ENVIRONMENTAL DEGRADATION IN SIKKIM WITH SPECIAL REFERENCE TO TOURISM

THESIS SUBMITTED FOR THE AWARD OF
THE DEGREE OF DOCTOR OF PHILOSOPHY (SCIENCE)

BY

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TO WHOM IT MAY CONCERNED

I am pleased to certify that Shri A. B. Chhetri (Karki) is known to me for the last five years and he is submitting his Ph. D. Thesis entitled **Environmental Degradation in Sikkim – With Special Reference to Tourism** for his Ph. D.degree in Geography and Applied Geography in this University. He prepared the Thesis on the basis of primary data collected from field visits and secondary data collected from different offices. He is methodical and sincere in his work. It is his original work and supervised by me.

I wish his success in his future life..

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PREFACE

Environment is a complex term, which broadly refers to milieu but in geographical viewpoint environment consists of abiotic or physical elements such as land, water, air and biotic components like plants and animals. The man and his several functions, organization, institutions and various components that support the lifeform in an ecosystem are known as "Biosphere". In dynamic evolving earth system, both physical and biological processes govern natural environmental system in a particular place. Different types of physical, chemical and biological processes are involved regularly in creation, maintenance and destruction of surface materials of the earth's crust. These earth materials such as minerals, rocks, soils, water etc are constantly changing their properties, shifting from one place to another and even destroyed by geological cycle. While passing through the several alleyways, these materials remain initially uncontaminated and useful for men. Life of humans and constituents of the atmosphere, lithosphere and oceanic environment has been subject to alteration since the very beginning of emergence of life on the planet earth. Since the dawn of industrial revolution in 1860's man has emerged as the most powerful polluter in environmental process spearheaded by modern technologies capable of modifying the environment to a great extent. Man is indeed the most intelligent and powerful agent and is capable of not only affecting the environment but also able to alter the basic composition of the environment. Hence, increase in human population in the present century has put enormous pressure on earth resulting in accelerated rate of exploitation of natural resources. Therefore it is clear that environmental degradation refers to the deterioration of physical and social components brought in by the biological process headed by human activities. In the word of Singh (1991), environmental degradation simply means overall lowering of environmental qualities because of adverse changes brought about by human activities in the basic structure of the components of the environment to such an extent that these adverse changes

adversely affect all biological communities in general and human society in particular.

Human ecological relationship is a matter of study of the continuous evolutionary process of the universe, nature and earth; to evolve an ecological mind to build an ecological essence and to guide random human action. It visualizes the earth as 'sanctuary' and discovers our role as 'custodians'. It is an attempt to rethink the place of man and the place of environment knowledge in the universe This relationship presents a comprehensive world-view based on a deep insight into the spiritual nature of our universe, which in other words is termed as ecological consciousness. This can be cultivated through education by the process of transmutation of human mode of thinking, perceiving and valuing. The ecological consciousness only can secure a healthy environment, peace on earth and spiritual bliss among the individual.

Prevailing myths about our relationship with mother earth are now obsolete and destructive. Already the four henchmen of ecological apocalypse loom in the distance namely toxic waste, the greenhouse effect, the depletion of the ozone layer and mass extinction of biological species, including indigenous tribes considered primitive and uncivilized. We are careening to a path, which leads to extension. Carelessly and ruthlessly, human beings have assaulted the environment and pillaged earth. They have become the greatest threat to global life-support systems because of their greed, shortsightedness or simple stupidity. The views of Roma (2002) in this context is acceptable as culture is defined in a number of ways, one school of thought says, 'Culture includes all the major social components that bind men together in a society'. According to Tylor, 'Culture is a complex mixture of knowledge, belief, art, morals, laws, customs and other capabilities acquired by men as a member of society.

The former prime minister of India Mrs. Gandhi pioneered in declaring poverty as the greatest polluter and its banishment through national and international debate and discussion. She stressed that unless poverty is addressed it will be a futile exercise to discuss about protecting the planet earth from environmental disaster.

Due to overuse and abuse the life-support system of the planet earth is gradually endangered. The change in environment is attributed to supremacy and monopoly of human interference over nature The deteriorating state of global environment and increasing human encroachment on resources have broken the sustainability of earth's life-support base. In 1972, Smith called degraded environments as "endangered environments". The degradation places the environments in endangered category by posing threat to biosphere as a whole. As mentioned by Husain, (1996) the sick ecosystem is in danger for survival of men, plants, and animals.

