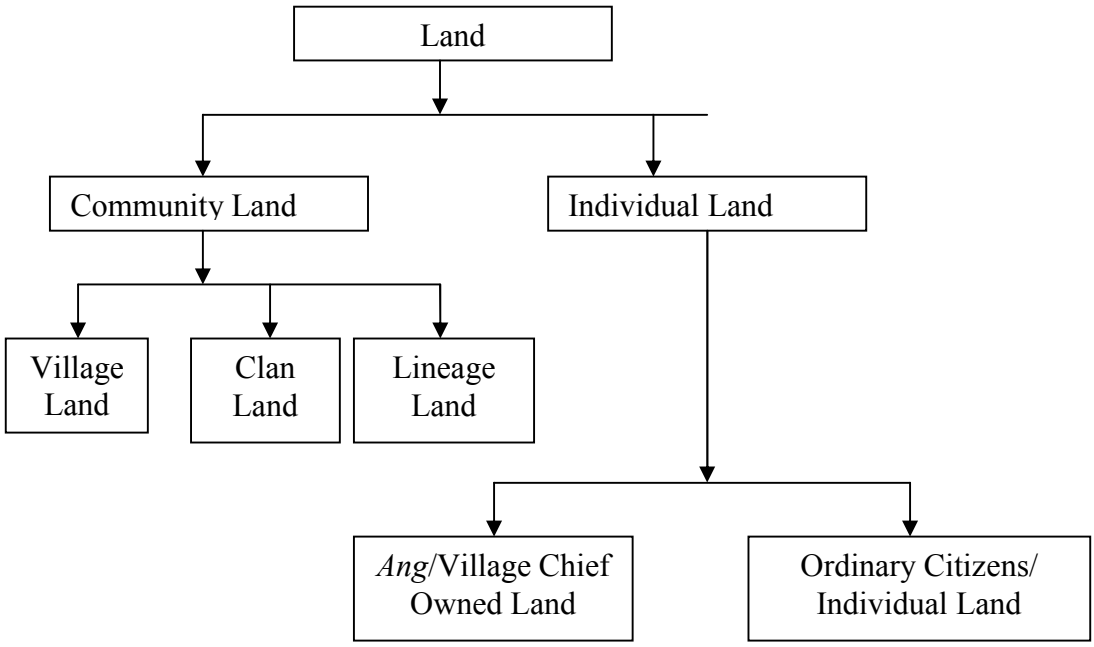
4.1 Introduction

To understand the Naga traditional knowledge and practices in conservation of biodiversity, it is important to first clearly understand the Naga ownership and their perception of the land/forest-Biodiversity. It is also important that these components i.e., land, forest, rivers and biodiversity are not treated as separate categories. This is because people do not necessarily differentiate between these categories in their use value and control and they complement each other. They see all these elements as part of the nature which is webbed together as part of the nature. Hence, the present study does not necessarily differentiate between these three categories. Rather, these three categories are used interchangeably with the same meaning and value.

Land is not only an asset or wealth but it is the main source of life and is sacred. Everything springs forth from the land. The trees, flowers, fruits, grains, rivers etc. all forms an inalienable part of the land. They live by what the earth provides. The land, the water, the forest and its resources are owned by the people as a whole and are passed down from ancestors to descendants as part of their cultural heritage.

In the modern system of arrangement within the government set up, the ownership of land and the individual right to use it is protected by Article 371 of the Constitution of India and is almost exclusively determined by their tradition, which is referred to as "Customary Laws", which are un-codified, and very effectively applied. In the event of any land dispute among individuals, they are propounded and interpreted by the traditional village councils.

The traditional system of land ownership and forest is fundamentally composed of three types' viz., village or community land, clan or Khel land and private land.



(Source: Lkr and Jamir, 2012)

Traditionally, land in Nagaland is used for three main purposes - for settlement, that forms the homestead, for agricultural purpose, and for conservation of forest. Apart from these three major land use other remaining areas are use for conservation of bamboo groove, plantation of trees and kitchen garden. The Nagas perceive, understand and express the land, forest, rivers, mountains and the entire ecosystems as a means of livelihood and Common Property Resources (CPR) for the people to use astutely.

Nagas consider land and forests as Gods' given gift to them and are considered as their life itself. For Nagas, land is not only the asset or wealth but it is the source of life and is 'sacred'. Everything springs forth from the earth, the trees, rivers, flowers, fruits, grains and so on. The land has catered to the people's needs and they, in turn, through various mechanisms such as custom regulating distribution, cultural traditions, religious myths

and beliefs and other forms of social control, saw to it simultaneously that their needs were met and that the land was not destroyed.

Therefore, the land is not just a mere space, but it is a place which gives identity to the community. Land is a material symbol through which people become one not only with the Supreme Being, but also their ancestors, the spirits and creation. The land is the exegesis of the Supreme Being through which people become aware about the spirits and about whom they develop myths and songs (Longchar, 1995).

The Naga land rhetoric states “do not be greedy for the land, if you want to live long”, “if anyone should take another’s land by giving false witness that person will die soon”. “The earth is truth; do not lie to the earth”. The land holds family, clan and tribe together. Thus, the land is the foundation of life and the social, religious and economic source of Nagas and forms the foundation of biodiversity.

4.2 Naga perception of biodiversity

As indigenous people, Nagas have spent a great deal of their time, through all seasons of the year travelling over, drinking, eating, smelling and living with the ecological system which surrounds them. Living in close proximity to their environment, Nagas have developed a clear understanding of the diverse ecosystem. Biodiversity is linked to the intergenerational cultural, social and economic development of the Nagas.

Over centuries Nagas have shared and developed a symbiotic relationship with the environment. All aspects of their belief, religion and survival are closely knitted to their environment in such a way that nature has become their very life support system. Their holistic understanding and approach with the nature has always helped them maintain a

close balance between the people and their ecological needs. The study of biodiversity and its conservation cannot be separated from their day to day natural resources utilization. Their immense respect to biodiversity can be found in their folklore and folksongs, belief and myth etc., all of which are directly or indirectly related to the nature and everything that surrounds them.

Nagas perception of biodiversity represents experience acquired over ages of the people's direct contact with the environment. In fact, Nagas association with their biodiversity (nature- in general) has provided them with a perception of themselves as distinct cultures, confirming continuity with their past and unity with the natural world. They have co-evolved with their environment, modifying nature but actively maintaining it in a diverse and productive state, based on local traditional knowledge, socio-cultural practices and religious activities since time immemorial (Ramakrishnan, 1996). Their quality of living is therefore, always intimately linked with the development and management of certain levels of local biodiversity.

Nagas perceive that nature has a sacred quality and believed "that nature is alive and its powers are distinguished as personal because human self directly experiences them" (Longchar, 1995). They do not consider nature as mere economic resource but rather they are revered, respected and worshipped. They have the insight that all living and non-living things, natural and social world are intricately linked. Their subsistence is based more on ecological exchanges than on economic exchanges.

Since time immemorial Nagas have always considered that man, animals and plants are equal. Not only did they considered nature as equal, but even worshipped them. Hence, the nature must also have a place to dwell and live with the humans. They believed and perceived that dense forests are the abode of spirits and thus were even restricted from entering such forests especially alone. Even today, it is a common practice among the village elders to put stones beneath big trees whenever they come across them in the forest as a sign of respect to the tree spirit. Thus, their association with the nature is not one of exploitation but is always that of mutual respect and co-existence. Their beliefs and myths reveal the mysterious relationship they maintain with the nature often in the form of kinship, lovers and to the extent of husband and wife.

Naga culture has always built around the resources that sustain them. Since time immemorial, the forests, hills, mountains, rivers, birds and animals have provided them with their livelihood. Their relationship and union with the nature and all kinds of living and non-living things has shaped their society. Birds, animals, roots, fruits, flowers, leaves, trunks and barks of trees are all life sustaining resources for the Nagas. They are so much inseparably related that once they divorce the world of plants and animals from the world of human, they lose the value of life. Thus, the Naga world of culture can be understood and explained only in terms of their nature. In other words, we cannot simply understand the Naga culture adequately without understanding the world of nature.

Further, Nagas perceive that, God speaks to them through nature in the form of birds, plants, animals and also in their dreams. They listened to noises and chirping of birds and observed various other unnatural signs in the nature very carefully. They perceived biodiversity/nature as:

i. Indicators of time, season and weather

a) Ongenkentempong (Hoopoe): Whenever this bird is seen flying around, the Ao Nagas perceived that it is an indication of clear and fair weather.

b) Auo: The Chakesang Nagas perceive that, this bird chirps only at 12:00 noon, hence they knew that it is time for them to take rest in the jhum field and have their lunch.

c) Yipilangleb, Nela, and Kekirhu: The chirping of these birds indicates the herald of spring. Hence they are known as spring birds.

d) Ongo: The chirping of this bird conveys that it is time for them to leave their field and return to village.

ii. Instructor in agricultureal feilds

a) Zipangrep': A seasonal bird' indicates the time for sowing seeds in the old field

b) Ongnang: This bird proclaims the time for pre-harvesting starting from the old field followed by the new field in September.

c) Pako: Chirping of this bird indicates the time for harvest.

d) Matsungi (Cicada): this insect is found in the month of April, the singing/sound of this insect is believed to be a sign of encouragement to the crops to grow.

e) Maning: This insect sings to encourage the paddy plants to stand firm and keep ready for rich harvest.

f) Jangjangkhokho: This insect is similar to Matsungi, but just that it is bigger in size than Matsunig and appears during the month of May-June.

When this insect sings they perceive that, it is time for heavy works, but consumption of only light curry.

g) Shomi (A type of Monkey): When it sings at around 11 -12 o'clock, during summer, they perceive that it is the time to have day meal for those who stay in the village (Kidangmonger).

h) 'Hutu': The Chakesang Nagas used to ask the well being of the relatives and closed ones to this bird.

i) Jokchu: when this insect sings from inside the earth, it is certain for downpours within an hour.

j) Loyang: When this insect appears, Remrem (Clerodendron) a vegetable plant becomes bitter and believe that young bamboo shoots listen to the singing of this insect.

k) Bokpo (Owl): By chirping of Bokpo, they make out whether the monsoon of the year will be good or there would be drought. They do believe that when the owl chirps 'coco' it signify the occurrence of drought in that year.

l) Sunglong (Wood Worm): When sunglong stays upward inside the log, tree and bamboo hut, it indicates dry monsoon/tsukla but when it stays downward, it indicates wet monsoon/meyikum.

iii. Indicators of danger/disaster

Whenever snakes, rodents, porcupines etc comes out in the open in the hill slopes at an unsual time, Nagas perceive that landslide will occur. Similarly in summer, if crabs and frogs come out of the river towards the river bank, it is an indication of

> imminent danger of flash flood, mud flood or torrent river water will follow in the downstream. Besides, sudden restlessness and cries of dogs, chiken and certain birds are an indication of impending earthquake or eclipse. When drongo bird makes a sudden loud cry and soars up and down the sky, it is likely that sudden cloud burst or stormy rain will fall (Longkumer, 2015).

Such perception of plants, animals and insects in their daily lives enabled them to prepare and manage the unmanageable in time of natural calamaties and various social needs which ultimately led them to respect, protect and conserve their biodiversity for ages.

As such, Nagas life circulated around nature and its biodiversity over ages owing to their strong believe and attachment with the nature, which has induced their knowledge and belief that in the process they have developed a strong sense of prediction (Knowledge) of weather, crop harvest etc.

Again, the people of Khezakheno calculated the different seasons by observing the location of the sun rise from different peaks of the Lelokede range. For instance, in summer (Chilu) when the sun rose from Taikhazu peak they knew it was the longest day: if the sun rose form the peak of Mikichirhokutsa-o, Rhowu, Chempfotsu, Mikitsuo, they knew it was sowing season; and in winter (Chithi) when the sun rose from Mongo peak, they knew it was the shortest day and the longest night (Lucy, 2009)

While collecting trees and bamboos it is very important that their activities are in sync with lunar and solar calendar. For instance, the cutting of timbers, bamboo, wood etc. for any kind of constructional work is done only during the full moon night so that it remains pest free for many seasons and years to come. “Ita lanu” (Young moon), is known as

animal's month because during this season plenty of animals appear. It is the best season to hunt animals as there are plenty and also the animals become more ferocious and dangerous to human beings. Likewise, 'by reading the facets of the moon they count every aspect of their life activity such as, for farming practices, marriage ceremonies, social activities etc. They even pluck the vegetables in the farm according to the moon's direction and knew the time and varieties of food items to be gathered from the forest observing the moon's movement.

Again, whenever there was no rain for a long period in the village, the Chakesang Nagas, usually catch a frog, spread their mouth with a piece of stick and kept at home and surely the rain falls within few days. Likewise, all the Naga tribes had distinct traditional knowledge, practices and understanding of the environment they live upon.

By studying weather conditions, they could analyze the setting of the jhum field, such as:

i. Snowfall: They believed that if snowfall continues for about seven days, there will be good rain for millet. Snowfall in the month of October and November will signify good monsoon for terrace cultivation and Jhum field respectively.

ii. Wind: More wind in the month of March and April signifies good monsoon and good harvest.

iii. Thunder: If the first thunder of the year starts from North-West direction, it shows good monsoon for that year, but if it starts from the East it indicates late monsoon. Thunder and lightning are believed to have husband and wife. The first sound is believed to be the husband and the second as wife. Therefore, heavy thunder and lightning happens twice simultaneously.

iv. Rain: Much like the wind, if the first rain of the year starts from North-West, it signifies good monsoon and if it starts from East, it indicates late monsoon.

v. Sun Direction: By observing the direction of the sun, they could predict the condition of monsoon. Accordingly, they carry out transplantation operation as quickly as possible because the late transplanted seeds will bear less grain.

vi. Longest Day (21st June): The farmers believed that paddy crops transplanted on the longest day of the year bears more grain.

Dreams and its interpretation play a crucial role in the Naga perception of agriculture or Jhum field. For Rengma Nagas, if a man dreams of tiger, leopards, bear, Muddy River etc. then they believe that, weeds will be troublesome in the Jhum field and that he will have difficulty in getting a good yield. An especially lucky animal to dream about in Rengma Naga belief is the langur monkey, for its long tail hanging down from the bough symbolises the fine heads of rice bending the stalks over.

Further, in their daily social life, at times certain Nagas perceive nature as justice deliverer. For instance, to identify liars and thieves, the Ao's of Chuchuyimlang village used "Shizung" (Nicker Bean). In this case, they will burn a seed each for all the suspects and if the seed burst then he/she is considered as the real liar/thief. They believe that the seed will never burst unless he/she is the real liar.

During marriage ceremony, the bride and groom's hand were tied with *'azu/ zhohu',* (a type of creeper which is very strong), symbolizing them to be strong and to stay together, was practiced among certain villagers of Chakesang Nagas. During this marriage

ceremony, they used different fire wood while roasting hen for bride and groom. They usually used ‘Tavuo’ wood for groom and ‘Khabuo’ wood for bride.

Nagas deep and sophisticated knowledge on biodiversity has given rise to cultural rules for conservation and management of their biodiversity which beautifully reflected in their notion of sacredness, belief, myths and taboos. The observance of taboos and genna, belief in Supreme Being and myths in the life of Nagas are a guiding principle as far as their relationship with the natural environment is concerned. The plants and animals appearing in their myths, belief and dreams are looked upon as friends and they contribute to the fuller life of the Nagas and have thereby helped in preserving their natural environment.

The voice of the Supreme Being is heard through the animals, plants, air and water involved in their belief and myths. To abuse and manipulate these media would be cutting the lifeline of the entire community because the very core of their life depends on them.

In fact the Ao Nagas believed that both human beings and animals were living together like family members in a village called *Merasha yim* (Jamir, 2005). The meaning of *Merasha yim* refers to a kind of undivided society of village between animals and human beings. In that village, tigers and bears were considered as the friends of human beings. They helped each other in times of needs. It is believed that the relationship between humans and animals had developed from that village. Thus, when animals like the tiger, bear or elephants are killed, a ceremony known as *Sungnaro mong*, meaning “cleansing

the environment" was observed the following day, with the main intention of cleaning the environment that became unholy due to killing of animals.

Their understanding of each of these natural element and biological diversity generated invaluable economic, social and cultural benefits and any permanent damage to any of such elements would have far reaching consequences for the survival of humankind. Hence, Nagas always considered nature not just merely as a source of wealth but "life in itself".

4.3 Traditional practices and methods of conservation

Nagas traditional practices and methods of biodiversity conservation system are based on their belief system. It is localized, holistic and integrated in nature (Felix, 2002). The Naga traditional conservation practices revolve around sustaining food supplies, such as fruiting trees or widlife, protecting cultural symbols, whether totemic animals or religious sites. Resources are seen and considered as God-given gifts and are to be shared astutely and to be taken care of by everyone.

Their belief that spirits dwell in nature and that they are to be respected is one of its key characteristics in conserving the biodiversity. The dignity and inter-relationship of all things, finite nature of resources, sustainability and that for every action there is reactions has always been a key principle in the minds of the indigenous Nagas (Felix, 2002). Nagas had the concept that, there is a limit to what can be extracted from the natural environment and that they are only custodians of Gods' gift. This concept of respect for all living and non-living things underlies the principle of dignity of all things and the recognition that all matters have a spirit. As such it discourages the arbitrary taking of

life-be it plants, animals, birds or insects, as well as indiscriminate destruction of the environment through various activities.

The Naga region is not only a treasure trove of the biodiversity but is also known for its rich cultural heritage. Their rich cultural heritage portrays the symbiotic relationship that existed between man and nature since time immemorial, which have allowed them to protect and preserve every aspect of their biodiversity and in general, Nature. Nature is, therefore, not only a productive source but the center of the universe, the core of culture and the origin of ethnic identity. At the heart of this deep bond is the perception that all living and non-living things and natural and social worlds are intrinsically linked (Toldo, 2013).

