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 planet’s 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 alia, 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 world’s 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 threatens 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 of biodiversity. Technological interventions and human activities have not only changed the setup 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 tasks 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 identifying 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 Palaeartic 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 earth’s 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 traditional 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 nagaluneneana*, *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 watti*, *Rhododendron 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 or 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).

![Respondents analysis chart]

**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

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>District</th>
<th>Name of Village</th>
<th>Latitude and Longitude</th>
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<tbody>
<tr>
<td>1</td>
<td>Zunheboto</td>
<td>1. Asukhomi</td>
<td>26°04’11.74”’N – 94°31’12.98”’E</td>
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<td></td>
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<td>3. Pangsha</td>
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<td>4. Yangpi</td>
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<td>25°41’38.50’’N – 93°32’24.52’’E</td>
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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 which 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 Culture”, 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.