In 1999,the Chief Minister of Sikkim while receiving the Greenest Chief Minister of India award stated, "Even in Sikkim today we face growing problem, which do not really require any sensitive measuring instruments to see. Our Zemu glacier has depleted in size by more than 3-4 Kms. The water in Tista is flowing at an all time low. We have had the warmest winter in living memory, these all are the indications of things going wrong". The total rainfall between October 1998 and March 1999 was 93.94 percent less than the rainfall in the last 25 years. It is estimated that 60 percent of the state cardamom plantations were lost in this (Lama, 2001) unprecedented dry spell. There are examples of saying no to tourism due to supremacy of negative impact over positive impacts; worst case is underlined as a prayer for tourists. In such case, timely planning and intervention may avoid following situation.

According to the London Times the Greek Orthodox Church issued a new prayer asking the Lord to protect the Greek people from tourists. The prayer, which to be said by monk and nuns every morning goes like this:

"lord Jesus Christ, son of god, have mercy on the cities, the islands, the villages of our orthodox fatherland, as well as the holy monasteries, which are scourged by the worldly touristic wave. "Grace us with a solution to this dramatic problem and protect our brethren who are sorely tied by the modernistic sprit of these contemporary western invaders."

If the monks and nuns are beseeching the Lord with anti tourist prayers, it is fair that the tourists are given equal chance. They may recite the following prayer in the morning and at night: "Heavenly father, look down on us, your

humble obedient tourist servants, who are doomed to travel this earth, taking photographs, mailing postcards, buying souvenir, and walking about in drip-dry underwear. "We beseech you. O, Lord, to see that our plane is not hijacked, our luggage is not lost, and our overweight baggage for unnoticed.

"Protect us from surely and unscrupulous taxi drivers, avaricious porters, and unlicensed English-speaking guides. "Give us this day divine guidance in the selection of our rooms made up, and water running from the faucets.

"We pray that the telephones work and that the operators speak our tongue and that there is no mail waiting from our children who would force us to cancel the rest of our trip.

"Leads us, dear Lord, to good, inexpensive restaurants where the food is superb, the waiters friendly, and the wine included in the price of the meal.

"Give us the wisdom to tip correctly in currencies we do not understand. Forgive us for undertipping out of ignorance and overtipping out of fear. Make the native love us for what we are and not for what we can contribute to their worldly goods.

"Grant us the strength to visit the museums, the cathedrals, the palaces, and the castles listed as 'musts' in the guidebooks. And if perchance we skip a historic monument to take a nap after lunch, have mercy on us, for our flesh is week."

(This part of the prayer is for husbands.)

"Dear God, keep our wives from shopping sprees and protect them from 'bargains' they do not need or cannot afford. Lead them not into temptation, for they know not what they do."

Save them for making fools of themselves in cafes and nightclubs, above all, please do not forgive them their trespasses, for they know exactly what they do.

"(Together) And when our voyage is over and we return to our loved ones, grant us the favour of finding someone who will look at our homes movies and listen to our stories, so our lives as tourists will not have been in vain.

"This we ask you in the name of Conrad Hilton, Thomas Cook, and the American Express (Pranseth, 1997) Amen"

Keeping in mind the rapid growth of tourism followed by urbanization and developmental activities, serious threat to environment is being felt hence similar study area has been selected for the present study. Sikkim has ample potentials for eco-tourism development with its rich nature, culture and adventure.

In chapter first, geographical and historical background is of the study area being briefed followed by population dynamics and socioeconomic characteristics in second chapter. The third chapter details out the major tourist destinations in Sikkim. In chapter four various agents involved in environmental degradation has been discussed followed by impact analysis of tourism on society, culture, economy and environment in fifth chapter. Based on all discussion, an attempt has been made in chapter six to outline eco-tourism prospects for the state of Sikkim. Finally, recommendation and summary has been drawn on the basis of findings in chapter seventh of the thesis. The entire work is being supported by bibliography, tables, figures, and maps as per the requirement.

Over the globe, international organization and agencies initiated innumerable projects towards highlighting environment degradation and its remedies. All researchers, environmentalists, scientists, thinkers, writers and eco travelers did write and submit reports on various aspects of environment degradation but Sikkim remained untouched in these studies. It was only JD Hooker in 1849 who surveyed the area extensively and researchers have been referring the same diary till date. The world is united to fight against the negative impact of tourism on environment, culture and society. However Sikkim remains away from all such activities. Hence present study is a pioneer in highlighting major issues on environment and tourism in the mountain land of Sikkim.