Their traditional knowledge stand rich in perception, precision and management of their environment which comes from time tested experience. Their deep sense of environmental ethos, belief and practices has helped in preserving the biodiversity in various ways. Besides, they have a strong sense of physical and spiritual attachment within the nature, so much so that their socio-cultural and economic life revolves around biodiversity of which they are an integral part.

4.3.1 Conservation based on Religious Belief

Religion forwards the preservation of natural diversity in several different ways such as, by providing ethical and social models for living respectfully with nature, it also provides direct protection for wild and cultivated plants and animals and it ties the non human residents of the cosmos to the divine or the overall meaning of human existence. The religious myths and stories that teach us importance of other species are often so basic

that we, in our human-dominated, industrial world, miss the critical message associated with it (Bratton, 2003).

In the words of Mills, Naga religion "is a system of ceremonies...he will not prosper if he omit the sacrifices due to the deities around him who, unappeased, are ever ready to blight his crops and bring illness upon him and his"(Mills, 1926). It is difficult to understand the Naga concept of biodiversity (in general nature), without referring to religious belief system. Nature is life, a scripture and a treasure of all knowledge (Wati, 1995).

Nature/Forests to the Nagas are as important as Temple for Hindus, Gurdwara for Sikhs, Masjid for Muslims and Church for Christians. They meticulously examine the objects around them. They care for all and treasure all they see and observe so that they could be a help to them in all their needs.

Nagas whole religious system is thus embedded with the world of Nature- Biodiversity. The Naga religious belief system is a world of face to face interaction not only with the living but just as vividly with the dead and with the totality of nature, and is centered on earth and its creation. Unlike other religions, Naga religion does not have a sacred scripture but "the religious ethos is contained in people's hearts, minds, oral history and rituals" (Wati, 1995). To them, nature is alive, and its powers are distinguished as personal because people self directly experiences them.

The belief incorporated in Naga life dictated the social system and inter-linked them with the other systems, which in turn kept the various systems flowing in cohesion with one another. The dignity and harmonious relationship of all things are the key principles

behind the Naga belief system. It follows that for every action, good or bad, there is an equal reaction (Tongkul, 2002).

Based on the above principles, the concept of respect and care for all things and the concept of give and take in Naga society are vital. Any disrespectful action whether carried out knowingly or unknowingly, towards a fellow human being, animals or plants invites trouble for the community, clan and the individual responsible.

The most prominent characteristics which determined Naga belief was the fear of the supernatural powers. They believed in the deities which control the earth, heaven and the land of the souls (Takatemjen, 1997). They held these deities in great respect. The most revered deity among all the Naga tribe is the "Creator God" also regarded as the "Supreme Being", who is known by different names to different tribes.

Nagas believed that the Supreme Being (regarded as a benevolent God), is the creator of the earth and deity in control of everything associated with their life and nature. According to them, the Supreme Being produces and provides all things, the earth nurtures them and humans protect them. They believed that the sun and moon are the symbolic expression of the Supreme Being. The supreme being appears in every being, tree, rock, flowers, plants, trees, animals and birds, fishes, beckons in every relationship and bursts forth in every ecosystem. He not only creates but also sustains and controls the earth, hence, it is worshipped and sacrifices are offered by the people not only because of fear, but also out of reverence and love.

Further, Nagas also believed in the existence of 'God of Judgement'. For instance, the Ao Nagas believed in God of judgement known as *"Meyutsungba"*. It is believed that he will

judge all human beings after dead according to their deeds. After dead, all male members will have to throw their spears at a banana tree outside *meyutsungba's* house and females with their "weaver's batton" to see whether he or she has been honest and truthful during his or her lifetime. If he/she hits the banana tree then they were believed to have led an honest and truthful life and vice versa. This weaver's batton is used by females in weaving shawls and clothes and is made of *"Mangi sung" (*Nahor-*Mesua ferrea)* and hence these trees were largely protected and conserved.

The Nagas had different deity for different social needs such as deity for home, for paddy fields, for forest, for rivers and lakes, for rocks and mountains etc. Besides, Nagas believed in different types of spirits, both benevolent and malevolent and some even indifferent. They are therefore to be honoured with sacrifices, offerings and prayers.

Even festivals were socio-religious. Almost all the Naga festivals are associated with the Supreme Being. All agricultural ceremonies are in honour of the Supreme Being. They believed that some spirits live in the fields and protect the crops from being damaged by the wild animal and other natural calamities. It was believed that the man's physical well-being, riches and wealth are obtained through this spirit and the cultivation of rice (most important crop of Nagas) was attributed to the generosity of this spirit. This spirit was considered to be fruitful and was responsible for giving good and bountiful crops, and is worshipped as the deity of harvest.

Table 4.1 Name of Supreme Being/Creator of earth and taboo known to different Naga Tribes

Sl.No	Name of Tribe	Name of Supreme Being/Creator	Taboo
1	Angami	*Ukepenuopfu*	*Kenyü*
2	Lotha	*Potsow*	*Sarüsatuk*
3	Sema	*Alhou*	*Chinih*
4	Ao	*Lijaba*	*Anempong*
5	Rengma	*Sunggizu/Anizaza*	-
6	Phom	*Vangyoung Ongpa*	*Cjhaipü Nüng*
7	Pochury	*Johtiwa*	*Kiitsiina*
8	Chakesang	*Mowo*	-
9	Zeliang	*Jadonang/Gaidenung*	*Renet*
10	Yimchunger	*Arimpuh*	-
11	Khiamniungan	*Goum goa*	*Anuo*
12	Chang	-	-
13	Konyak	*Kahwang*	-
15	Sangtam	*Lijaba*	*Mamore*

Existence of spirits controlling over the animals, water creatures, forest etc. are common among the Naga tribes. People propitiate this spirits for good luck during hunting, fishing, collecting of insects, cutting of trees and forests etc.

Nagas believed that certain springs, lakes, marshy lands, big boulders etc were the dwelling place of spirits. Hence, these places were worshipped and considered sacred. One such place is the *"Longlangba long"* in Longkhum village. The place is surrounded *by "metsubendong"* (Rhodhodendron), Pine trees and other variety of plant species. It is restricted even today to pluck flowers, cut any tree or plant or even misbehave with the

nature in the vicinity. For they believe that if they do so, it will bring misfortune to the person and to the entire village. Incidentally, it is one of the few villages in Mokokchung dirstrict where rhodhodendron trees are found abundantly.

Another place is Mount Tiyi near Wokha town. The Lotha Nagas believed that it is resting place of the departed souls and hence, cutting of trees, hunting etc were banned out of the fear that they will die. Shilloi Lake bearing the shape of a giant footprint in Kiphire is another such example. Almost in all the regions, such forest or water bodies exist which are either unaccessible or conserved due to certain belief or religious purpose.

In addition to these religious beliefs and mythical deities, they worshipped inanimate objects like stones, water, lakes and some local god or spirit that was found only in a particular place. Nagas believed that forests are the abode of spirits and hence they are not to be disturbed but rather should be treated with respected. They believed that there were indwelling spirits in large trees and as such if and when these trees were to be cut down for village gates or log drum etc., they offered drink offering at the foot of the tree with a short prayer. After the tree is cut down, the *Ao* tribe usually places a stone on the stump of the tree so that the spirit of the tree might not blame the men for the high handedness but simply put the blame on the stone.

Besides, it is common to find a large tree near a village gate, and it is said to be a guardian of the gate itself. Village gates are most common in the Angami area. The tree selected for village gates must be without any blemish. Prayers are offered before the tree is cut and at the time of erection of the gate. The belief is that, the spirit of the tree used for the gate is not destroyed but only transformed and will act as the guardian of the gate

itself (Souza, 2001). Again, an *Angami,* while crossing a forest would take a leaf and put it behind his ears or pluck some leaves and places them on the ground. He believes that this will protect him from any undesirable attention of the malevolent or powerful spirits. Their belief in this spirits of individual trees has a bearing on which tree is suitable for timber, for building houses, for firewood etc. and hence men cannot cut any tree for any purpose arbitrarily.

When entering an unfamiliar area/forest, one has to shout aloud saying, "I am entering your territory for certain reason, please allow me to pass through and don't disturb me", and while leaving the area, one shouts, "I am leaving your place, please do not follow me". For Angami Naga, when one leaves that area, one has to call his/her name loudly with the believe that his/her soul, who may be roaming around to return home together.

Whenever these spirits were offended, to restore balance, an *"arasentsur"* (Sorcerer), performs certain ritual. During the ritual the sorcerer will offer Chicken, eggs, ginger charcoal etc. wrapped in *"amja"* leaf to the offended spirit to cure and take away the sicknesses in men and also they were propitiated so that they may not bring disease and misfortune to man. Further, the rituals were followed by performing various "taboo" and "genna" by the individual/community/family of the offender.

The religious belief system of the Nagas indicates and ensured respect and protection of all living and non-living things. Thus, for whatever reason, purposefully or accidentally it has led to protection and conservation of biodiversity and the entire ecosystem surrounding them.

4.3.2. Conservation based on folklore and folksongs

Every aspect of Naga life, history, politics, religious beliefs, legends, love and romance are embedded in their folk lore and folk songs. Naga culture had no written language till the recent past, their history and traditions were passed down from generation to generation either by narration or through songs. Perhaps Nagas deepest thoughts could be best expressed through their folklore and songs. Therefore there is a rich repository of stories and legends available in the folklore and folksong of various Naga tribes. Almost all the folklore and songs are accompanied by different style of dances called war dance, bamboo dance, harvest dance, lovers dance and so on. Their folklore and folksongs always played a significant role in their everyday life and depicts a symbiotic relationship between men and nature.

According to *Chang* Naga legend, their ancestors lived at "*Chansang*" during the creation of the universe, a big hole in the earth and that the entire living creature came out of this great big hole and live together, ate common fruits and drank from the same river. This stage or generation was known as "*Mongyangyangabumuthen*" in Chang dialect meaning "the senseless stage". It was a time when men and animals lived together and had beautiful hills, mountains, valleys and rivers which were covered by tender plants and pasture. They thought that the earth was flat and made no distinction between birds and animals or between them and human beings.

The *Ao* mythology says that man, God, bear and tiger, lived together as brothers of a family. There is a folklore that tells about how a man named *Tipusang* associated himself with the wild animals from time to time and often he had given command to gather them

together around him and it was also he who could give orders to both fishes of the river and the birds of the air.

Naga folk songs are unique: romantic in character, patriotic in nature, factious in essence with fundamental nature and spiritual in principle. Every festival, occasion etc. were marked by singing. According to *Ao* Naga belief, singing was learnt from a "song tree". It is believed that a tree and a woman were having a love affair. This big tree (Sungwa Sung) changed itself into a fair complexioned young man at night and appeared at the girl's dormitory and often spent the whole night with her but he was nowhere to be found during the day. As often in those days, the girl once wove a nice shawl and presented it to her lover at night time. The following day as she went out to draw water and to take bath, she looked around and found the shawl which she had presented to her lover wrapped around to a tree as if it was worn by a man. As she was taking bath, still confused and shocked as to how it had happened, she was singing a simple song saying *"Tsusenjoker.....Tsusenjoker"* meaning "taking bath...taking bath". It is said that in those days the *Ao's* could not compose poems and songs and hence she could not go beyond this words. The tree suddenly plunged into singing and asked her to join in singing together in this way: *"Tsusenjoker laza surem sune moker; O chungliyimti lar meyu temsenaka matsungzukla, kongro yimti yongyala"* meaning "wearing a girl's shawl, having taken a bath, though girl's of *Chungliyimti* move along in hundreds, they can't outshine you, orchid that brighten the mid village". On hearing this song sung by the tree, the girl's astonishment was increased and learning the song by herself she went home and told about it to her parents. Thus began the expression of feelings in songs relating to the sound of nature, animals, birds and the surrounding environment.

Further, while pulling the tree for log drum, the Ao Nagas would sing, *"oh! Yongpang suungdi; Lima nakba siingko, Yimkongwapang chang, aren henba, nang penlir, zongzar; nang mongjen nii asset angni",*which means "Oh! The source of stream, huge tree of jungle guardian, the umbrella of the forest, Carrier of blessings to the villagers, your hear-trobs longingly awaits, to your original place, step ahead".

There are other folk lore and songs among all the tribes of Nagaland such as the 'Girls who married a Tiger', 'the woman who married a Caterpillar', 'the Children who turned into catfish and monkeys', 'how women were turned into Gibbons', 'the spirit, the tiger and the man', 'the bird woman' etc. Again, they have folk lores that tells about the origin and behaviour of each lore birds and animal. Thus, Nagas were able to maintain a close relationship with the nature which has helped them in utilizing their resources judiciously.

4.3.3 Conservation based on Taboo and Genna

Naga belief and religion always had a close association with taboos and genna. A number of taboos and genna were observed in the life of the Nagas. Observance of taboos and gennas enabled the Nagas to protect and preserve the nature from rampant destruction. The duration of taboos and genna varies from few days to several days and extend from and individual to entire community.

The term taboo and genna are closely connected and in many instances inter-woven, so much so that observation of one leads to the other at the same. However, the basic difference is that the former implies prohibition on something that is regarded for

religious or other reasons as not to be done, touched, used, speak against etc. while the later applies to abstaining oneself from going to fields and work on certain occasions.

The word genna is believed to have been derived from an *Angami* word *"Kenna"* meaning prohibition. During genna, nothing is taken out or brought in the house or village, no one is allowed to work or to go to fields neither are guests entertained. It was observed when the paddy fields are being destroyed by the pests like rats or grasshoppers, birth of new baby, the rise of new moon, sowing of seeds, harvesting of crops, unnatural death of a person who is killed by wild animals like tiger, elephants or drown in water etc. Genna possesses socially and religiously dangerous attributions and is believed to produce evil effects. Therefore it is to be strictly observed to avoid consequences upon one's life which may be from the fellow villagers or from supernatural forces.

When there is no rain for several months, the Rengma Nagas would observe rain genna by sacrificing 'akhiitu' fish (the smallest fish in the region known as 'water source watcher), to the water spirits thereby invoking the sky to send rain. It is said after performing such genna ceremonies rain comes within one or two days (Nillo, 2011)

The observance of taboo is called by different names to all the Naga tribes and violation of the same entails heavy punishment. There are taboos against offending the Gods, spirits, cutting sacred trees, against religious occasions etc. Also certain taboo exists which prohibit the killing of animals at certain stages of their life. For instance, prohibition of hunting, killing and keeping traps are not allowed during the breeding season. Killing of pregnant animals and birds and during gestation was a taboo, for by doing so it was believed that it would bring misfortune to the hunter and their family. The

same is applied for fishing. The use of certain poisonous roots and leaves that kill fishes in the rivers or springs is taboo during the spawning season. It is also a taboo for them to kill animal when they were sleeping because sleeping is the time for all beings to take rest so they would have to wait until it wakes up or in the process throw a small stone (Shimray, 2014).

Defecation in the rivers and streams are taboo because it is unnatural and unethical. By doing so it not only dirties the purity of the water but also abuse the essential elements of life's survival. It is a taboo for man to hunt or kill an animal during the pregnancies of his wife for fear of befalling misfortune with his wife delivery or with the new born baby. A warrior or priest abstains from killing any animals while absorbing taboos. Further it is a taboo to cut a bamboo from a bamboo grove when a person dies, for it is believed that the whole bamboo grove would die.

It is also forbidden to cut certain trees which are considered 'sacred'. Trees like the banyan, peepul, *mangisung, mala (Konyak*), oak etc. are protected throughout the land. For Angami Nagas, it was forbidden to burn the wood of the tree "mela" at weddings, because if burnt at weddings or touched by the bride or bridegroom it causes barrenness and necessitates divorce (Hutton, 1921).

Those trees that are used as timber cannot be used for firewood and vice versa. Any kind of trees with blemishes like crossed branches or injured bark were not used for timber. To the Nagas, reckless cutting down of trees, being cruel to seeds, plants, animals etc. were a serious offence. There is a *Phom* Naga saying that states "*Phongpenn Phaünyü*

Loihamnyih Paikok Vü Kao Tülangtük", meaning *"Don't cut the stem of this plant* (Nicker Bean)*; it will feed you during famine".*

Thick forests are believed to be the abode of spiritual beings and so, are left untouched. These are cut down only while in groups, never by the individuals, for it is believed that family of the defaulter will never prosper and will have a hard living at least for seven generations.

When it comes to agriculture, taboo is observed to ensure healthy food crops and abundant harvests. The lands were allowed to rejuvenate its fertility through the observance of gennas and taboos. During genna and taboo ceremonies, one has to remain chaste. Nagas believed that violation of genna and taboo would bring misfortune and sickness to the individual and community and so they observed these ceremonies with utmost sincerity and dedication.

Genna and taboos take place in different duration and intensity according to the respective tribe and occasion. Some last for one day, others for few days, while some may last even for week and more. Free from hard work and engagement it is also a time of reflection and contemplation on their approach to agriculture, animals and the Supreme Being. Without genna and taboo, with its ample rest, Nagas may not have been able to develop a healthy relationship with creation. Genna and taboo therefore, enriches the whole land and community along with the flora and fauna. Such an observance is essential to protect nature from over-exploitation.

4.3.4 Conservation practices through traditional food, medicine and healing Practices

Nagas have rich traditional medicine and healing practices which stand out as one of the most valuable asset for them. It has not only kept their traditional knowledge and healing practices alive but has helped conserve the bounteous medicinal plants and species. The use of medicinal plants clearly depicts their close relationship with nature.

Their traditional knowledge and practices of medicines is one of great antiquity and continues to serve as an invaluable service to the people even in this scientific age. The use of common medicinal plants is known to almost all the members within the Naga community though only certain people possess deeper knowledge of medicinal and healing gift that can even deal with the life threatening ailments affectively.

Herbs, plants and certain animal parts are used as tonic or medicine for common ailments such as cold, fever, headache, fatigue, loss of appetite, diarrhea, cuts, sprains, muscle ache, bone fracture, animals and insect bites etc. Nagas had the knowledge to identify the plants according to their local names and were able to find their usefulness to cure different ailments. However, for serious injuries and diseases, healing and medication were done only by a medicine-man.

Indigenous techniques and knowledge on medicines, that is in practice since antiquity continues to serve as an invaluable asset to the people. The use of common medicinal plants is known to almost all the members of the community. However, it is only the elderly members who possess the deeper knowledge of medicinal plants even for the cure of life threatening diseases. People use the indigenous plants as medicines mostly in combinations. In fact, every plant species present in their locality is regarded as having a

medicinal value. For instance, to cloth bleeding from a cut, they just collect any three types of plant species and squeeze it on the cut or wounds. The plants species used for medicine are collected in a particular time or season. In fact, for every community there are elderly people who sit and observe the whole activities of the sun, moon, plants, movement of the animals, seasonal change, etc. then only every activity for the villager gets started. This indicates that for the Nagas, land, trees, forests etc, are not just mere objects to be used, but they are alive and active and thus must be respected and protected.

Some medicinal plants and their mode of utilization, plants used as vegetables and wild fruits are given in **Table 4.1**.

The use of traditional medicines is still very much alive among the Nagas even today. However, this knowledge is limited to few medicine-man and some local villagers. A wide variety of these medicinal plants are grown as crops in jhum fields and kitchen gardens but many are also collected from the wild. Thus, plants with medicinal properties were preserved and conserved throughout Nagaland.

Table: 4.2 Medicinal plants and their mode of utilization:

Sl.No	Botanical Name	Local Name	Mode of utilization
1.	*Adiantum philipinense*	Asang	The leaf extract is used for fever, blood diseases, epileptic fits & rabies, the rizome extract is also taken for dysentery, ulcers and muscular pain.
2.	*Aloe vera*	Alo-vera	Fleshy leaf is eaten raw for any stomach problems. Leaf juice is also applied to all kind of skin diseases.
3.	*Angiopteris evecta*	Arem Asang	Rhizome is eaten after cooking. Base of the stipe is crushed and applied for leprosy and ribs pain.
4.	*Asplenium falcatum*	Enjen memejaba	The plant is used for spleen problem, jaundice, malaria and also urinary bladder disorders.
5.	*Blechnum orientale*	Asang	Fresh frond is used as poultice for boils, urinary bladder disorders and as germicide.
6.	*Cocos nucifera*	Coconut	Dried coconut is chewed every morning and evening to kill germs in the stomach.
7.	*Urtica* sp.	Zaklo	The leaf juice is taken after boiling with water for malaria.
8.	*Hypoxis aurea*	Tinulemba	Tuber is used as antitode for snakebite.
9.	*Lantana camara*	Anitong	The tender leaf is grounded into paste and then eaten along with water for various diseases like allergic, cough, asthma, diabetes, arthritis, rheumatism, eczema, leucoderma.
10.	*Lygodium flexuom*	Alu enjen	The rizome is boiled with mustard oil and applied for rheumatism, sprains scabies, ulcers, eczema and wounds.
11.	*Morus indica*	Menthüthü	The root is cut into pieces and put on the patient's neck as a necklace. This will automatically cure jaundice.

12.	*Paederia foetida*	Tsumenemli	The leaf juice mixed with 2 or 3 drops of honey is drunk for high fever and dysentery.
13.	*Panax pseudoginseng*	Ginseng/miracle or wonder plant	Rhizome is used for liver, diabetes, stomach ache and general weakness as tonic.
14.	*Taxus baccata*	Taxus	The bark is used for tumour diseases and also used for body pain as massage lotion.

Table: 4.3 Plants ate as vegetables:

Sl.No.	Botanical Name	Local name	Mode of utilization
1.	*Allium ampeloprasum*	Alolasung	Whole plant is used as vegetable
2.	*Alpinea bracteata*	Doto	Young shoot is eaten after cooking
3.	*Basella rubra*	Tarui	The leaf is used as vegetable
4.	*Crataeva religiosa*	Unkatong	Leaf is used as vegetable
5.	*Diplazium asculentum*	Asang/enchen	Leaf is used as vegetable
6.	*Distemon indicum*	Askaklo/Zaklo	Tender leaf is eaten as tonic after boiling
7.	*Hodgsonia hetetroclita*	Asatong	Cotyledon tissue is eaten as vegetable
8.	*Maclura cochinchinensis*	Bhat kerala	Fruit is eaten as vegetable after cooking
9.	*Parkia roxburghii*	Yongjak	Young fruits and seeds is eaten as vegetable either raw or after cooking. It is also used as medicine for stomach problem
10.	*Passiflora edulis*	Intsulatsu	Tender leaf is eaten after cooking as vegetable
11.	*Musa* sp.	Mongutong	Ripe or raw fruits and middle portion of the plant shoot is eaten as vegetable
12.	*Rhynchotechum ellipiticum*	Zopatong	The leaf is eaten raw after cooking

Table 4.4 Wild edible fruits:

Sl. No.	Botanical name	Local name	Mode of utilization
1.	*Areca catechu*	Salijang	Fruit and seed is eaten
2.	*Baccaurea sapida*	Tangsusu	Seed is eaten
3.	*Calamus erectus*	Injang kieosu	Fleshy fruit is eaten
4.	*Docynia indica*	Arem-Metoklashi	Whole frit is eaten
5.	*Elaeocarpus floribundus*	Majeblam	Whole fruit is eaten
6.	*Emblica officinalis*	Lozü	Whole fruit is eaten
7.	*Garcinia tinctorea*	Sungsulani	Fleshy part is eaten
8.	*Livistonia jenkinsiana*	Surajang	Fleshy fruit is eaten
9.	*Nephelium longana*	Ajensu	Fleshy fruit is eaten
10.	*Prunus nepalensis*	Mesusujang	Fleshy fruit is eaten
11.	*Roydsia suaveoden*	Dimetsulasu	Fruit is eaten
12.	*Spondias pinnata*	Kansu	Fleshy fruit is eaten
13.	*Zalacca secunda*	Okti-jang	Fleshy portion of the fruit is eaten

Table 4.5 Trees/Plants taboo to cut

Sl.no	Local name	Scientific name	Reason
1	Charak Sung	*Rhus griffithii*	Never even touched because of its watery fluid that gives diseases
2	Tsupen sung (Skull tree)	*Erythrina indica*	Never cut or burned till now because they keep the head hanging in this tree
3	Hetho (Angami)	-	It is kenna to burn this wood as these woods are used as substituted images in burial ceremonies for the unrecovered corpuses of those slain I battle
4	Metsubendong	*Rhododendron arboreum*	Because of religious nature
5	Sungwa sung	*Duabanga grandiflora*	Brother of human beings
6	Alder	*Alnus nepalensis*	Because of it ability to regenerate soil fertility
7	Zaklem	*Girardiana diversifolia*	Poisonous
8	Mangi	*Mesua ferrea*	Strong and valuable
9	Agar	*Aquilaria malaccensis*	Belief that if people sleeping in bed made of this wood live a longer life
10	Thizhethikrubo		Hunted by deer and wild animals
11	Nissa tong	*Ficus elastica*	Because of religious nature

4.3.5 Conservation practices in agriculture

Normally, the Nagas live on top of the hills and cultivate in the lower lands and steep slopes. Agriculture has been the main occupation of the Nagas since time immemorial. Nagas rely on simple indigenous technologies based on extensive traditional and ecological knowledge that permit their sustainability from essentially fragile environment.

Shifting cultivation, also called Jhum or slash and burn cultivation is a method of farming where the people practice mixed cropping system (MCS). The MCS enables them to cultivate rice, wheat, millets, leafy vegetables, chili, tomatoes, pulses and fruits etc. together in limited area depending on monsoon rain. The MCS not only helps in utilizing the seasonal rainfall but also in keeping the soil unexposed thereby preventing topsoil erosion. The combination of crops with legumes helps in nitrogen fixation, thus maintaining the soil fertility. This not only helps them derive maximum benefits from their small land holdings but also takes care of their food and economic requirements throughout the year.

Majority of the Naga tribes mostly practice Shifting cultivation. Terrace and wet terrace cultivation is done mainly by the southern Naga tribes. As stated in the exceeding chapters, the site for shifting cultivation is selected by the respective traditional village councils. Nagas harvest for two years in a particular jhum field before leaving it for fallow, the jhum field in the first year is called ‘Tsukchilu/Ludi’, and the second year field or the old field is called ‘maipu’, by the Ao’s.

Before selecting the jhum field, in order to know the fertility of the soil, Nagas in general follows an indigenous method of soil testing that is practiced for generations, is indicated below:

i. Location, size of area and settlement of the land is verified.
ii. Direction of sun is confirmed.
iii. Types of rock/stones/earth/sand are checked.
iv. The color of the soil is verified.
v. The type of trees/ shrubs is verified.
vi. Earthworm's waste is also measured.
vii. The cycle of the year is counted before operation.
viii. Old stories are verified.
ix. Qualitative and quantitative of yield in the previous year is measured.
x. Dryness or wetness of the soil/plants/forest etc are confirmed.
xi. Digging the soil and refilling method
xii. The amount of stream and water source is checked.
xiii. Distance of the filed from the village and in terms of sun's direction is verified.
xiv. Types of weeds grown in a particular field are confirmed first.
xv. All kinds of seeds are used following the above conditions.

By applying such methods, they get accurate results from the soil (Jamir, 2005 & Field work).

Some of the indigenous varieties of rice grown in a jhum field are *Nagaland Sinsatsu, Henigido, Akatan, Kemehyasopa, Kemenhya, Ngoba, Mikotchuwakelu, Mikudep, Sarang,*

Sarengma, Misarengma, Khulong, Misokmil, Mitonging, Yaribatsuk, Moyatsuk, Maikutsuk, Pangnakla, Geartsuk, Mamen, Yirnontsuk, Makuktanakla, Meserong, Kiyirtsuk, Maikumapuk, and Nagaland special.

Although shifting cultivation is practiced extensively throughout Nagaland, the peoples' priority is always to protect the forest ecology and to regenerate the ecological system for the coming phases of the cycle. For instance, trees were never uprooted even during cultivation and the offshoots that spring out from the stem were never cut. It is the universal understanding for the Nagas to ensure the standing trees in their jhum fields and also along the streams or rivers, thereby ensuring the speedy regeneration of forest and to safeguard other aquatic plants and animals in the rivers.

In order to save the top soil from erosion in jhum fields, they use wood and bamboos as "bunds". It is a practise where whole bamboos or long wood are laid over the field across the slope in a regular manner with the help of wooden pegs to stop soil he soil from eroding down the jhum field.

It was restricted to mock the thunder and lightning, search or kill 'louse', cooking of wild animal's meat/ prawn/crab, burning of animal's skin, feathers and fresh weeds in the jhum field during harvest time. Besides, the habitations of ants, presence of toad in farm houses, odour of wild cat, marks of tiger paws, undistorted hooting of owls, bees hives in the farm house, dreaming of fishes etc. were considered as indicators for rich harvest.

While burning jhum fields, they used 'fire against fire' to prevent from excess burning of forest. This was done by burning certain area around the jhum field before actually

burning the jhum field. Through this method they were able to control the jhum fire without spreading to the nearby forests.

Again there are areas where agriculture is done along with Alder trees (*Alnus nepalensis*). Alder agriculture fields are found at high altitudes ranging between 1,000 to 2,000 meters. It is particularly prominent in Angami villages in Kohima district. This practice has been in practice since antiquity in this part of Nagaland. The alder tree has root nodules which improve soil fertility by fixing atmospheric nitrogen into the soil. It also enhances crop yields and reduces soil erosion. Normally, a jhum farmer cultivates the fields for two years within a nine-year cycle (1:4 ratio of cropping to fallow). But the alder system allows two harvest in two out of every four to five years (1:1 ration of cropping to fallow) (NEPED, 1999).

Besides, the villagers are of the view that alder grows fast and yields good quality and quantity of fire wood and that the alder used in construction as timber becomes stronger with age. The villagers have even perfected the art of pollarding the alder tree at a height of about 2 meters from the ground when the tree is about 10 years old. The trunk then sprouts around 50 approx. small branches, which are cut for fire wood and timber (leaving behind 5-6 branches) after a period of 10 months to 1 year. The remaining branches grow fast and within 4-5 years the tree is ready for pollarding again (Field work).

Sowing of any kind of seed is never done during the full moon time. For, the seeds sown during this time never grow healthy. The different agricultural activities are ascertained

from the movement and chirping of different birds. For example, the chirping of the cookoo birds heralds the ideal season for sowing seeds and plantation of various crops.

Seed material for sowing and the grains for consumption, are preserved in traditional granaries and baskets. These baskets are made of a certain bamboo species *Dendrocalamus hamiltonii* and the inside of the basket is further covered by leave called "amji" in Ao dialect. This practice has enabled them to maintain, preserve and conserve the genetic seeds from extinction.

Besides, the knowledge of Germ Plasm is also found among the traditional Naga farmers. For instance, Chang Naga farmers in Tuensang, makes an effort to maintain good breeds of crops in their fields to conserve germ plasm with the aim to produce a wide variety of food that are nutritious and tasty and to make it available throughout the year depending on the soil conditions and altitude. This maximises crop productivity because risk is spread and species selection is adjusted to land capability (ICIMOD, 2006). They ensure that crop seeds are never lost and exchange from farmer to farmer with the community and with other community too.

Plate 4.1 Conserving trees along the stream in

Plate 4.2 View of Terrace field

Plate 4.3 Use of Bunds in Jhum field to stop the soil from erosion

Plate 4.4 Pollarding of Alder tree in Jhum

Plate 4.5 Mixed cropping in Jhum

Plate 4.6 Naga women selling jhum products in local markets

4.3.6 Conservation based on traditional hunting and fishing

Among the Nagas, prowess in hunting and fishing, commanded deep respect. They have always hunted to supplement their daily diet and the forests have always served their purpose. In olden days, they haunted with the aid of bow and arrow, spear, Dao and sling until muzzle loading guns grew in popularity after the Manipur rebellion in 1891.

The Nagas believed in the prognostication of certain dreams and taking of omens before a hunting spree. For instance, the Angami Nagas used a method of slicing a twig on the ground or a flat stone and watched the fall of the slices before undertaking a hunt. The method of interpretation of dreams and omens apparently varies with different persons. The Chakesang Nagas believed in the existence of an animal shepherd called 'Thochipu', who look like a human being with short stature, foot opposite and long hair. They believed that if they meet 'thochipu' at the time of hunting then, they will not hut anything that day. They say that 'Thochipu' use to protect the forest and its animals from human being.

Nagas never hunt animals and birds such as 'Shitsuk', Deer, Tiger, Snake, Owl, Chu-Chu bird, Hornbill etc., except when they disturb the villagers or when required for some specific purposes. But, animals like Wild Boar and Bear are considered as destroyer of jhum fields and hence they were hunted anytime. When a hunter kills a Wild Boar, it will always die lying face down on the ground, if not the hunter will die. Again, if the left tooth of the Wild Boar is broken, then the hunter's wife will die or get sick and if it is the right tooth then the hunter will die. Again, wild boar tusk with red stripe is never used or sold with the belief that the user or the buyer will die. Further, they believed that if a

hunter kills a ‘Lemur’ (Shinumongmong) or ‘Tsungnu’ (a type of Mole), then the hunter will die, thus, they were never hunted.

The restriction in hunting and killing certain animals differ from one tribe to another. For instance, a Konyak Naga never hunted a Civet cat, Slow Sloth (*Awai*) etc. because of bad omens associated with the animal. But the same is hunted and killed by an Angami Naga or Ao Naga. This limitations and restrictions imposed on certain animals have helped in conserving and preserving the species without much impact on the animal community.

The period from March to early September is considered as the breeding season of wild animals and birds and hence, hunting was banned or not allowed during this period. Even wounding and killing of domesticated animals was considered a serious offence to certain tribes. For the Rengma Nagas, malicious wounding of a domestic animal was fined exactly the value of the animal or as decided by the village customary court.

The Chakesang Nagas believed that the ‘Hog’ (Vothu- like pig, having the claws of dog) comes out of their habitat only after 7 years and hence, hunting of Hog’s was restricted. Again, the skin of ‘Tupho’ was used as shield and bullet proof during head hunting and wars, by the Chakesang Nagas. So, they never hunted the ‘tupho’ except for the said purpose.

Nagas perceive that male and female hornbill always flock together and hence, if a hunter has to kill, then, he should kill both the male and female otherwise they believed that the other hornbill will die after few days, and along with the last hornbill, the hunter will also die. Besides, hornbill feathers with red and white stripe on the tail were never used or sold, because they believed that the buyer or the user will die.

There are many lakes and pond where fishing is completely prohibited because of their belief that various deities and spirits reside in this water bodies. The famous Shilloi Lake in Kiphire district, *"Amok Lushi"* at Chuchuyimpang village in Mokokchung district, *Menjonghan* at Chi village in Mon district etc are such water bodies that are strongly associated with several deities. Fishing was done mainly during the dry season. They also believed that if a person meets a 'Tsungko Fish' while fishing then, that person will die soon.

4.3.7 Conservation through Sacred Forests/Groove

Sacred forests/groves have contributed largely to the conservation of biodiversity in Nagaland. The existence of these scared forests can be attributed to the wide traditional belief and deity associated with these forests for ages. Perhaps, this traditional practice is the most important factor that has led to the abundance of biodiversity in the state.

Sacred forests are segments of landscape containing trees and other forms of life and geographical features that are delimited and protected by human societies because it is believed to keep them in relatively undistributed state as an expression of important relation to the divine or to nature (Lucy, 2009). Sacred forests are generally tracts of virgin forest, left untouched or at times with minimal human influence, by the local people/villagers, generally due to their cultural and religious belief associated with the forest. It has been observed throughout the globe that several medicinal plants, rare, endangered and threatened species of plants and animals are often found concentrated in scared forests.

Nagas possess a wide knowledge regarding the concept and practice of designating certain area of forest as sacred forest. This practice is as old as the Nagas themselves. In

other words, this practice prevailed since the dawn of Naga society. In the view of Nagas, "Sacred forests are tracts of land covered with thick forest and are the dwelling place of various spirits and deities. A place that is to be treated with utmost respect, revered and sometimes even worshipped". Every sacred forest carries its own legend, folk lore, myth and significance and plays an integral part in the life of the local people. The area of this sacred forests ranges from few square meters to several hectares.