A.B. CHHETRI (Karki)

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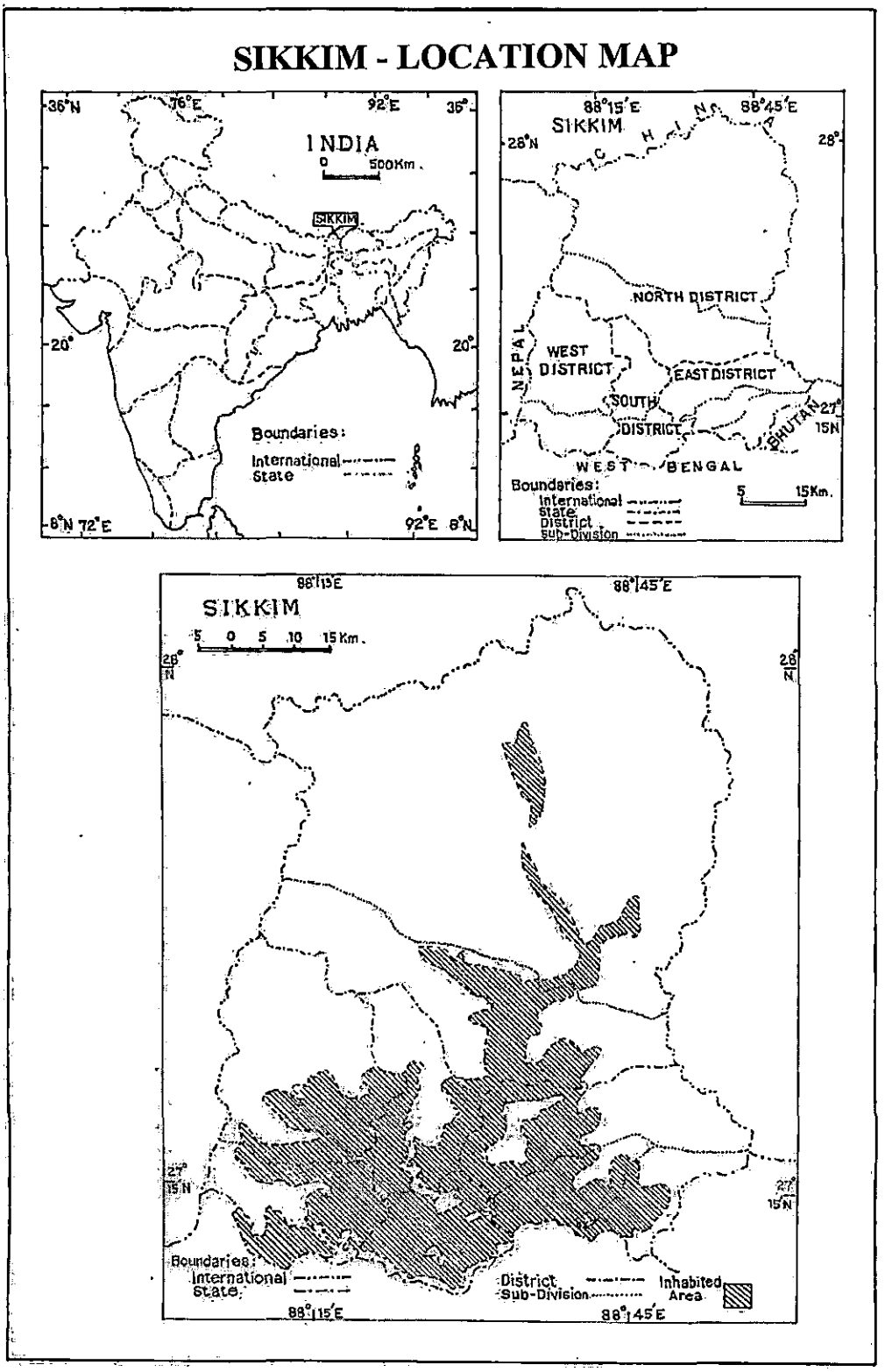
INTRODUCTION