Almost all the traditional villages in Nagaland have at least one or two scared forest of their own with different meaning, belief and significance. These forests are deeply attached to their social values and belief system in their everyday life. People do not dare to cut trees, plug leaves or collect forest products from these sacred forests.

Abviinhou or Kabviinhou sacred forest is located about three kilometres south of Khezakeno village in Phek district. This sacred forest is bounded in the North by the *Libolo/Tadziiza* slope, in the East by *Chiyi* River (Perennial River), *Teko* in the South and *Leve/Miyie wo* in the west. Different myth and legends surround the origin of the name of this sacred forest. One legend speaks of a Mithun (Bison) locally called *'vi'*, by the name *Abvii* resided in this sacred forest, while a tiger inhabited at Kilimato, a peak lying to the north of the village. These animals moved and roamed freely from Kilimato to Abviinhou. One fateful day, the tiger was seriously injured by the *vi's* horn (*chi*) succumbed to the injuries. The name *Abviinhou* is derived from the two words, *'Abvii'*, meaning the name of a 'mithun' (known as *vi* in local dialect) and '*nhou*' meaning the sitting place.

Another legend says that the name *Kabviinhou* is derived from two words, *Kabvii*, meaning Kohima (place where '*akube*'-a type of grain was found in abundance which was believed to be a blessing from *chiikichi-o',* their creator), and *Nhou* meaning sitting place. In other words, *Kabviinhou* can be said as place from where Kohima is seen. There is another sacred forest called *Ngade*, which forms a contiguous part of *Abviinhou*. Some consider it to be a part of *Abviinhou* itself, while majority consider it as a different sacred forest.

For ages, the people of Khezhakeno believed that the forests were the abode of Chiikichi-o, their Creator. They dared not disturb their *Chiikichi-o* for '*Chile chichi sii-e de matha'* (fear of disastrous weather). For this reason the forest was considered sacred and no one dared to cut trees, cultivate or even pluck flowers from this forest. In *Ngade,* a place/spot prevailed where they believed that people use to lose their sense of direction if they step their foot on it. This spot is called, *"Kowube",* meaning "Place of Madness".

As stated above, there are many such sacred forests spread all over Nagaland, some of which are, *Penwandong, Tseknuhoa* and *Thoakpai* Sacred forest at Jaboka village in Mon district, *Wangpoumnok* and *Takhang* Sacred forest at Chi village in Mon district, *Mechulu* at Longmisa Village in Mokokchung district, *Akijihii* Sacred forest at Askomi in Zunheboto district, *Nanyii yongshiih* sacred forest at Kangching village and *Lima Jangsa* sacred forest at Yongyam village in Longleng district.

Again sacred forests are also found in the form of "Alitara" and "Ait" (Ao dialect). The concept of Sacred Forest, Alitara and Ait are all very similar to each other. However, the difference is that "Alitara" is purely related to the "land/soil" of a particular forest and

"ait" is a place "where birds and animals take shelter or a place where birds and animals drink water".

Alitara consist of two words, *"ali",* meaning Land/Soil and *"tara",* meaning strong. Thus, it is purely associated with the soil of a particular forest. The spirits and deities are all related to the soil and not to the forest. Since the soil is sacred, people don't cut the forest or cultivate in this places. There are several such places all around Nagaland and sometimes this "alitara" is used synonymously with sacred forest. Some of the important ones are, *"Meyutsungba apok"* at Chuchuyimpang village, *"Shiitsukong"* at Longmisa village in Mokochung district, *Phucholu* and *Miidizu* at Phusachodu village in Phek district.

According to Ao-Naga believe, *Ait* is a place believed to be the home of supernatural beings or spirits and deities often called as *"Ait Tsungrem",* (Ait God). People worship and perform rituals in *ait* in order to appease the deities for the well being of the villagers. One unique characteristic of ait is that, it consist of a lake or pond within the forest, where all the two legged and four legged birds and animals come to drink water and flock together (*tetsung ana aser pezii aketba shiruru ajak aruagi itaki tzii ajemer aser kulemi kazur*). It is a taboo to hunt and kill birds in the *ait*. They believed that even the wounded creatures get healed supernaturally when they entered the *Ait.* There are various *Ait* such as, the *Ait* at *Lakuni* forest, *Ait* at Changdang Village, *Ait* at Mongen village, *Ait-tzu lumang* and *Ashini Ait* at Chuchuyimpang village, *Yangermanglongpok, Nashimer, Shirkimong* in Mpoungchuket village, *Kaomong, Shamalong* in Debuia village under Mokokchung district.

The presence of sacred forest, *alitara* and *ait* has contributed largely to growth of rich biodiversity in Nagaland. It has not only helped in biodiversity conservation but also helps in soil conservation by reducing the erosive action of water. Besides these sacred forest helps in maintaining the desirable health of ecosystem, reduce habitat destruction and also balance the general climatic and weather conditions of the area or region.

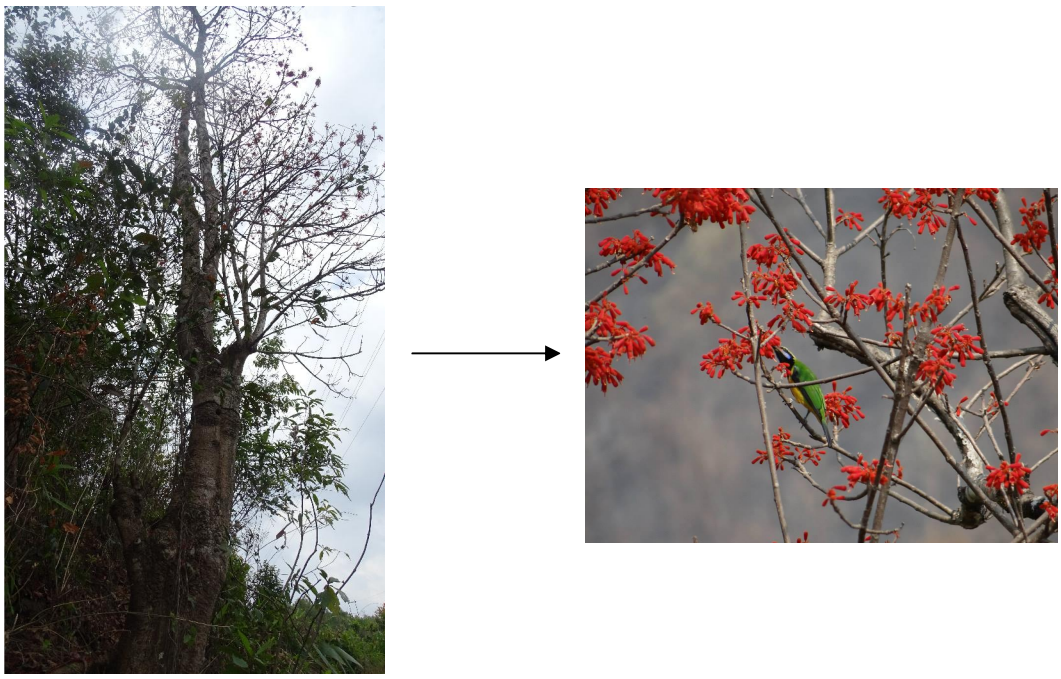


Plate 4.7 *Erythrina* (Skull tree), never cut because skulls were kept hanging on this tree

Plate 4.8 *Pandanus frucatus*, Naga traditional comb

Plate 4.9 Longlangbalong, A sacred place of worship in Longkhum Village, Mokokchung

Plate 4.10 Shilloi Lake: Believed to be the abode of Spirits situated in Kiphire district

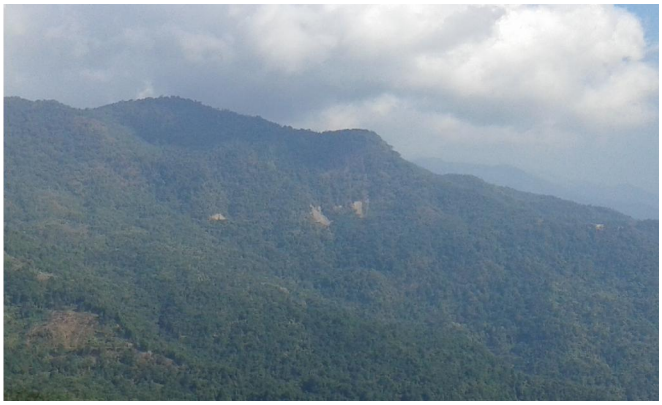


Plate 4.11 Nanyii *yongshiih* Sacred forest Kangching Village in Kiphire district

Plate 4.12 Rock bee hive in Kiphire District

Plate 4.13 Hoopoe (*Upupa epops*): Medicinal bird

Plate 4.14 Gecko -Medicinal lizard

Chapter 5

Development and its impact on biodiversity

5.1 Introduction

Nagas sensitivity around nature faced a serious challenge from a modern ideology of development that was based mostly on indiscriminate exploitation of nature for the supposed good of the humankind. Unfortunately that humankind does not include the local people. The result is their large scale destruction of biodiversity, environment, land alienation and displacement etc.

Till the early 19th century, Nagas were more or less confined to their territory, holding on to their traditional culture, ethos and values. Thus, their contact with the outside world was minimal and the modern notion of development was alien to them until the British came and colonized part of Naga territory. The advent of Christianity and the shifting of the British headquarters to Kohima proved to be a decisive factor in exposing the Nagas to the outside world. Further, the World Wars I and II during which the British imposed conscription of abled Nagas as boarders and fighters, some of those who sailed to Europe and other parts of the world were particularly significant as it has created political consciousness among the Nagas leaving long and lasting political implications. The process, thus started continues unabated even today.

Today, the traditional communal land practices of the Naga people are being greatly undermined by various developmental projects. Increasingly large areas of communal land are taken over by governmental as well as by private agencies. Today we see thousands of acres of land being acquired by the government through the transfer of administrative centers, for the purpose of administrative circles, establishment of government offices, institutions, parks, roads and for other developmental purposes.

As such, since the formation of statehood, various developmental activities have been taking place in one form or the other. During the last 50 years of statehood, the government has created 93 administrative circles, 52 blocks, 12033 km of road length have been laid (837 km in 1962-63) providing connectivity to 89.14% of officially recognized villages: 1010 villages (82.45%) have been provided water supply; 29 MW of electricity are produced and 1216 villages have been electrified (only 6 villages had electricity in 1962-63); and the literacy percentage has climbed from 7.91% in 1962-63 to 78.8% in 2011, which is better than the national average.

The above statistics depicts of a well developed Nagaland, however the truth is all the above data's are basically in black and white and most of them are yet to be properly implemented. It is true that the growth and progress of a nation, country or region is largely attributed to the various developmental activities taking place in that particular place. However, development if and when done without proper planning can be hazardous to the people and environment which in turn bear a negative impact in the growth and development of nation.

Of late, modernization, capitalism, individualism along with development is penetrating every sphere of life of the Nagas which is directly affecting the landholding and land use pattern among the Nagas. There is a fragmentation of communal land, clan and family land into private/individual land. Land, far from being a source of identity and communal solidarity in the past is now perceived merely as a source of wealth for many Nagas. The once rich and strong cultural ethos, values and the rich traditional knowledge of the Nagas are severely threatened today.

5.2 Development and problems of biodiversity conservation in Nagaland

Development is the key to progress of a Nation, Country or a Region. With this objective, the department of Industries and Commerce in Nagaland had been making all round efforts to encourage/ set up various Small Scale & Cottage industries, Medium-Sized industries and Large Scale industries. However, the productivity of especially the latter two had been very disappointing.

The mission of the Industrial policy of Nagaland-2000 (revised in2004), states, *'to facilitate rapid and sustained industrial development in the state through enhanced investment, an investor friendly environment, provision of infrastructure and institutional support, attractive incentive package and optimum utilization of existing resources in order to gainfully exploit emerging opportunities in the national and international markets and generate substantial income and employment for the people of Nagaland'*. Thus, the model of development pursued by the State Government calls for diversion of land, for road building, mining, industrial establishments, Hydro-Dams, etc with little or no focus on the rights of the local people, the environment and biodiversity of the state.

It appears that in the backdrop of the ongoing process of modernization, liberalization and privatization, the state of Nagaland without in-depth perusal and consideration of the local realities, threw open the door to foreign investors, which will have far reaching consequences on the people's rights over land and resources (Jamir, 2012).

Under the 'Vision of Nagaland 2020' massive developmental projects have been initiated by the government of Nagaland. Under this concept, the government has been acquiring land throughout the state. Some of the recent acquisitions by the government of Nagaland

include Chiethu Airport (Kohima district), where out of the total requirement of 746 acres, 650 acres of land have already been clearly demarcated. Almost 70 percent of the total land belongs to the community of Chiechama village and the remaining 30 percent belongs to private individuals. The worst part is that this project has been cancelled with the excuse that the place is not suitable enough for an airport and has been shifted to Razuphema village under Peren district.

Besides, the acquisition of Deputy Commissioner Office complex, Chumukedima with a total area of 64.30 ha, New Deputy Commissioner Office Peren, the proposal of a Hydro-Dam under Longleng and Mon district which will be at the cost of several villages, proposal of Nagaland Special Development Zone (NSDZ) etc are some of the recent developmental proposals made by the government of Nagaland.

Further, many traditional villages are being converted into model villages such as tourist destination- Touphema, Naga heritage village- Kisama, Mount Pauna Village- circuit tourism, Zhavame – Vegetable Village, Mon- Large Cardamom district, Molvom – Pineapple Bowl of Nagaland, Green village- Khonoma, Tanamir- Apple Village etc. Thus, villagers are destroying their traditional forest and land to plant more of their associated horticultural crop, vegetables, tree etc which are all mono-centered with no diversity.

In 2007 under the prime minister's initiatives, the Government of India accorded approval for setting up of 2 Special Economic Zones (SEZ) in Nagaland. Out of these two multi- product Special Economic Zones promoted by a private company acquired over 400 hectares on the outskirts of Dimapur for modern township recreation and

manufacturing purposes. Secondly, an agro food processing SEZ is earmarked as an export for promoting industrial park with 125 acres of land already acquired by the Government. The Nagaland Industrial Development Corporation (NIDC) acquired estates covering a total area of 40 acres with 25 acres already built with standard factory sheds and area for a small industrial plot at Dimapur.

Nagaland Pulp & Paper Company Ltd. (NPPC) popularly known as Tuli Paper Mill was established in 1971. Located nearby Tuli town, it lies by the National Highway - 61 and is 21kms from Amguri town in Assam. The area in and around its vicinity is known as Tzudikong or Tuli Paper Mill township.

NPPC entered into an agreement for lease of land at Tuli measuring 697.98 acres for 99 years w.e.f. 01.03.1972 with the Government of Nagaland. In the said agreement, the lease rent was fixed at an agreed rate of Rs.2000/acre/annum (Annual Report - 42, 2012-2013). However, not only is the lease rate too less but though the land is being used by the company since 1972, lease deed has not been executed till date. The report further states that, non-provisioning of the same has resulted in understatement of both short term provision and loss for the year by Rs.558.38 lakhs (Rs. 2000 x 697.98 acres x 40 years).

The reason for non-payment of the lease rent is attributed to the fact that, *"NPPC was a non-starter since its inception and the production got suspended in the year 1992. Since the production activity at NPPC is suspended and there was no demand from the state government, the lease rent has neither been paid, nor been provided for".*

Today the people of the region have been given a new hope with the scope of Revival and Up-gradation Plan of NPPC already being approved by Cabinet Committee on Economic Affairs (CCEA) on 04-06-2013. However, the report astonishingly states, *"Since GoN is also keen for the project and have assured certain supports for smooth implementation of the project, NPPC will seek exemption for payment of lease rent after obtaining clearances from the BIFR"*.

The irony is that, the company which has failed to pay their lease rent over the past 42 years is seeking exemption of the same without even paying a single paisa.

Thus, it is evident that the company in collaboration with the State Government has lured the villagers with promises of better economic gains from their land. The innocent and ignorant villagers on the other hand have willingly leased out their traditional land and forest with the hope of better livelihood but in return they got nothing and are yet benefit from the company.

The Nagaland Forest Products, Tizit/Nagaland Plywood industry, Tizit, and Nagaland Sugar Mills Co Ltd, Dimapur also bear the same consequences. Where local people have donated large tracts of land hoping for a better livelihood but in return they are miserably victimized. Sadly, today both these industries are non-functioning or can be called "Dead Industries" of Nagaland.

Besides, the performances of Nagaland Mechanised Bricks Co Ltd, Dimapur, Nagaland Distillery Ltd, Dimapur; Nagaland Fruit Canning Factory, Longnak in Mokokchung district and others are all very disappointing, The Urban Haut constructions located by

the side of the old Dhansiri Bridge, Dimapur which was developed under the Centrally Sponsored Scheme is lying in waste.

All these industries which started with lots of promises and assurance of better economy to the people of Nagaland, have sadly failed miserably. Yet the worst lies not in the failure of these industries to function but the worse lies in the fact that these industries have damaged vast acres of land into non-cultivable land. Not only has it destroyed the biodiversity and the environment of the particular region, but it has taken away the cultural rights and their only source of livelihood from the people of these regions. The impact of these industries on the people, environment and biodiversity is immense. Land which is considered sacred and in which lays the identity of people has been taken away.

Besides the fact that they have lost the land, there are other environmental consequences with multi-dimensional implications on health, cropping pattern, weather conditions, biodiversity etc. Some of the environmental consequences include undesirable modification of the landscape, changes in the surface and underground drainage, decline in quality and quantity of vegetation cover, degradation of downstream rivers due to massive erosion and slit run-off.

5.2.1 Impact created by Hydro-Dams on Biodiversity and cultural lives of the people

For the developing agencies, North East India is considered to be the future power house of India. Nagaland, with a potential of more than 2000 MW in Hydel power generation has been the target of many agencies and corporations including multinationals. 75 MW Doyang Hydel Electric Project (DHEP), 24 MW Likhimro HEP and 24 MW Thermal

Power Station at Chumukedima are some notable projects that take away a large percentage of land from the local community.

For instance, the 75 MW Doyang HEP is a project commissioned in 2000 by the Government of Nagaland in collaboration with the North East Electric Power Corporation Ltd (NEEPCO). The MOU between the Government of Nagaland and NEEPCO for DHEP was signed for 99 years. The total catchment area of the DHEP is 2,60,6000 ha which falls entirely within the community lands. For the state government the Doyang HEP is often referred as the 'Pride of Nagaland', but for the affected community of people, the totality of the consequences is grave.

There are 22 villages falling within the perimeter of the immediate catchment area, with 11 villages most seriously affected. Considerable areas of fertile agricultural land and pristine forest have already been submerged. Out of the total catchment area of the DHEP, forests accounts for 521.20 ha, terrace fields 125.42 ha, orchards 30.12 ha, non-agricultural land 255.40 ha and area under jhum cultivation accounts for 1,673.81 hectares. The most astonishing part of the 1992 MOU is clause 1.5 which says, ' *The government of Nagaland accepts the position that NEEPCO will not be burdened with any additional cost to the project for economic rehabilitation of the affected land owners'*

Besides, the impact of the Dam on the remaining cultivable land is also a thing left to be addressed. As an unhappy villager lamented, *"we used to harvest 35 – 45 tins of rice per acre, but now we get only 20 – 25 tins of rice in the same plot after construction of the dam"*. Another villager states, "*since the inception of the dam, weather has become warmer and there are dizziness and sickness have become more prevalent*".

Thus, the simple and ignorant villagers were made to part with their precious land for development, lured with promises of a better life and future. But today, the harsh reality is that many of the villagers have lost their best cultivable land, their orchards and forests. With the monetary compensation they got from the NEEPCO, some villagers have migrated to urban centers like Kohima and Dimapur with hopes of a better future, but except for a few, the urban centers in fact cannot offer them a decent living as they have no jobs or security. And the worst irony of all, ostensibly for development (electricity), is that many of their houses still remain without electricity connectivity and the only lights they see at night *"are the reflections in the Dam reservoir"* (Longkumer, 2012).

5.2.2 Biodiversity loss due to Mining and Stone Quarrying

Coal mining is emerging as a profitable business in Nagaland. The state Government is still in the process of exploration and in the initial stage of dealing with the prospecting companies. However outside the ambit of government regulations, private and small firm extraction has been going on in many areas for a decade or so. Since many of these mines are located in private lands, the state government is unable to regulate and monitor them.

Mining is carried out in Changki, Anaki and Tuli in Mokokchung district: Namsang in Longleng district and Tiru in Mon district. In Namsang, extraction of coal started since 2004 within a parameter of 5 sq. kms. Many of these mining operations are carried out in the jhumland where within the stipulated lease period, the contractors or the agency tries to maximize their profit by mining as much as they can. The mine-waste are dumped on the agricultural land thereby exposing the sulphurous coal dust creating both health and environmental hazards in the area. These wastes are being carried downstream by the rain

water destroying the entire environment in the slopes and aquatic life in the rivers. Villagers of Anaki village-C in Mokokchung District claims that the rivers in their village are polluted and do not have any aquatic diversity owing to contamination of water by mineral waste discharged from coal mines in the area.

Besides, with no competent authority or department to monitor the coal mining till date, the most unplanned and unscientific Rat Hole mining practice continues in Nagaland causing a high health risk for the miners as they are not properly equipped for scientific mining and at the same time disrupting the surrounding environment to a great extent. This unabated and regulated money-oriented business is fast creating a trend where large tracts of land are concentrated in the hands of a few. Affluent people with money like politicians, bureaucrats and rich individuals are acquiring large tracts of land from both individuals and communities, while many lands are leased for a specified period of years.

Stone quarrying is another emerging trend in Nagaland which seriously threatens the biodiversity and environment of the region and is found in small pockets in entire Nagaland. This practice is supposed to be another economic venture among the Nagas and is fast becoming a business oriented enterprise where large tracts of hilltops are removed for the sake of quarrying. However, due to its unscientific approach, it has vast impact on the environment. One common feature of stone quarrying in Nagaland is that, they are done just adjacent to the road side. Thereby affecting not just the biodiversity and environment but damages the road condition to a large extent.

5.2.3 Mono-culture and its impact on biodiversity

A number of environmental and social organizations have declared September 21st: "International Day against Monoculture Tree Plantations" to highlight the social upheaval and environmental degradation including impacts on global biodiversity and climate change wrought by industrial plantations.

The introduction of monoculture crops/plants by the State Government and individuals in the name of economic development is another factor contributing largely to the decline of biodiversity in the state. The concept which is alien to the Naga people is fast becoming a trend especially among the affluent people like the politicians, bureaucrats and rich individuals who are acquiring large tracts of land from both individuals and communities.

Following are some of the negative impacts of monoculture tree plantations:

1. Depletion of water sources due to changes in the hydrological cycle
2. Deterioration of rivers and streams
3. Air and water pollution due to the use of pesticides and other agrochemicals
4. Deterioration of cultural diversity and
5. Deterioration of biodiversity

Of late, the emerging trend among the Nagas is for the affluent class to buy huge plots of land, not for the sake of livelihood, but for the purpose of profitable investment such as tree plantation, for commercial use, cash crop farming etc. Such instances are more visible in Dimapur areas where rich Nagas have been buying hundreds of acres, particularly from Kacharis, leaving them almost on the verge of becoming landless tribes in Nagaland and Assam (Longkumer, 2012). Plants such as Teak, Rubber, Kokon and

many others are taking the place of the once rich forest vegetation in many places. Of late, practice of tea and rubber plantation is widespread thereby converting the traditional forest land to tea and rubber plantation sites.

Large acres of land along the Japukong and Ongpangkong range, under Mokokchung District; Tizit area under Mon District; Jalukie area under Peren District etc are extensively under Rubber plantation. Given the fact that rubber plantation is a very recent concept in the state, the area that these crop covers is very astonishing.

Again, vast acres of land along the border of Mon district, is under Kokon (*Duabanga grandiflora*) and *Melia dubia* cultivation, under the initiatives of Green Plywood Industry (a private firm). This plantation is done solely for personal economic benefits.

In the year 2013-2014 alone, they have distributed more than 2 lakhs sapling of kokon and *Melia dubia* in the district. Further, according to their report 440 plants are planted in 1 acre of land. Thus, we can roughly estimate that in 2013-14 kokon and *Melia dubia* plantation alone has acquired 454.54 acres of land under Mon district.

Besides these trees, in the lower plains of Mon district bordering Assam, large areas of forest are replaced by Tea cultivation. Few villagers have even leased out their land to their Assamese counterpart for a period of 10-15 years without any benefit and in return after completion of the leased period the plantation is given to the owner.

Thus, the ignorant villagers are clearing their traditional forest and planting these trees with the hope of getting better economic gains from their land not realizing the environmental and social and cultural impact that is being caused by such policies.

The introduction of various horticultural crops under the directives of the Department of Horticulture, Government of Nagaland, for economic gain adds to the problem. For instance, under the 10th and 11th Five Year plan, 2012-2014, the department has initiated plantation of various horticultural crops such as citrus, Passion fruit, pineapple, banana, vegetables, ginger, turmeric, large cardamom and naga chillie, covering a total area of 52759 ha. Further, the Department during 2013-2014 has undertaken area expansion of a total of 2082 Ha. Of major focused crops in all the districts (Annual Administrative Report, 2013-2014)

Thus, large tracts of traditional lands/forest are being converted to horti-land/farm etc. Those land/forest which were once considered sacred, revered and respected are destroyed under the notion of development and promise of better economic gains to the people.

The irony of all is that, hardly a handful of people are benefited through these government initiatives. An unhappy villager for Longsa village under Mokokchung district lamented, *"We were asked to cultivate turmeric in place of jhum and accordingly we invested many acres of land for turmeric. But the government rejected our products saying it is not of good quality"*. Further he says*," we have used the best available land for turmeric and various other crops but the money we generate out of it is too less"*.

Similarly, a villager from Phek district said, *"we have cabbage all around; nobody buys cabbage during season, not even at Rs. 3 per kg. We can't take it outside because we don't have money to hire vehicles. We use to feed it to the pigs during season"*.

The various departments while working for a socially and economically sound Naga society have sadly failed to evaluate and assess the social, cultural and environmental impact on the state and have miserably failed to value and respect the aged old traditional land/forest.

The drawback of monoculture and other economic plantations is that, it does not necessitate the growth of biodiversity within the area. From economic point of view it might be reasonable, but from environment point, this monoculture is very destructive and in the long run it will rather bring hazardous impact on the region.

5.2.4 Militarization and its impact on biodiversity

Another serious factor that is affecting the biodiversity in the form of development activity is the presence and expansion of military and armed forces headquarters in the state. Along with developmental activities, militarization and expansion of armed police forces under the central and state policy has contributed largely to loss of large tracts of community or village land/forests which in turn have affected the biodiversity to a great extend.

Destruction of biodiversity in Nagaland through military forces was at its peak between 1960's and 1980's when Indo-Naga conflict was at its crest. During these years, there were hardly any traditional Naga village which had not experienced the brunt of the military force through burning of villages, forest and jhumland by the 'security forces'/Indian army.

This fact is borne out by historical facts which shows that just between 1955-1964, 190 villages were burned down to ashes in the Sema region; 60 out of 64 villages in

Chakesang region were razed to ground; and in the Ao region 49 villages out of total 56 were burnt totally (Iralu, 2000). Besides, regular clearance of forest of considerable areas was made mandatory in many strategic places to prevent roadside ambush by the Naga insurgents.

Thus, many of the traditional primary forest/biodiversity in the state was mercilessly destroyed beyond restoration by the paramilitary forces in the name of security reasons during this period.

At present, these armed forces under various names such as “Operation Good Samaritan”, “Friends of the Hill People”, and “Sathi Laga Force” (Friendly force), through its Army Developmental Group (ADG) 1995 programmes and Military Civic Action (MCA), continues to acquire large tracts of land for building schools, public halls, parks etc. in the state.

The presence of paramilitary forces can be found in all the districts occupying large acres of land which were all once covered with rich vegetation. On the pretext of maintaining ‘law and order’, such military camps have being set up after clearing large tracts of forests.

For instance, the thick forest cover near Mokokchung compound paved the way for setting up a military camp for Central Resrve Police Force (CRPF), and is presently occupied by the Nagaland Police. The Army cantonments in Rangapahar as well as in Chisami which have set up Golf Courses for their pleasure have largely degraded the forest cover of the region. Besides, the state has approved the renewal of land lease

measuring 1,180.2 acres to Rangapahar military cantonment, Dimapur at its cabinet meeting on 13th June 2008.

Further, almost as a rule, the military always occupy the most prime location in all the town's and village's hence acquiring valuable traditional community land. Likewise, large pristine areas of lands have been acquired by the Nagaland Armed Police in Aboi, Peren and Zadima and by the Assam Rifles and Central Reserve Police Force (CRPF) in all the districts.

Thus, militarization in the state not only has destroyed the biodiversity in the state to a large degree, but also exhibits the extent to which community land has been alienated and thereby has deprived the Naga indigenous people of their land. Besides, it has also created a war-like environment, inciting fear psychosis in the mind and heart of the people by their presence in all the districts.

5.3 Environment-Development interface

With the ever increase in population over the years coupled with enhanced consumption and rising level of economic activities, tremendous pressure has been added to the environment all over the world. Environmental impacts as a result of the various developmental activities such as thermal or hydro-power generation, mining, setting up of large or small scale industries etc manifest themselves with one or more environmental problems.

For instance, mining has led to serious environmental problems like water pollution, dead of aquatic organisms, land subsidence, species extinction, habitat destruction etc. Again, the use of unplanned and intensive agricultural chemicals leads to deterioration in food

quality resulting in serious health hazards and environment sustainability. Besides, the introduction of Green Revolution in India has been accompanied by over exploitation of natural resources and excessive usage of fertilizers and pesticides.

Chauhan has rightly stated that after so many decade of development, poverty remains widespread and in our country perhaps development has resulted in the disruption of traditional economic and social systems. Truly, almost all the developmental activities in Nagaland have become a threat to the cultural, social and biological diversity of the state. Thus, there is a need to interlink the two systems i.e. environment and development.

It is important to realize that the natural and environmental resources like soil, forest, mines, water, air etc are the basis of all economic and developmental activities. In fact, the productivity of an economic system depends on the supply and quality of its natural resources to a large extend. Thus, nature or environment must not be considered as just another sector of development. Rather, it should be treated as the guiding principle to every form of developmental plans and programmes.

The concept of "sustainable development" is the primary requisite that needs to be advocated throughout the state at present. Sustainable development attempts to strike a balance between the requirements of economic development and the need for protection of the environment. It seeks to combine the elements of economic efficiency, inter-generational equity, social concerns, biodiversity and environment protection (Ganesamurthy, 2011).

Mega developmental projects with least concern for sustainability and conservation coupled with urbanization and demographic expansion have led to overexploitation of

environment in the state. Thus, there is an urgent need to adopt sustainable developmental measures, strategies and policies in the state to meet the cultural and social needs of the people on one hand and to conserve the biodiversity on the other.

Besides, the following principles need to be adopted while following the path of development:

1. Development must grow from within and not shaped by outside influences
2. It must provide the basic necessities of life with safe living conditions
3. It must foster local resource control and empowerment
4. It must encourage participation from both the privileged and under privileges sections of society
5. Local peoples knowledge on the environment needs to be studied and considered
6. Proper Social Impact Assessment, Environment Impact Assessment and Cultural Impact Assessment should be done before initiating any developmental programmes.

Plate 5.1 Present scenario of Tizit Plywood Factory

Plate 5.2 Logging in Mon

Plate 5.3 Betel-nut plantation in Mokokchung

Plate 5.4 Lands submerged in Doyang Dam

Plate 5.5 Stone quarrying at Wokha

Plate 5.6 Unplanned Road construction in Longleng

Plate 5.7 Rubber Plantation in Mon

5.4 Modern acts and laws and it's implications on biodiversity in Nagaland

Off late, there is an increasing recognition of the importance of the conservation of Biological Diversity, not only among the researchers but also among the policy makers at local, national and international levels. With the increase in the use of biological resources by the ever expanding human populations as well as the State, there is an alarming destruction of global Biodiversity that is threatening the very bases of human development and survival. Throughout a large part of the modern world, national governments and national conservation organizations play a leading role in the protection of all levels of biological diversity (Saterson, 2001).

Thus, many acts and laws, legislations, treaties and conventions are signed and imposed at the national and international level to ensure total protection and conservation of biological diversity establishing national parks, regulating activities such as fishing, hunting, logging, limiting air and water pollution etc. all around the globe. The effectiveness with which these laws are enforced shows a nation's determination to protect, preserve and conserve its biological diversity.

International bodies such as the United Nations Environment Programme (UNEP), Food and Agriculture Organization (FAO), Convention on International Trade in Endangered Species (CITIES), International Union for the Conservation of Nature (IUCN), World Wildlife Fun (WWF), and World Conservation Union etc. encourages and influences the protection of biodiversity all around the world. For instance, CITIES has notably succeeded in influencing and banning ivory trade which was causing severe decline in the African elephant Populations (Ginsberg, 2002). Besides, countries can also establish Red

Data Books of endangered species, which are national versions of the international Red lists prepared by the IUCN.

While efforts are made to strengthen these organizations and thereby protect the world's Biodiversity, there are certain drawbacks and weaknesses of these international and national organizations/treaties/conventions etc. One major weakness is that they operate through consensus, so strong and necessary measures are often not adopted if few countries are opposed to the measures.

DiMento (2003), in Conservation Biology draws that, "Any Nations participation is voluntary and countries can ignore these conventions and pursue their own interests when they find the conditions of compliance too difficult". A further problem is that many conventions are underfunded and consequently ineffective in achieving their goals. And the worst of all is that there is frequently no mechanism of monitoring to determine if countries are even enforcing the treaties (Conservation Biology, 2011).

In India, Kautilya is said to have written a treatise on forest regulations of India, as early as 300 B.C. However, legislations on conserving biodiversity were not enacted until the British colonized South Asia. Until three to four centuries ago, forested areas remained largely under the control of indigenous groups, with rulers exercising control over agricultural plains and valleys (Singh, 1998). Today, there is a separate legislation for forests, wildlife and other environmental good and services in India. Recently, with the passage of the Biological Act in India, the legislation has covered biodiversity as a whole.

At the highest level, the Constitution of India contains specific provisions for biodiversity conservation (articulated in the Directive principles of State Policy) and (51 – A. g.) and

Fundamental Duties (51.A). Numerous other acts, laws, rules, circulars and orders have been passed taking into account governmental and civil society concerns. Notable legislations towards biodiversity protection were initiated with the Forest Policy Act (1865), Indian Wildlife (Protection) Act (1972), Environment Protection Act (1986), Coastal Regulation Zone Notification (1991) and the Ocean Regulation Zone Classification (1997).

Further, the Biodiversity Act (2000) empowers the central government to list threatened species and to undertake rehabilitatory measures. Recently, government and non-governmental organizations have collaborated to draft the National Biodiversity Strategy and Action plan.

5.4.1 National Forest Policy and it's implications on Biodiversity Conservation in Nagaland

The Government Forest Act of 1865 established the Indian Forest Service to conserve and manage the then vast forests of the subcontinent, covering areas that now compose the modern nations of Bangladesh, India and Pakistan. This Act of 1865 was followed by the 1878 Act providing more powers to the Indian Forest Service to gain greater control over forest resources. With these, the state started to expropriate more land to bring it under scientific management and conservation. Forests under the control of local communities were included under reserve forests and access of the communities to forest ecosystems was severely curtailed (Conservation Biology, 2011).