STUDY AREA-AN OVERVIEW

Sikkim, a small vertical state is griddled between 27°04'46" and 28°07'48" North latitude and 88°58" and 88°55'25" East longitude with a total geographical area of 7096 sq km. The third highest mountain peak Khangchendzonga forms a major part of Sikkim. The glaciers in the Kanchendzonga belt are the main sources of water, which flows through river Tista and Rangit. The study area is bounded by Nepal in the west, parts of Bhutan and the Chumbi Valley of the Tibetan Autonomous Region of the People's Republic of China in the East, Darjeeling Gorkha Hill Council of West Bengal in the South. and the Tibetan Plateau of the Tibetan Autonomous Region of the People's Republic of China, in the north (Map 01) It extends 114 km from north to south and nearly 64 km from east to west with the altitude ranging from 300 m to 8598 m. The total of 447 revenue blocks (villages) accommodate total population of 5,40,493 (2001 census). The society is composed of three dominant ethnic groups mainly the Lepchas, the Bhutias and the Nepalese. The lingua-franca of the state is Nepali and it is included in the VIII schedule of the Constitution of India. At the state level, however there are seven other languages recognized by the Government of Sikkim. They are Bhutia, Lepcha, Limbu, Rai, Newari, Gurung, and Tamang.

Sikkim was a kingdom till the (Amendment) act of the Indian constitution was passed in 1974.Various developmental works were carried out as per the guidelines after it gained the status of an associate state of India. Of the total population, 53% are males and 47% are females. As per the census of 2001,sex ratio was 875 with decadal population growth rate of 32.98% during the year 1991-2001. The density of population was recorded at 76 persons per km^2 The state is administered from four districts namely, the North, South, East and West and nine sub-divisions. Each district has its headquarter with the state capital at Gangtok.

Fig. 01 Location of Study Area



Human Development Index (HDI) of Sikkim was 0.532 in 1998 lower than all India HDI of 0.563. However both per capita income and the HDI value fail to capture the true vulnerability of the people, the insecurity of the population and the challenges for ensuring sustainable human development. Despite the relatively high levels of per capita income the proportion of population living below poverty line has gone up from 36% in 1987-88 to 41% in 1993-94 Sikkim has diverse cultural, natural, social, environmental, political, historical background beautifully nestled in the slopes, valleys and mountain topography.

There is however a large disparity in the prevalence of income between rural and urban areas. In 1993-94, for instance, only 8% of the urban population lived below poverty line. The corresponding value for rural areas was more than five times (45%) than urban areas. The state remains extremely dependent on agriculture, which for instance accounts for nearly 40% of gross domestic product at current prices. In 1991, 65.6% of the main workers were dependent on agriculture, either as cultivators or as agricultural (Lama, 2001) labourers.

The occupational structure shows domination of primary occupation because 70% of its population is engaged in agriculture. According to 2001 census, 48.72% population comprised of workers and the remaining 51.28% were categorized as non-workers. The data revealed that cultivators shared 49.9%, agricultural laborers comprised of 6.4%, workers in household industry constituted 1.2% and other category workers contributed for 42.4% to total workers. Due to rapid development of infrastructure, per capita availability of different types of land has been sharply declining, owing to land heritance, fragmentation of land holding is prevalent in the state.

The economic activity especially livestock farming showed an increase of 66% in livestock during 1977 -1992; cattle population increased by 27% and Yak by 34% respectively. It is estimated that 22% of the area in Sikkim is available for fodder production and pasture.

There has been considerable increase of domestic and foreign tourists. The state is recognized as eco-tourism capital of India. With the mass

awareness and implementation of stringent policy of the Government, natural, cultural and adventure tourism are booming in the State. Steps are taken to promote village tourism with a view to percolate income towards the remote and inaccessible areas. Roadways dominate the transportation system; National Highway 31 is the lifeline of Sikkim. The biodiversity of Sikkim include 150 species of mammals, 550 species of birds, 650 species of butterflies and moths, 33 species of reptiles, 16 species of amphibians, 48 species of fishes, 4500 species of flowering plants, 36 species of rhododendrons, 9 species of conifers, 450 species of trees, 480 species of orchids, 362 species of ferns and allies and 175 species of wild edible plants. Besides, State reserves 19 percent species of mammals, 11 species of birds and 65 species of plants are categorized as threatened and endangered. Therefore conservation ethics needs to be inflicted into the minds of planners, managers and Government and non- Governmental agencies. The biotic and abiotic resources are found in the high altitude mountain ranges; hence tapping these resources need super technology. The total hydropower potential is estimated to over 8000 MW from two giant rivers namely Tista and Rangit.