In 1952 Forest Policy was oriented towards both conservation and extensive use of forest resources. Under this policy, India was to maintain a third of its area under forests, on the

other hand it gave primacy to the needs of the industry and to timber as a sources of revenue. Conversion of native forests containing inferior species into plantations of timber yielding trees was encouraged through this policy. Hence, the period between 1950-1980 experienced large-scale conversions of natural forests into plantations of commercial, often exotic, species occurred.

The 1952 Forest Policy further reduced the access of local communities to forest resources. The Indian Forest Service severely limited the traditional rights of people living in and round forests. Consequently, the traditional management practices continued to erode.

The large scale deforestation however continued despite of the policies adopted, hence in order to curb the country's dwindling forest resources, India's Supreme Court, on 12th December 1996, prohibited the Forest Department from harvesting wood in non-plan areas. In addition, the court banned the shipment of logs from India's northeastern states where most forest resources are located. Further, in 1997, the court ordered closure of all unlicensed saw mills and wood processing plants and in 1988 the National Forest Policy was adopted to further strengthen conservation and to involve local communities in the management of forests. Under this new policy, the involvement of indigenous people and women in the conservation and management of forests was to be the key element.

Lately, the appointment of National Forest Commission (2003), National Environment Policy (2006) and subsequently, the Eleventh Five Year Plan (2007-2013) that stressed on "inclusive growth' encompassing environmental sustainability, agricultural

revitalization and rural development are all efforts made by the Government of India for protecting and conserving the biodiversity of the country.

Before the 1988 National Forest Policy, the role of indigenous communities in biodiversity protection and conservation was always undermined or went unnoticed. Thus, on 1st June, 1990, the Government of India passed a historic resolution that recognized the rights and role of Indigenous groups in managing forest biodiversity (Conservation Biology, 2011). Later, The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 was passed by the parliament with the aim of recognizing the traditional rights held by forest dwelling communities over access to forest good and occupation in forests lands. However, the implication of this act created controversy as this law failed to encourage the participation and rights of indigenous people who already were living inside the forests since time immemorial. This stalemate still continues and opinion is divided over this act.

India participates in many international acts and laws concerned with the aspect of protecting and conserving biodiversity. These range from legal instruments to various programmes and agreements both at the national and international level. The most important being “Convention on Biological Diversity” (CBD), which plays obligations on those nations which become contracting parties, to scientific programmes such as the UNESCO Man and the Biosphere Programme.

Besides, India is also a part of the World Heritage Convention, Ramsar (Wetlands) Convention, Convention on Migratory Species and Convention on International Trade in Endangered Species (CITES).

The concerns over the indiscriminate exploitation of biodiversity, due to the increasing demand for the biological resources and the problem of possible misappropriation *inter alia,* have led to the adoption of Convention of Biological Diversity (Valuation of Biodiversity-2).

The convention of Biological Diversity, which was signed by 171 countries including India, during Rio and thereafter, has entered into force with effect from 29th December, 1993. The main objectives of CBD are:

a) Conservation of biological diversity
b) Sustainable use of its components
c) Fair and equitable sharing of benefits

CBD expressly calls for the rights of recognition of indigenous and local communities in conserving the biodiversity and in protecting the traditional knowledge associated with genetic resources.

To safeguard the salient provisions of the CBD, India has set up the National Biodiversity Authority (NBA), in 2003. NBA incorporates a three-tiered structure comprising State Biodiversities Authorities and Biodiversity Management Committees at local level. Although the logical framework of this structure is sound since it includes central, state and local governance, its practical implementation is a serious challenge in the context that India is a vast country with diverse cultural and social values and that application of acts and laws will differ from state to state.

5.3.2 United Nations Convention on Biological Diversity and the Nagas

The historic United Nations Conference on Environmnet and Development (UNCED) Summit held at Rio de Janeiro, Brazil, in June 1992, adopted the Convention on Biological Diversity (CBD). Consequently, India has ratified the Convention on18th February, 1994 and thus it has come into force for India from 19th May 1994, 90 days after the ratification. As stated above, the main objectives of CBD include conservation of biological diversity, sustainable use of its components and fair and equitable sharing of benefits arising from the utilization of genetic resources.

Nagas are a group of indigenous people who depend on biodiversity for their socio-cultural, religious and economic development and for their very existence. Therefore, the Article 8 (j) of the CBD which states, *"Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of benefits rising from the utilization of such knowledge, innovations and practices",* could be of great help and necessity in protecting and utilizing its biodiversity.

The CBD could be a great contribution to the Nagas from the point of its recognition to:-

a) The intrinsic value of biodiversity
b) The fundamental requirements of *in situ* conservation of ecosystem and natural habitats
c) The supporting role of *ex situ* measures

d) The vital role of local communities and women in the conservation and sustainable use of biological diversity
e) The desirability of sharing equitably the benefits arising from the use of traditional knowledge, skills, innovations and practices
f) The importance of and the need to promote regional and global conservation for conservation and
g) The requirement of sustainable investments to conserve biological diversity.

Besides, the CBD recognizes that the indigenous community have close links to their biological resources, which is further affirmed in the paragraph 12 and article 10 (c) (protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements), paragraph 13 (role of women in biodiversity conservation). Further, Article 8 J of the CBD could be of great prospect to the people of Nagaland as it recognizes the importance of indigenous peoples and their knowledge on conservation and sustainable use of biological resources. The key provisions of Article 8 (J) are;

1. The traditional knowledge of Indigenous peoples be respected, preserved and maintained
2. That the use of such knowledge should be promoted for wider application with the approval and involvement of the holders of such knowledge and
3. That they should equitably share in the benefits which arise from the use of their knowledge (Nagoya Protocol).

Today, almost all the developmental activities in Nagaland overlook the above mention key provisions of Article 8 (J). Mining, deforestation, dams and other agents threatens the traditional knowledge and practices of Nagas. They are deprived of their contact with nature, culture and other social activities. People displaced are yet to be rehabilitated.

While acknowledging and appreciating the constant effort of CBD on protection, preservation, respect and equitable sharing of benefits of traditional knowledge and practices of indigenous people, it has its own share of limitations and disadvantages. For instance, the starting phrase of Article 8 (J) which states, "subject to its national legislation" negates the indigenous Naga people decision and participation. The state is given the absolute power and hence there is no assurance of the local people in cultural and biodiversity conservation. This drawback is reflected from the fact that almost all the decisions for constructing dams, power houses, national parks, wildlife sanctuary, factories etc are all made by bureaucrats or Govt. Gazettes only. As such, many of the information's are not disseminated properly to the local people leading to rise in conflict and misunderstandings and ultimately the local people end up being victimized and exploited.

Further, the article does not adequately reflect on the preservation of the social, spiritual and language diversity of Nagas (indigenous peoples) which plays an important role in the conservation of biodiversity. It also lacks in recognizing the significant relationship between Nagas and their Land. The survival of culture, language, religion, forest, biodiversity etc depends on their land. Hence, CBD and other acts and polices should ensure the control of the Nagas over their land to affect the protection of their environment and enhancement of their biodiversity. Again, there is no mechanism to

ensure that the policies are implemented and acted upon, whether at local, national or international levels.

Thus, in this present context, CBD if implemented strongly in the state will rather lead the people to confusion and victimization. Therefore, there is an urgent need to ensure that certain mechanism are adopted along with the CBD guaranteeing that the rights of the indigenous Naga people's rights over their land and bio-resources are not exploited.

The United Nations Declaration of the Rights of Indigenous Peoples (UNDRIP) is now the key defining reference document guiding engagements with Indigenous Peoples. The UNDRIP was initiated in 1982 by a Working Group on Indigenous Population within the UN Economic and Social Council, and UNDRIP was ratified 25 years later by the UN, in 2007. UNDRIP addresses the issues that face historically-marginalized Indigenous Peoples by confirming their rights to self-determination and human rights, with freedom from racial discrimination, forced assimilation and forced relocation, and supporting their freedom to their own decision-making mechanisms, cultural heritage, language, religion, cultural diversity, education, and identity, as well as their rights to resources and land, traditional knowledge, land use planning, and gender equality among the key rights, that nations and others have obligations to recognize and support.

The relationship between Nagas and biodiversity are as old as themselves and any effort to conserve and sustainable use of its components must take into account the consideration between their culture and biological resources. However, modernity and the process of development with sophisticated and wide ranging body of knowledge have

adversely affected this relationship. Today, as a result, not only the genes, species and ecosystem are lost but it is destroying even the social and cultural diversity of the people.

Thus, there is the need to carefully analyze all the existing forest acts, laws and policies before implementing at the grass root level.

Chapter 6

Summary and Conclusion

A summary of the research sightings, recommendations, suggestions and conclusion is presented in this chapter. The research attempted to study and analyze the traditional practices and knowledge in biodiversity conservation in Nagaland from a geographical perspective.

For the Nagas, their ethos of integrating and attachment with the ecology is so strong that most of their folksongs and folklore expresses their love and appreciation for nature. Even in the present days, throughout the year the farmers and people in the village would invoke the blessings of nature or welcome the advent of seasons etc. Their strong perception of the living environment and human being as an inalienable part of the nature has not only helped them understand the nature but to sustainably manage and co-exist harmoniously with the nature for centuries.

Like many of the Indigenous peoples around the world their deep and sophisticated knowledge of biodiversity has given rise to cultural rules for conservation reflected in notion of sacredness and taboos. Their conception of land goes much beyond its material value. It is sacred because it is gift from God and their ancestors have lived and worked on the same land. Therefore, land is to be used and shared by everyone in all fairness. Trees and other vegetation surrounding the villages are meant for community use. They are not destroyed or felled unless they are required for specific purpose. Nagas have rich traditional medicine and healing practices which stand out as one of the most valuable asset for them. It has not only kept their traditional knowledge and healing practices alive but has helped conserve the bounteous medicinal plants and species. Though slash and burn system of agriculture is followed extensively throughout Nagaland, the peoples' priority is always to protect the forest ecology and to regenerate the ecological system for

the coming phases of the cycle. Observance of certain taboos enabled the people to protect and preserve the nature from rampant destruction. It was an unwritten belief that disrespectful and cruelty to nature was disgraceful and brings misfortune to the community.

Over the centuries, Nagas have learned to respect the nature, value the forests, utilize the bio-resources and conserve the biodiversity in a sustainable manner. Their love and respect for the nature forms an integral part in their socio-cultural activities. Nagas way of managing and conserving the biodiversity has proved to be an ideal system for many of the rare and endangered plants and animals of the state and region.

Their deep sense of environmental ethos, beliefs and practices has helped in preserving their bio-resources in various ways. Besides, they have a strong sense of physical and spiritual attachment with the nature, so much so that their socio-cultural and economic life revolves around their nature of which they are an integral part.

At present, Nagas traditional holistic view towards understanding and management of the environment is being seriously challenged by the modern Naga society. The indigenous techniques and practices towards utilization and conservation of biodiversity are fast waning away and are being replaced by modern techniques and strategies.

Thus, based on the research study, the significance, relevance and challenges of traditional practices and various other research findings, suggestions and recommendations for considerations are highlighted below:

6.1 Significance of Naga Traditional Knowledge and Practices in Biodiversity Conservation

As an indigenous group of people, Nagas possess a colossal amount of traditional knowledge and practices that have been orally passed down from one generation to another. Their traditional knowledge and practices are diverse and precise. Everything in nature happens for a reason and with a reason. Thus, it is to be valued and treated with respect. Their deep and sophisticated knowledge has prevailed over centuries and has transcended boundaries. Nagas have always venerated and treasured the forest and in turn the forest has helped the people in pursuit of their everyday wants and needs in the form of food, medicines and recreation. Each and every tribe in Nagaland has their own distinct set of information and knowledge and though they vary slightly from each other, the concept behind every knowledge and practices is almost the same.

The traditional knowledge, innovations, and practices of Nagas are underpinned by spiritual beliefs and customary laws that reinforce communities' identity, culture, and ways of life. They enable the people to live within the natural limits of specific territories, areas, or resources upon which they depend for livelihoods and wellbeing. They are also integral to their languages, spiritual beliefs, and culture, education, health, and nutrition. Through their knowledge, Nagas were able to constantly monitor and determine the intensity and frequency of their use and impact on biodiversity.

Thus, traditional knowledge helps in biodiversity conservation through:

i. **Total protection of certain species:** Such practices vary from avoiding species that are poisonous, medicinal, protection of species at vulnerable stages (during breeding season and pregnancy) and species that have religious and social values.

ii. **Total protection of specific habitats:** Such practices include culturally protected habitats like scared forests, sacred lakes, sacred cliffs etc.

iii. **Protection through temporal restriction:** Traditional seasonal and periodic restrictions on hunting, fishing, cutting of trees etc. contributed largely in biodiversity conservation and protection.

iv. **Multiple species resource management:** Such practices include Kitchen garden and Jhum cultivation, where as many as 20-40 species are cultivated and managed.

v. It helps in maintaining the continuity of man-ecological relationship thereby deriving all the required resources for human needs while allowing the local biodiversity to exist without destroying them.

It is to be noted that not all the traditional practices and belief system were ecologically adaptive (Berkes, 2000), neither were all the traditional knowledge ecologically wise. Nevertheless, the growing interest in traditional knowledge in the recent years is an indication of the need to gain further insights into indigenous techniques and practices from a sustainable ecological perspective. Hence, traditional knowledge that are wise and are of great value to protection and conservation of biodiversity, some of which are discussed in the above chapters, needs to be studied, documented and practiced.

6.2 Role of Naga Women in Biodiversity Conservation

Scientists have discovered that already in the early Stone Age (15,000-9,000 B.C.), women's roles and tasks in hunter-gatherer communities were explicitly linked to biodiversity, with the natural environment in essence determining their status and wellbeing. They are a rich repository of traditional ecological knowledge. Yet, women have always been a neglected group of society in almost every field all over the world.

The 13th paragraph of the preamble of UNCBD states, *"Recognizing also the vital role that women play in the conservation and sustainable use of biological diversity and affirming the need for the full participation of women at all levels of policy-making and implementation for biological diversity conservation"*. Thus, there is a global realization that women play a pivotal role in conserving biodiversity all over the world.

Naga women share a very close relationship with the environment they live in. For many indigenous Naga women, biodiversity forms the cornerstone of their work, their belief system and their basic survival. It is assumed that women discovered the art of life cycle of plant from discarded seeds, therefore women have their own distinctive symbolic relation with nature (Khala, 2012). They themselves form a distinct group within the forest-biodiversity sector. They know that the food security and the welfare of their families strongly depend on preserving and sustaining the surrounding environment. Thus, they have very strong appreciation and knowledge of the value of forests and the agricultural fields.

Naga women contribute to biodiversity conservation through practical indigenous knowledge of agriculture, kitchen gardens, sustainable resource use etc which they alone possess.

Most of the Naga women spend as much time, if not more in forests and agricultural fields than their male counterpart. This can be found through the fact that 65.2 % of females are engaged in agriculture as compared to males accounting 44.4 % (Census, 2011). They can be called the "guardians of biodiversity" and caretakers of most agricultural and livestock resources (NEPED, 2012). Their work ranges from tending the kitchen garden, to sowing and cultivating the agricultural fields and foraging in the nearby forests.

Their knowledge on biodiversity is vast and enormous. For instance, Konyak Naga women say that "Paddy and weeds" are best friends as they depend on each other for biomass production and healthy growth. The uprooted weeds are usually dried and returned to the paddy as mulch and likewise paddy straw is also used as mulch to conserve soil moisture and increase soil fertility. Besides they have distinct knowledge on preservation of different kinds of seeds, sowing of seeds and also about each plant they use at home or in forest and agricultural fields.

Unfortunately, in spite of the rich traditional knowledge they possess, women are often neglected, their views overlooked and have little say in decision making process. Thus, there is an urgent need to address the issue at all levels. Following are some of the steps and challenges for a gender sensitive approach in biodiversity conservation:

1. Need to recognize and acknowledge women's knowledge and participation in biodiversity conservation
2. Need to fully encourage and involve women in decision making process
3. Define their role in biodiversity conservation and document their rich traditional ecological knowledge.
4. Need to accept the fact that women are partners in biodiversity conservation and not laborers.

6.3 Relevance and challenges of Traditional knowledge and Practices in Biodiversity Conservation

For centuries, biodiversity has provided the Nagas a broad array of livelihood options and in return they were able to sustainably maintain the biodiversity of the region mostly through their traditional knowledge, techniques and practices. However of late, there is a drastic change of culture, lifestyles, education and introduction modern scientific activities, which are threatening the very base of traditional knowledge that has helped sustain the region's biodiversity for ages.

Today, due to the changing socio-political scenario, and education, most of the young generations do not know the value of the local biodiversity and their usage in day to day life (NEPED, 2012). The traditional social mechanism that helped in transferring of traditional knowledge from generation to generation based on strong cultural ethics and principles is fast disappearing from the modern Naga society.

Social taboos against hunting certain species are breaking down, system of traditional hunting territories is disappearing, and traditional hunting and fishing methods and practices are declining. Advances in hunting technology, especially the spread of shotguns and wire snares, result in hunting being more destructive to the natural environment.

Further, some of the social, demographic and economic factors that are already adding pressure on the rich traditional knowledge and biodiversity of Nagaland include, waning of Naga culture; Demise of elderly folks who are the original holders of Traditional knowledge; Increase in population density; Intensive Jhum cultivation; Private ownership of forests; Deforestation; Rapid urbanization; Incidence of forest fire; High rate of unemployment and thereby leading to increase in timber business; Plantation of economic trees and other developmental induced activities.

Here, it is to be noted that not all traditional knowledge or indigenous society have necessarily lived in harmony with the natural world neither are all of the traditional practices economically sound. Moreover, many of the environmental problems we face today are of recent origin, so traditional knowledge and practices may not be effective in the new circumstances. However, this traditional knowledge is of paramount significance from *in-situ* biodiversity conservation perspective with continuity over centuries.

In spite of the growing global awareness and recognition that traditional knowledge is important and vital for sustainable biodiversity conservation and climate change, a deep and meaningful appreciation of the indigenous knowledge is yet to be felt and realized by the modern Naga society. Thus, there is a need to understand the internal system of

values of indigenous communities, comprehend their traditional knowledge and practices on resource use and then try to work with them toward achieving the goals of biodiversity conservation and sustainable economic development.

6.4 Loss of Biodiversity: A threat to Naga Culture

The richness of any local culture is a direct reflection of the deep interaction, association and appreciation of the local biodiversity. Disruption of forest ecosystem, results in degeneration of the culture and degradation of biodiversity (Chuahan, 2003).

Culture includes many dimensions and is passed down through generations through direct and indirect teachings and hidden in metaphors and stories in language. In such situation, cultural diversity act as a means of strength for conservation, because culture is the means by which Indigenous peoples have adapted their lifestyles and identity to a myriad of local conditions (Alcorn, 2010). What's more, some of these cultures have developed sustainable methods of existence that can serve as models for modern sustainable development.

Djoghlaf (2008) stated that, "The interrelated nature of biological diversity, traditional knowledge, and language necessitates a comprehensive approach to the conservation of biological diversity. Indigenous languages are treasuries of vast traditional knowledge concerning ecological systems and processes. Indigenous languages hold knowledge about how to protect and sustainably use some of the most vulnerable and biologically diverse ecosystems in the world. Losing linguistic and cultural diversity has been directly linked to losing biological diversity".

Humans are and will continue to be a part of both natural and degraded ecological systems, and their presence must be included in the conservation planning. Conservation efforts that attempt to wall of nature and safeguard it from humans will ultimately fail (Meffe, 1994).

In the wake of material development like construction of Dam's, declaration of biosphere reserves, national parks etc, people are forced to leave their homelands, their best cultivable land, their forest etc inhabited by them for centuries, which has shaped their culture and identity. With the disappearance of indigenous culture all over the world the biodiversity which they conserved for centuries is also disappearing (Chauhan, 2003).

Similar situation is already starting to take place in Nagaland as in the case of DHEP, where villagers have no option but to migrate to urban towns like Wokha, Dimapur and Kohima as they are unable to acess to their ancestral forest, jhumland etc. This diffusion of villagers is leading to loss in their traditional knowledge and practices, their social and cultural values etc.

Naga culture itself is an historical part of the ecological landscape and add other types of diversity such as cultural and language diversity which the earth is rapidly losing. Not caring about biodiversity equates with the willingness to allow one's culture to be diminished now and in the future. However, like most indigenous culture all over the world, Naga culture is also under assault under the impact of modernization and development and they are fast dwindling.

Thus, under the present scenario, we would be hopelessly naïve to imagine that our culture will remain unchanged and unaffected by outside influences. The present modern scientific technology age has tended to disturb the continuity of the traditional Naga

culture and the associated indigenous knowledge. The challenge therefore is to raise awareness of the fundamental inter-linkage between culture and biodiversity among the largest segments of the present generation.

6.5 Research Findings

- The study reveals that, the traditional Naga society have consciously or otherwise through their social and cultural systems have conserve and manage their biodiversity and other environmental resources sustainably since time immemorial. Conscious sustainable practices stemmed from the traditional environmental knowledge and their application in their daily life. While social and cultural practices evolved from the traditional belief systems both of which, were instrumental in shaping the present biodiversity scenario of the State.
- Human perception of the environment is important as it determines its purpose and utilization of the natural resources. It is evident from the study that the Naga people's perception of the environment was "akin and spiritual" before colonization. The colonial period simultaneously followed by the introduction of new religion in the form of Christianity which at its extremity dejected the Naga traditional belief and cultural system terming it as ancient/un-modern/un-human/uncivilized etc thereby replacing it completely by the concept of the new religion, has ultimately affected the entire Naga perception of the environment. As a result, post colonization/Christianity there is a change in utilization and exploitation of the nature and its resources from a sustainable way to non-sustainable method.

- Further, the study reveals that most of the biodiversity rich areas in Nagaland at present are found in villages where people still have strong attachment to their environment with sound traditional belief, techniques and practices in environmental management. Thus, it is evident that traditional knowledge of the Nagas has the potential to contribute significantly in the global endeavor for future biodiversity conservation in the state and the entire region.
- The Naga traditional belief and practice of designating certain forest, land, rivers, trees and animals as sacred, abode of spirits, practice of lycanthropy, seasonal restriction in hunting etc has to a large extend helped in conserving biodiversity in the form of habitat protection, species preservation and managing them sustainably.
- The Nagas demonstrate a sound understanding of their forests, the biodiversity and its resources, both natural and physical. Thus, the loss of forest land (which is evident from the study) is a threat to Naga indigenous forest knowledge and biodiversity as unavailability of the forest and its resources may lead to a decline in the practice of this knowledge.
- The study revealed that the concept of declaring Community Biodiversity Conservation Area (CCA) in Nagaland began as early as the 18th century. This is manifested from the fact that the villagers of Phulonger under Kiphere district declared "Murong Community Conservation Area" in 1818 and the "Yingnyu Shang CCA was declared in 1842 by Youngphang villagers in Longleng district.
- In a Jhum field, the traditional method of soil testing, practice of rituals before selecting the site, the use of bunds to stop soil erosion, keeping the land for

fallow, leaving standing trees, growing alder trees etc indicates that they have a rich repository of knowledge in assessing and maintaining the land and its soil fertility. Thus, the research discloses that, Jhum is not just a "slash and burn" activity as the name indicates but it is done with deep respect, study and analyses of the nature, the land and its fertility.

- While hunting among the Nagas has been in practice since time immemorial for the purpose of bush meat, recreation and to meet their socio-cultural requirements, the findings indicate that there is a wide difference in hunting before and after colonization. The difference can be seen in frequency of hunting; type of hunting tools used; decline in hunting knowledge among the hunters. This has led to a drastic decline in fauna diversity of the state.
- Further, the study revealed the traditional environmental knowledge of the Nagas can act as an important tool in understanding critical social issues such as "land inheritance and clan distribution" among a particular village or tribe which directly or indirectly have a bearing on the biodiversity of the state as most of the land belong to clan and community.
- The study reveals that traditional knowledge coupled with modern ideas and technique can help in speedy regeneration of forest cover and biodiversity in the state. This is evident from Old Jalukie village in Dimapur district, where within a conservation period of 10 years was awarded the Indian Biodiversity award in 2014, owing to the increase in forest cover, flora and fauna.
- The study indicates that modern international/ national acts, laws and policies are not implemented and practiced at grass root levels. Moreover, the local people are

not consented and their opinions neglected in adopting these rules and policies, which are directly or indirectly implemented upon them.

- The study also revealed that development and modernization have a negative impact on the biodiversity and environment of the state. It is because most of the developmental activities are done without proper planning and environmental impact assessment.

6.6 Some pertinent issues for consideration/recommendation

Along with the above discussed issues and suggestions, following are few remedies that needs to be incorporated in future decision making system for successful biodiversity conservation and various developmental programmes in the state:

a) Community Conservation Area's as storehouse of future Biodiversity

In Nagaland, conservation is as old as the people who inhabit the land. Whatever be the reason, Nagas have been conserving their forest and biodiversity since time immemorial. Though the formal system of biodiversity conservation in the form of "Community Conserved Area" (CCA's) can be traced back to the 18^{th} century, informal way of conserving forest and its associated biodiversity is as old as the people themselves.

In ancient times Biodiversity Conservation among the Nagas took place, in the form of sacred forest, scared lakes, sacred plants, sacred cliffs, sacred mountain peaks, restrictions in hunting, restriction in cutting certain trees, restriction in fishing etc. Thus, conservation in Nagaland is not a new phenomenon.

Extensive conservation efforts are found in the state mainly in the form of community conservation areas. Though most of the CCA's are new and yet to be recognized by the government, people have taken a bold and voluntary step in initiating conservation activities through this CCA's. Almost every village in Nagaland has at least one CCA or a traditional sacred forest, managed by the traditional village council, student unions, youth clubs etc.

Realizing the importance of biodiversity, self-imposed restrictions on hunting, extraction of timber and non-timber forest products etc are in force in almost every village in Nagaland. There are around 1000 (approx) CCA's in the state. It is reported that in five districts of Eastern Nagaland viz Tuensang, Mon, Longleng, Phek and Kiphire, there existed 766 CCA's as compared to 458 villages in the year 2007 (NEPED, 2012).

At present, CCA's exist in the form of forest reserves, wildlife reserves, wetland reserves, seasonal or complete ban on hunting etc. For violations, different communities have their own penal systems, mostly in the form of imposing fines ranging from Rs.500-50, 000. Fines vary depending upon the type of species extracted or killed.

The presence of CCA's adhered with strict rules and penal system, has helped in protecting several threatened and endemic species of flora, fauna and other aquatic species. Endemic fauna and avi-fauna such as Blyth's tragopan, Mrs. Hume's pheasant, Grey peacock, clouded leopard, Slow loris and Hoolock gibbon etc have all found their homes in these CCA's all over Nagaland.

Within a span of 2 years after its official declaration, Old Jalukie village in Peren district, which started its conservation activity in 15th June 2012, has been awarded the "Indian

Biodiversity Award-2014", mainly because of the significant increase in forest cover and biodiversity in the village. It is to be noted that, before the official declaration this CCA, the villagers were already protecting and conserving this forest for more than a decade. Hence, there are enough reasons that the CCA's could become the future store house of biodiversity all over the globe.

The conventional governmental strategy of declaring protected areas and reserve forest to conserve biodiversity in recent years, where human beings are prohibited or restricted might not succeed in the long run, given the fact that most of the forest is owned by the community and the people depend on it for their livelihood.

Under such circumstances, biodiversity conservation through traditional CCA's in Nagaland needs to be recognized and encouraged by all sections of the society. The local people idea of restriction on utilization of resources from the CCA's and at the same time making sure that their daily needs are obtained by permitting certain zones or areas for hunting, cutting of trees etc during particular seasons needs to be studied and incorporated in modern acts and policies.

Following are some of the steps needed to strengthen the CCA's in Nagaland:

1. Need to document all the existing CCA's and the management practices in the state.
2. Need to carry out studies on the biodiversity status in all the CCA's.
3. Need to conduct capacity building programmes at grass root level.
4. Need to develop corridors connecting all the CCA's.

5. Need to develop a comprehensive CCA's policy with participation from the local people.

b) Jhum – Rotational Agroforestry as an alternative

Jhum or shifting cultivation is a traditional farming system practiced by the Nagas and other indigenous group of people all around the world for centuries. It is a farming system mired with misunderstanding and seen by various government and developmental agencies as an ancient, anachronistic and destructive practice, summarized in the negative phrase "slash and burn" cultivation. However the irony is, given the fact that 80% of the world's biodiversity is found in indigenous regions where people have been practicing jhum for centuries, why is it considered unhealthy, outdated and harmful for biodiversity and environment. *It might indeed be paradoxical to imagine that the basic philosophy of shifting cultivation has been 'to greate forests and not to destroy forests', for without forests the next jhum cannot be cultivated* (ICIMOD, 2006).

Jhum cultivation has been criticized mostly because of the ever shortening fallow cycle due to increase in population, air pollution caused by jhum burning etc. However, there is a realization among scientists and policy makers today that, while there are clearly examples of negative impacts, jhum actually represent an efficient and appropriate form of agro forestry and contributes more to biodiversity than mono-culture, economic plantations and other governmental afforestation programmes.

Under the given situation, Nagas have been practicing jhum for centuries and have mastered the techniques of jhum and have sustained them for many hundred years. Inspite of its rudimentary nature, it provided them with self sufficient needs while

maintaining the agro biodiversity. Thus, it had lot of positive impacts on the daily life of the Nagas.

Following are some of the positive impacts of Jhum cultivation:

1. Jhum cultivators hold a vast amount of traditional knowledge about their particular landscape, climate, soil quality, forest, animals and plants etc and how to best sustainably use them for their survival.
2. It is the life line of the local people where mixed cropping system (MCS) is practiced with no less than 25-65 varieties of crop, vegetables, fruits etc including firewood and fuel meeting most of the farmer's survival .
3. Naga food delicacy like *Xanthoxylem* and *Am konger* (Banana Mushroom) grow better in Jhum fields.
4. Almost all the cultural festivals of Nagas are related to Jhum cultivation.
5. Study reveals that young and middle age trees absorb more carbon than older trees (above 80 years). Jhum encourages the growth of young trees and forest and hence contribute more in carbon sequestration.

To do away with jhum cultivation will be a disaster as our Naga cultural and social life mostly revolves around Jhum. Hence, effort should be made in making Jhum less destructive by finding ways to increase the jhum cycle thereby adapting to the demanding needs of the modern generation. The alder based jhum practiced by the Angami Nagas should be encouraged and incorporated in jhum practice all over Nagaland. And wherever alder is not possible, plantation of Wild sunflower (*Tithonia dviersifolia*), *Macaranga denticulate*, *Albizzia* spp. etc should be planted during the fallow cycle which

allow the forest to regenerate faster. Besides, efforts should be made to find other ways and means to increase the jhum cycle and to increase the productivity of jhum.

c) Some of the environmental problems being face today have occurred due to the introduction of foreign plants into a given area. They often seem like a good idea but too often, they have proven to be invasive and have wiped out local plants, which are vital for the health of the overall general environment. Therefore the plants which have already evolved in the local environmental conditions are the ones that will be most successful for fast land reclamation and regeneration. In this aspect indigenous plants are vital for a successful. Efforts should be made to promote indigenous crops and plants that have economic values. The state is endowed with many indigenous horticultural crops that are yet to be explored for their economic values such as tomato, Mechinga (*zanthozyllum*), tree bean, Ginger, Local goose berry, local garlic, wild apple, local archive etc. (Annual report, 2013-2014). Apart from proper development of these plants whose economic values are well established, it is necessary to explore and exploit the untapped potentialities of those plants which otherwise may have economic bearings.

Traditional knowledge should be carefully and properly documented. Nagas have a long history of oral tradition. All their belief and practices have been handed down for generations orally. However, with the onset of modernity their knowledge and practices are fast fading away along the demise of senior citizens who are the actual holders of traditional knowledge coupled with the fading of local language among the young generations.

d) While it has been recognized that shifting cultivation is one of the main culprits of tropical deforestation, however with a long fallow cycle it does not cause significant depletion of forests and causes relatively low damage when it takes place in secondary forests. Although jhum cultivation had negative impacts on the forest, it allow for regeneration of secondary forest. While crops are growing, the vegetation is renewing the site for the next cultivation cycle. In addition, a complex system off agro forestry combining food crops and trees could be identified. Alder based cultivation should be encouraged and plantation of soil enriching plants such as wild sunflower should be practiced and encouraged during the fallow period.

e) Traditional knowledge should be incorporated in sustainable development, adaptive management of biodiversity. The indigenous knowledge of the Nagas can be useful in developing reserve management plans and local residents can play important roles on reserve staffs as guards and environmental educators which will also strengthen their role in conservation.

f) Policy decisions should be taken through prior consultation from the people inhabiting the areas, who may help with practical suggestions. Whilst the strategies, acts and laws are made logically, their implementation at the grass root level is very poor. Very often the acts and policies contradict with the local people's decisions or opinions. Besides, the execution of these acts and laws are done most of the time without the concern and knowledge of the indigenous people. Biodiversity conservation strategies and policies needs to be carried out using rules that are locally crafted and socially enforced by the users (Nagas) themselves.

g) Traditional Knowledge and Modern Knowledge should be masked together to achieve a greater desired result in biodiversity conservation and climate change.

h) Development and other modern planning's should be done with proper Environmental, Social and Cultural Impact Assessment.

i) Need to develop corridors connecting all the CCA's in the state. At present there are approximately 900-1000 recognised and non-recognized conservation areas in Nagaland. Almost all this CCA's are individually scattered in different villages. Thus, there is the need to connect all this CCA's through satellite mapping which will enhance the growth of flora and fauna in the state.

j) Nagas cultural integrity must be strengthened. As Indigenous communities Nagas have strong historical continuity and cultural and spiritual heritage that needs to be strengthened supported. Nagas are more determined to preserve, develop, and transmit their ethnic identity and ancestral territories to future generations as the basis of their continued existence as peoples and in accordance with their own cultural patterns, social institutions, and legal systems. Contributions to cultural revitalization (traditional knowledge and spiritual beliefs) can therefore reflect back well on improved conservation efforts.

k) Developmental activities and projects should respect the traditional organizational structure of the Nagas. It is important to maintain the Nagas own institutional arrangements and decision-making processes and avoid the inclination to create new institutional arrangements. Over the long term, this approach will save time and effort,

reinforce community organization and capacity, and foster better achievement of project objectives and sustainability.

l) There is the need to promote full participation of the local in all the developmental projects and decision making process. Further, there is a need to ensure that prior consultation, participation, and consent procedures are designed to be acceptable to the Indigenous Peoples and are culturally appropriate. Local/village people should be given a greater voice in decision making and seeking greater control over the resources upon which their welfare depends. One of the best practices is to establish signed formal agreements between indigenous organizations and the government authorities before the project starts.

m) Further, there should be cooperative governance in conserving biodiversity. If institutional arrangements beyond indigenous institutions are needed, unnecessary complexity should be avoided. Decision making processes through voting tend to create winners and losers, which may result in conflict. Instead, projects that support forums for reaching consensus and avoid voting should be preferred.

n) Equitable sharing of benifits: As per Biological Diversity Act, 2002, it refers to sharing of both monetary and non-monetary benefits arising out of the use of accessed biological resources, their by-products, innovations and practices associated with their use, application and knowledge relating to biodiversity etc. Application of this act practically could benefit the local people financially which might possibly encourage them to preserve and value their traditional knowledge, techniques and practices on biodiversity.

o) Utilize culturally appropriate indicators: What Indigenous Peoples value might not be the same as what conservationists and economists value. It is important to assist indigenous groups in establishing adequate indicators for the projects they implement. There is an incredible opportunity lying ahead to work with Indigenous Peoples toward the protection of their environments in areas of the world very rich in biodiversity. In order to increase this opportunity, key actions need to be taken by all national governments and international organizations and funders.

p) Cooperatively map community conservation areas and buffers such as sacred forests and ait. These mapping activities should include training, provision of equipments, and participatory workshops with all community members so that their hunting places, sacred sites, agricultural plots, etc. are identified and mapped. These exercises will represent a very important empowering tool for Nagas which will facilitate them in future claims of their ancestral lands and will alos help in developing corridors connecting all the CCA's in the state.