According to Webster new word dictionary' environment means " all the conditions, circumstances, and influences surrounding and affecting the development of an organism or group of organisms". An environmentalist is a person working to solve environmental problems, such as air and water pollution the careless use of natural resources, uncontrolled pollution growth etc"

Ever since homosapiens set their mortal feet on this terrestrial globe an attempt at exploring natural resources for the benefit of human race is going on and there will be no end to this process (Sankaran, 1999) the mother nature is bountiful in accommodating all aspects of economic activities by offering free gift of nature, but the demand for food, fiber, fodder, firewood, timber, bamboo, cane, medicinal herbs, is greater than their regeneration and renewal able capacity.

The mother gave us birth, nourished and saved us, fulfilled our demand and taught the lesson of need and not greed.

The mother earth is a metaphor, like mother she nurtures us and undergoes all the pain and agony to give as utmost comfort, mother earth is also indomitably elastic, and it adjusts with many changes around her like climate, soil, vegetation and natural calamities to maintain equilibrium in an ecosystem.

Life on 'planet earth' exists in a delicate balance with a system of interdependency among plants, animals, insects and the environment in which they live. The planet supports an infinite variety of ecosystems, each of which is directly or indirectly dependent upon other organism for survival. If a single habitat is destroyed or a single species becomes extinct, everyone on the planet is directly affected. An environmentalist therefore must be broader to include unborn generation before any advance decision on environment is taken.

The resources like water, forest, soil etc are free gift of nature but constant human tempering and encroachment to ecosystem for the last million of years made it scarce and short in supply. Only the demand of resource became renewal but resource became non-renewal. The predicament of environmental degradation rests with unlimited human greed, colonial exploitation and competitions to amass material wealth to be branded as wealthy and rich individual. By raping mother earth, the underdeveloped nations are trying to be labeled as developing nations and developing nations are also in the race of exploiting nature to be labeled as developed nations. This illogic and immaterial sense of competition has led to disparity, despair, deprivation, disease, death, and disaster resulting in untimely death of planet earth.

Mounting menace of green house effect, ozone depletion, sea level rising, glacial receding, temperature rising, El Nino and cyclone etc are the gift of environmental degradation.

During 1960's environment degradation became a catch phrase and awareness programmed penetrated towards district and grassroots levels.

After Earth Summit 1992, and Brundtland commission report of 1987, major strategies and policies were adopted to combat further deterioration. The concept of development is replaced by destruction. In the process of human civilization, human being initially clear forest for civilization. With the vigorous use of soil, they pollute the land and apply fertilizer and chemicals to maintain loss of soil nutrients. As a result, insect and pesticides destroy crops and seeds and human being as well. By killing the insects and rats, whole trees and jungle were murdered mercilessly. The Earth is badly wounded she needs rest and guard to strengthen and protect her. After industrialization, urbanization and population explosion, tourism revolution is booming across the length and breadth of the continents. It is reported that Onglokthang glacier had retreated by about 500 meters and Rathong Chu glacier by 600 meters. This may lead to devastating floods and ultimate dryness in river Tista (Down to Earth, 1999& Lama 2001)

In North Sikkim the phenomenon of glacial lake outburst flood on 26th September 2005 took lives of four mountaineers from Punjab Police. It happened while attempting to scale the 22,532 feet Chomo Yummo Peak in North Sikkim. (Sikkim Express, 28th Sept 2005) The torrential rain of 24th September 2005 took nearly 15 lives and left 174 families homeless in various places in Sikkim. All the roads were blocked due to landslide everywhere in Sikkim.(personal visit, 2005)In this natural disaster, not only the lives of animal and human were lost but massive loss of flora ,fauna and soil were transported by river Tista and its tributaries.

New York. Sept 28 writes, caught in a vicious circle of global warming, the polar ice pack has shrunk by 30 percent since 1978 and melting is speeding up causing the warmest summer in 400 years, an yet to be realized. (Sikkim Express, 29 Sept 2005). At a recent Lhasa declaration mountain expert sat on the roof of world and agreed that millions face glacial catastrophe. Average temperature across the mountains is increasing at 0.06 degrees a year. Glacial lakes that used to be small ponds 20 years ago are now 5 sq km and large. In Himalayan tsunami it reports that glacial melt is underway and the signs are alarming. Scientists revealed that there has been

a tenfold jump in such catastrophes in the past two decades\ as a result of global warming. A report in Nature said, future disasters around the Himalayas will include floods, droughts, land erosion, biodiversity loss and change in rainfall and the monsoon. There has been retreat of glacier for 5 kms since Tenzing and Hillary's assent to the Everest. According to Nature, temperature in the region have increased by more than 1^0 C recently and are ser to rise by a further 1.2^0 C by 2050,and by 3^0 C by the end of the century. This heating has already caused 24 of Bhutan's glacial lakes to reach 'potentially dangerous' status. An example of Luggye Tsho in Bhutan which burst its bank in 1994, sweeping 10 million cubic meters of water down the mountain. It struck Panuka, 50 miles away, killing 21 people. Now a nearby lake, below the Thorthormi glacier, is in imminent danger of bursting that could release 50 million cubic metres of water, a flood reaching to northern India 150 miles downstream. Eventually, the Himalayan glaciers will shrink so much their melt water will dry up, say scientists. A Greenpeace report last month suggested that the region is already experiencing serious loss of vegetation. The director ICIMOD said "we must make information travel faster than flashfloods."(Now newspaper dated 13-12-2005)

TOURISM –A CONCEPT

Tourism is a dynamic subject, expands like a parachute, covering all aspects of Geography, Environment, Botany, Zoology, Geology, Meteorology, Economics, History, Sociology etc. Similarly the definition of tourism has changed over time. It stands today as the largest smokeless industry in the world. This is a service-oriented industry with massive potentials to generate employment and income. According to Hunzikar, Krapt and International Association of Scientific Experts in tourism (AIEST) "Tourism is the sum total of phenomena and relationships arising from the travel and stay of non-residents, in so as they do not lead to permanent resident and are not connected with any earning activity"(Burkart ,1974). However, staying with friends and relatives and travel for less than 24 hours do not fall under the definition of tourism.

Travel from the earliest time has held a fascination for mankind, the phenomena of exploring new places and seeks a change is an established and dynamic concept of the glamorous world of travel. The world has shrunk so much that the movement between the continents is the matter of hours only. The tourism industry is highly labor intensive, which offers wide range of employment opportunities in multi-faceted tourism development activities. In modern approach, tourism has acquired the status of the largest smokeless industry in the world. Literally, the word 'tourist' has been derived from the word "tour", which has its root in Latin word 'tornus', meaning a circle of a turner's wheel. The term 'tourist' in Indian context means, a foreigner having no residence or occupation in India, whose stay doesn't extend beyond three months, who has no objectives visiting India other than recreation and sight seeing. The tourism industry is expected to maintain its high rate of employment growth; tourism industry has seldom fallen into a serious long-term downturn, making it one of the world's most dependable revenue generators. By the advent of transport, communication and information technology rapid expansion of tourism has witnessed mass tourism across the globe, estimation has been made whereby air travel would increase by 100 percent over the next (Bhatia ,1997) fifteen years.

According to WTO "Tourism is the world's largest growth industry with no signs of slowing down in the 21st century. A receipt from international tourism has increased by an average of 9 percent annually for the past 16years to reach US and 423 billion in 1996. During the same period, international arrivals soured by a yearly average of 4.6 percent to reach 594 million in 1996. WTO forecasts that international arrivals will top 700 million by the year 2000 and one billion by 2010".

VISITOR, EXCURTIONIST AND TOURIST

According to United Nations conference on travel and tourism in 1963 at Rome, define a 'visitor' as someone who visits a country/region other than that in which he usually resides for purpose other than that of earning money. The 'visitors' are subdivided into 'tourists' and 'excursionists'. 'Tourist' is a

temporary visitor who stay at least 24hours in another country/region for recreation, health, study, pilgrimage, sports, business, meeting and family purposes. But the present study concentrates on those visitors who visit for the purpose of leisure and recreation. Those visitors who do not stay overnight in a country should be classified as 'excursionists' or 'day visitors' (United Nations Statistical Commission, 1967). The present study concentrates mostly on tourist rather than 'day visitors' or 'excursionists'.

Tourism is a fastest growing international industry (Sinha, 1998) and movement of people is an (Sing, *et all,* 1992) unending process.

COMPONENTS OF TOURISM

There are three components of tourism. They are: -

1- *Transport and communication* – The mobility of man depends on the mode of transportation.