The undertaken research ascertains that legislated protected areas alone will not automatically save biodiversity, neither do traditional knowledge alone is not competent enough to safeguard the world's biodiversity specially those that occurs in indigenous lands such as Nagaland. On the other hand, developmental activities in indigenous lands are posing a serious threat to the biodiversity.

In this scenario, a multi faced approach is required where traditional practices of the local people is respected (Article 8.J, UNCBD); the social, cultural, economic and land rights of the communities involved be recognized (UNDRIP); proper Environmental, Social and

Cultural impact assessment of developmental activities; in the policy-decision making system and biodiversity conservation strategies.

Keeping the above core issues of biodiversity conservation, the present day method of biodiversity conservation policies and stratiegies at international, national and local level is illustrated in **Fig 6.1** and a DIPi Model of biodiversity conservation is being suggested in **Fig.6.2** for biodiversity conservation in Nagaland and in regions where indigenous people inhabit.

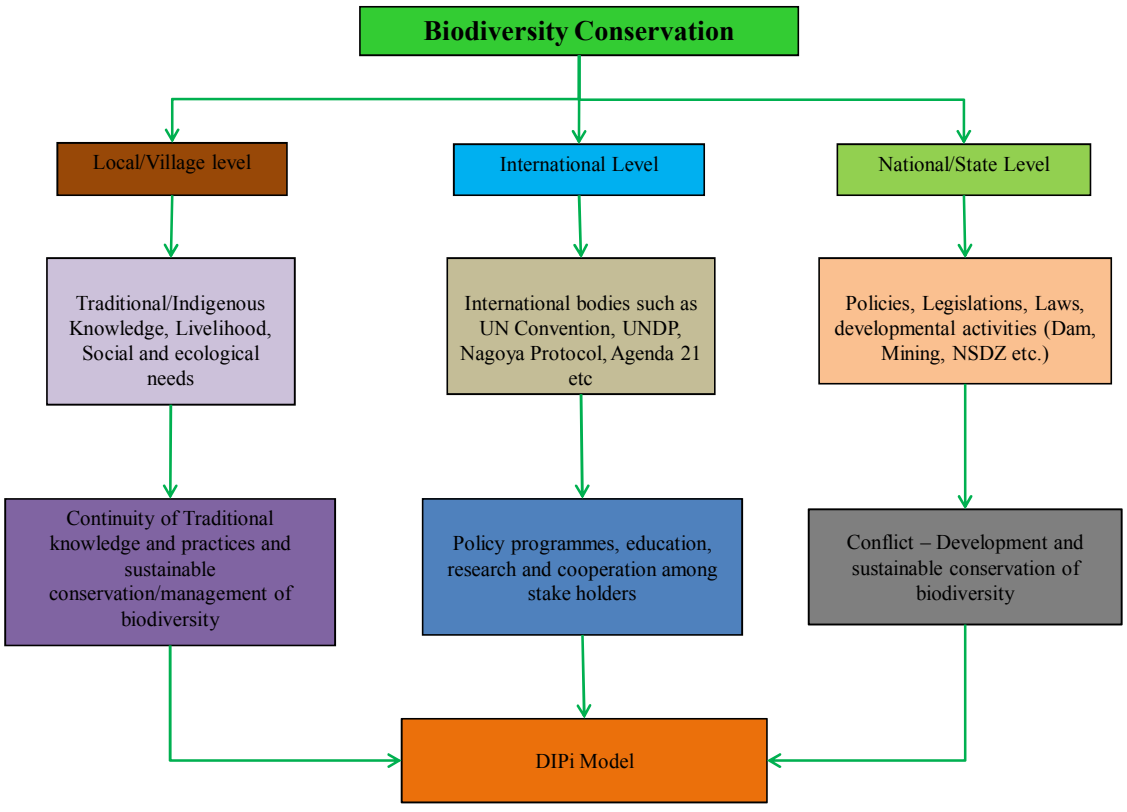


Fig. 6.1 Process of biodiversity conservation in Nagaland.

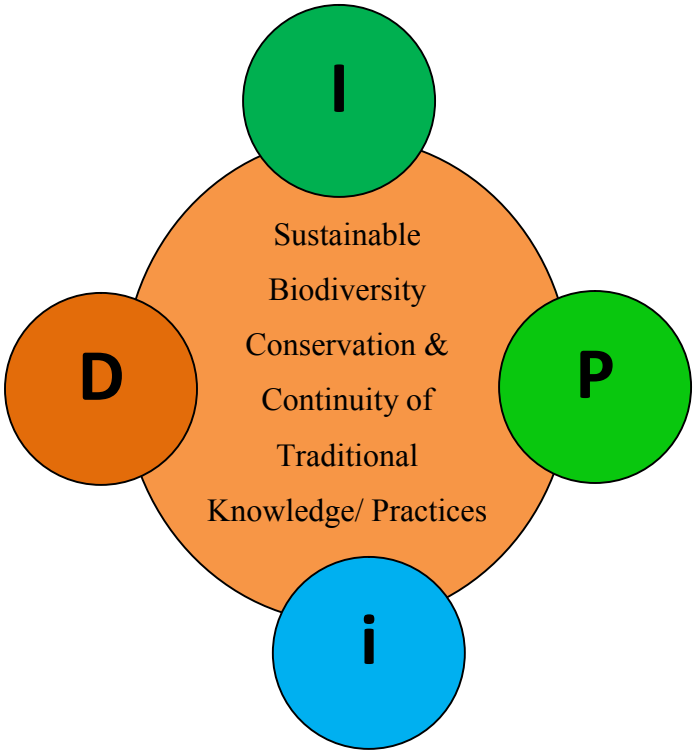


Fig. 6.2 DIPi Model

Where **D** stands for **Documentation**: It includes documentation of rivers, forests, mountains, the traditional knowledge and practices of the people.

I stand for **Incorporation**: It means incorporation of the documented traditional knowledge and practices in the modern frame work syllabus i.e. modern acts/laws/legislation/policies etc of biodiversity conservation.

P stand for **Participation**: It includes participation of local communities/Indigenous peoples in policy-decision making and management of biodiversity conservation. Thereby, start partnership programme such as Joint forest management, CCA's etc for biodiversity conservation with government sponsorship.

Finally **i** signify **Implementation**: It means implementation of two pronged policies i.e., 'bottom up' and 'top down" policies in biodiversity conservation, including translation of the policies in local language or dialect and dissemination of the same at local level.

The implementation of the DIPi model might probably lead to an effective way of conserving biodiversity in the state as well as in regions all over the worldwhere indigenous people dominates.

While the conservationist, environmentalist and policy makers see the forested lands as a medium last resort for biodiversity conservation, to the local people it is their only source of livelihood. Their entire life cycle is defined by their land, forest, water and biodiversity.

Today, most of the acts, laws and legislations have failed to address the issue of the local people's livelihood while focusing on the wider prospect of biodiversity conservation. This has lead to conflict and disputes between the local people (who are the original holders of the land and its biodiversity) and various agents encouraging biodiversity conservation.

Thus, the present research aimed to study and analyze biodiversity conservation in Nagaland beyond the economic and conservation values and also intents to study the relationship between man and environment from a Naga perspective. Further, it dwells to study the Naga perception of biodiversity which has contributed singnificantly to the conservation of biodiversity in the state. A critical analysis of the Naga traditional practices in biodiversity conservation and the impact of modern developmental activities on the biodiversity of the state is also highlited.

While proof of conservation success is ultimately biological, conservation itself is a social and political process, not a biological process. An assessment of conservation requires therefore an assessment of social and political institutions that contribute to, or threaten, conservation (Alcorn, 1994). Thus, one of the main social aspects related to biodiversity is, undoubtedly, the case of the world's Indigenous peoples (Toledo, 2013).

With the high increase in the extinction rate of anthropogenic species with those that are culturally and socially symbolic to human beings, there is a realization that measures are urgently required to protect the "life supporting system" of our planet i.e. Biodiversity. Thus, an overwhelming support to promote biodiversity conservation is evident today in the global realm. This evidence is reflected in the steps and measures along with financial support provided by various organizations and institutions for the purpose of research and establishment of protected areas to conserve nature from global to local level.

At present, there are nearly 10,000 nationally protected areas (parks and other reserves) in more than 160 countries, covering some 650 million of hectares, which represents over 5 percent of earth's land surface. Many of the areas that have been established as protected areas and many of those that are suitable for future addition to the protected area network are the homelands of indigenous peoples. On the other hand, large tracts of the territories under indigenous control, estimated in between 12 and 20 per cent of the earth's surface, are in the scope of conservationists as future reserves

However, while establishments of protected parks, reserved forests, community conservation areas etc for biodiversity conservation have become popular worldwide, greater efforts and steps is required beyond the declaration of protected areas. Besides,

the social, cultural and political issues pertaining to areas and the people associated where protection areas are declared are still pertinent and remain an issue of great concern. The question of who should make the decisions for biodiversity conservation or, where biodiversity conservation should occur, require sufficient planning and research to determine what will and will not work.

Sadly today, most of the conservation policies and strategies have failed miserably to address the above mentioned issues. The traditional practices of the local people, the government initiated developmental activities and programmes and the various international conventions and agendas are all more or les functioning in an independent manner whilst working for biodiversity conservation.

Today, Indigenous Peoples are taking more actions against damaging development and industries that are threatening their lands and waters, at great personal risk. Their effective participation in biodiversity conservation programs as experts in protecting and managing biodiversity and natural resources would result in more comprehensive and cost effective conservation and management of biodiversity worldwide.

Indigenous Peoples are carriers of ancestral knowledge and wisdom about their biodiversity. They are responsible for the preservation and maintenance of traditional knowledge and practices that are highly relevant for the sustainable use of biodiversity in their region. Thus, we must equally recognize that indigenous cultures have the right to control their destiny.

Since time immemorial, Nagas had always maintained a close relationship with the biodiversity. They were never a threat to the pristine environment in which they live;

rather they themselves have been an integral part of the environment since time immemorial. The development and upkeep of the village life and the care for environment is always within the purview of their traditional values, ethos and customs that was handed down for generation.

In the understanding of the Nagas, biodiversity is much more than an economic resource or of academic interest, rather they are life itself and have an integral and spiritual value. It is understood as the source and provider of livelihood. Hence, it has to be respected, preserved and taken care with utmost sincerity and dedication. The plants, animals, fishes, birds, hills, streams, rivers, Lakes, stones and boulders etc have always served them faithfully in their time of needs for ages.

In recent years the onslaught on the forest and its resources for commercial uses and other developmental-induced activities has caused immense pressure and depletion making the biodiversity of the region critically fragile. The existing situation has been exacerbated by the dominant state views and policies imposed upon the tribal and Indigenous Peoples which is completely oblivious of the sacred law of the nature traditionally practiced by the Nagas for ages. Concentrated focus on the material development has not only disturbed their indigenous approach to living and life but threatens to severe the age-old human and environmental co-existence pattern.

However, against the backdrop of the present indiscriminate use of biological resources through the economic expansion and technological development on one hand, and the popular dominant view of the modern conservation system on the other hand, the

traditional and indigenous knowledge of the people struggles to play a crucial role in the conservation and management of biodiversity in Nagaland.

Biodiversity policies of the state would therefore, do well to take account of the invaluable knowledge of the people which helped sustain the ecology for centuries and not discard them as irrelevant while framing any modern conservation policies. Even in the contemporary technological age the traditional Indigenous resource management practiced by the Nagas can well serve as a catalyst for effective management and conservation of biodiversity in a situation where modern science fails to provide answer to the most crucial issue of conserving the global biological diversity that directly concerns future of humanity.

The research will act as a means of information dissemination among the people of Nagaland thus making them realize the importance of Naga traditional knowledge in biodiversity conservation which until now was not recognized. It can act as an insight into what conservation practitioners can do for adopting future conservation strategies within the state and also at national and international level where indigenous people with similar physical topography exist. Besides, it could also be beneficial in incorporating indigenous environmental knowledge into the formal school curriculum. Moreover, the study will remain a source of inspiration particularly for the younger generations who are intended to take up the research in this field of study.

The present research work is an attempt to broadly analyse the traditional knowledge and practices of biodiversity conservation in Nagaland from geographical perspective. There are many thrust areas that need to be covered and studied from multi dimensional school

of sciences but do not come within the perview of the present research work. A detail analyzes on the Naga traditional system of biodiversity conservation has been conducted and presented in this work leaving scope for other multi dimensional studies for a comprehensive study in the field of biodiversity conservation.

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Appendix

DEPARTMENT OF GEOGRAPHY NAGALAND UNIVERSITY, LUMAMI

I am a research scholar from the department of Geography, Nagaland University, Lumami.

I am doing research on the topic **"BIODIVERSITY CONSERVATION THROUGH TRADITIONAL PRACTICES IN NAGALAND: A GEOGRAPHICAL ANALYSIS."**

My research demand intensive field studies and collection of first hand information (through, discussions, interviews) and local data available in order to assess the accurate situation of the above given research.

I would be highly obliged if you could help me in answering the prepared questionnaires. Your truthful and honest answers and opinions will be highly valuable for the above mentioned research and will be duly acknowledged.

Name: _____

Research Scholar
Department of Geography
Nagaland University
Lumami.

Research Topic: - **"Biodiversity Conservation through Traditional Practices in Nagaland: A Geographical Analysis"**

Name:_____

F/Name/H/Name:_____

Sex:_____

Age:_____

Qualification:_____

Profession:_____

Present Address:_____

_____

Permanent Address:_____

_____

Part – 1

1. Name of the village/town: _____
2. Total geographical area of the village/Town : _____
3. Total area under settlement: _____
4. Total area under cultivation: _____
5. Major type of Agriculture:
   a) Jhum: ☐
   b) Terrace: ☐
   c) Orchard: ☐
   d) Any other: ☐
6. Total area under forest (Virgin forest/Protected forest/Conserved forest): _____
7. Types of vegetation: _____
8. Types of birds and animals: _____
   _____
9. Types of plants and trees commonly available: _____
   _____
10. Types of fish and other living creature available in the rivers, lakes in your village/area:
    _____
    _____

Part –II

1. What is the total population of your village/town?_____
2. Total number of household: _____
   a) Male :_____
   b) Female:_____
3. Total number of schools:_____
   a) Primary: _____
   b) High school:_____
   c) Any other: _____
   _____
4. Any medical facility in the village/town: Yes ☐ No ☐
   if yes, name:_____
   _____
5. Any government developmental activities happening in your village? Yes ☐ ☐
   No
   If yes, Please state the nature of work/project:_____
   _____
6. What is the distance of your village/town from the district headquarter or nearest town?
   _____
7. What is the major source of livelihood:
   a) Cultivation: ☐
   b) Cattle rearing: ☐
   c) Government/Private service: ☐
   d) Any other _____

Part – III

1. What do you understand by "Biodiversity"? _____

   _____

2. What do you understand by "conservation"? _____

   _____

3. What do you understand by traditional knowledge practices? _____

   _____

4. To what extend is traditional practices carried out at present: _____

   _____

5. What is a forest to you? _____

   _____

6. Do you go to forest? Yes ☐ No ☐ If yes, for what purpose?
   a) Fire wood collection: ☐
   b) Hunting: ☐
   c) Timber: ☐
   d) Collection of vegetables/medicinal plants etc. ☐
   e) Any other: _____

      _____

7. What is the major land use pattern in your village/town?
   a) Agriculture ☐
   b) Settlement ☐
   c) Forest ☐
   d) Plantation ☐
   e) Any other _____

8. Have you attended any Environmental awareness programme? If yes, state briefly.

_____

_____

9. Do you think there is any relationship between Human and Biodiversity? If yes, in what way? _____

_____

10. Are you involved in any of the activities related to Environment/Biodiversity conservation? _____

_____

11. Do you see any change in the biodiversity and environment in your village/town?
    a) Weather: _____
    b) Cropping pattern: _____
    c) Nature of flowering and fruiting: _____
    d) Trees, animals, insects etc.: _____
    e) Any others: _____

12. Do what extend do you see the decline of flora and fauna in your village/area?

_____

_____

13. Has the change in Biodiversity and Environment affected you in any way? If yes, please state briefly.

_____

_____

14. What do you think is the major factor that affects the changes and decline of environment in your village/ area (tick wherever necessary).
    a) Increase in population ☐
    ☐

b) Shifting cultivation
c) Forest fire ☐
d) Developmental activities ☐
e) Commercialization of forest ☐
f) Wrong government policies ☐
g) Any others: please state briefly _____

_____

15. What do you think of the present status of biodiversity in your village/town?

_____

_____

16. To what extend to you depend on biodiversity/environment?

_____

_____

17. Do you think conservation of biodiversity would hamper development and processes? If yes, please state reasons.

_____

_____

18. Do you think Jhumming is responsible for the destruction of biodiversity? If yes, in what way? What alternative do you suggest? _____

_____

19. Do you think our present government polices is adequate enough to safe guard and conserve biodiversity in Nagaland?

_____

20. Do you think traditional knowledge and practices can effectively conserve Biodiversity in your area? If yes, how?

_____

_____

21. What do you think would be the best strategy to safe guard the biodiversity in Nagaland in general?
    a) Traditional way ☐
    b) Government policies ☐
    c) Education and Environmental awareness. ☐
    d) Any other, please suggest _____

22. What is the traditional approach of biodiversity conservation practiced by you or your community? Please state the merits and demerits:

    _____

    _____

23. Do you find any conflict between traditional and modern practices in your village/town?

    _____

    _____

24. Any suggestions/opinions/remarks.

    _____

    _____