2- *Accommodation*: Types of hotels, ranging from low budget to high budget. Besides star hotels, resorts, Yatri Niwas, tourist home, caravan, campsites, tents etc. influence tourism development.

3- *Locale*: The site and scenic attraction determine the flow of tourists. Besides peace, friendliness, accessibility, security, climate, stability etc. are prominent components.

ELEMENTS OF TOURISM

CULTURAL	-	Site of art, architecture and historic & religious Monuments.
	-	Museums, culture and folklore.
	-	Fairs and festivals.
SCENIC	-	Natural beauty.
	-	Wildlife and National Parks.
	-	Flora and fauna.
	-	Beaches, deserts, coast and mountain.
ENTERTAINMENT	-	Parks, Zoos and aquariums
	-	Cinema, exhibition, theater.

- Discos and nightlife.

GEOGRAPHICAL - Climate, accessibility etc.

ADVENTURE - Trek, surf, climb, ride, raft, rope etc.

MOTIVATION OF TOURISTS

According to MC Intosh, motivation can be grouped into the following: -

1- *Physical motivator*:They are related to physical relaxation and rest, medical treatment, leisure and adventure sports.
2- *Cultural motivator*: Individual interest to know about culture, art. archeology and history of other countries. Such tourists visit museum. archeological site, folk centres etc.
3- *Interpersonal motivator*: Decision to meet relatives, friends etc.
4- *Status symbol*: Travel for business, education and personal interest to impress people about ones way life.
5- *Educational motivator*: where students attend meetings, trainings. conferences and conduct research tours.
6- *Religious*: Visits to pilgrim centers.

CLASSIFICATION OF TOURISM PRODUCTS

It is revealed from the study that there are mainly three types of tourism products in Sikkim, which can be broadly classified into the following:

1- *Natural tourism product*: - It includes natural tourist attractions such as mountain, river, glacier, lakes etc.
2- *Socio-cultural tourism product*: - It includes manmade attraction, which reflects the society, culture and tradition. Such as fairs and festivals, temples, monuments, art and architecture, museum, painting etc.
3- *Symbolic tourism products*: - Such product bears both the character of natural and socio-culture such as stadiums, parks and sanctuaries.

4- *Adventure tourism products*: - It include white water rafting, mountain biking, skiing, hang-gliding, skating, rock climbing trekking etc.
5- *Pilgrim tourism products*: The individual faith in religion and their act of wishfulfilling centers are temples, monasteries, churches etc.

The subject matter for present study is to access whether tourism is bliss or blight? the pros and cons of tourism and analyses on dualism of destruction versus development. There is an urgent need to address unwanted and undesirable side effects of tourism development in the seismically sensitive mountain ecosystem of Sikkim. Besides, aspect of cultural erosion and economic impact is the crux of present study. With mass tourism in the Himalayas mountain region like Sikkim and natural resources being the only tourist destination, pressure on flora and fauna is sure to be exerted. Hence, rate of tourism growth would be directly proportional to rate of extinction of natural resources. Mountains of the world seem to be predestined for tourism for all their excellent land-architecture, climatism, recreational flora and fauna. Hindus of the Himalayas gave them a kind of apotheosis. calling their snowy mountains as (Singh, 1992) "home of gods'.

The rate of deforestation in case of Nepal as studied by Mieczkowski (1995) reveals that in Himalayas one tourist uses 6.4kg of firewood per day, which equals the daily needs to two Nepalese families. (Batta, 2000) The additional tourist growth requires additional infrastructure and recreation which leads to digging, earth cutting and landuse change at the expenses of ecosystem. As a result, hill station like Shimla and Darjeeling face severe problem of pollution. congestion and amenities. In Darjeeling, during tourist seasons a bucket of water costs Rs 5. The present study focuses on socio-cultural, environmental and economic impact of tourism in the context of Sikkim Himalayas.

Sikkim is covered with mountain and hills, except for very small tract, which are characterized by valley, plateau, tableland and undulating terrains. This phenomenon embodies the tourism magnetic diversity of both nature and culture. Tourism normally refers to the practice of making tours for pleasure,

in other words it refers to those business or activities, which are related to providing accommodation, services and entertainment for visitors who visit a place for pleasure. Therefore tourism in general is the business of providing hotel and other accommodation, facilities and amenities for those traveling or visiting or staying in a place for a relatively limited period of time for leisure and pleasure.

As tourism is as old as the emergence of man-environment relationship, tendency of human beings have been to move from one part to another in order to perceive the beauty of natural environment. However the climatic conditions also affect the rate of tourist inflow in a particular place. Secondly the cultural factors or man made factors such as entertainment, recreation for tourists have greatly influenced the tourism environment at a given place. Therefore it is a prerequisite to find out the above-mentioned factors of a given place while studying the tourism environment in the surrounding. The present paper attempts to examine the status of Sikkim with regards to tourism environment, major tourist destination and their potential to attract tourists.

Sikkim, which falls under the Eastern Himalayan biodiversity zone shares a large variety of species of flowering plants, fungi, lichen, mammals, birds, butterfly and rhododendron. In between the bewitching scenery of natural heritage there squeezes diverse socio-cultural environment. Ethnic diversity, way of life, pilgrimage sites, art and architecture etc. are the most appraised cultural resources in Sikkim. Besides adventure sports, mountaineering, trekking, boating, biking are some ideal sites.

The rapid growth of tourism industry is associated with corresponding increase in infrastructure. Hence during peak season, demand is not met with the existing infrastructure. At this point, pressure on environment increases tremendously and ethics of carrying capacity erodes leading to ecological imsbalances.

VISITORS PROFILE

Tourist traffic is increasing annually in Sikkim. In the year 1980 only 15434 tourist-visited Sikkim, out of which about 83% were Indians and 17% foreigners. Since 1984 there has been a steady increase in the tourists flow. In 1989 about 46,416 tourists arrived Sikkim in which 96% were domestic and 4% from abroad. Whereas in 1996 about one and half lakh persons visited Sikkim out of which 93% were domestic and 7% from foreign countries. Tourist inflow in Sikkim follows two seasons, firstly, during the month of October-December and secondly from March-May. This type of seasonal concentration generates unemployment problem as well.

The study area is considered a heaven especially for the scholars of life sciences and theology. In the year 1994, majority of tourists around 60-70% had visited Sikkim for recreation. About 35% of foreign tourists were trekkers, while 20% were domestic and only 1% percent foreign tourists had visited for official and business purposes. However, this trend of tourists' inflow, it is clear that there is progressive change that has been taken place in the trend of tourist flow in Sikkim through different successive years.

REVIEW OF RELEVANT WORKS

The concept environmental study grew in 60's when people confronted with water scarcity, amenities, ozone hole, green house effect, sea level change and disease killing human being. In the ancient days, pilgrim tourism became important and Macca and other religious and spiritual centers grew as tourist destination. After the advent of jet and concept of paid holiday, social and mass tourism grew fast. The growth of adventure also reached its pinnacle in the west. The movement of tourists were initially generated from the western world .At this time, (Murry 1930), discussed about recreational activity in northern Michigan. He gave a geographical account of land utilization in depth. The economic importance of tourism was placed by Brown (1935) while discussing magnitude, pattern of tourism. Need of statistical data was realized by Phophet (1947) he stressed on research and development. The importance of recreation site was studied by Deasy (1949) and Zierer

(1952) in western United States. While explaining values, patterns, forms of recreation, Hedrick (1934) prepared maps of various recreation elements discussed on environmental aspects of tourist destination. With first ever-recreating mapping, Jone (1933) and Booth (1949) studied the recreational regions of Canadian Rockies with a mining town in British Columbia. Study of lakes as recreational center also carried out with special reference to Washington. It was Carlson (1938) who studied economic significance of recreational activities to local and state government. The major work on map preparation, route and distance measurement, accommodation took place during the period from the late 1940s to early 1950s.However systematic study of tourism did not take place, some geographical study helped in finding routes and relief feature of earth. In Europe the British geographers played an important role in the study of travel and tourism. The publications of Rabinson (1976) made tourism a subject matter of geography. During this period attempts were made to simplify movement and packaging of travel was designed. Other prominent geographers contributing to the literature on tourism include Mitchell 1984), Collins (1979) and Clawson (1984), Butler (1978), Rojotte (1975), Wall (1989), Ruppert (1984) and Ritter (1989) Mercer (1978), Pearce (1981) and Pigram (1983). The contributors were from Canada, Germany, Austria, Italy, Russia, Australia and South Africa.At this time many geographers had studied various components of tourism and western geographers specialized in tourism studies. The research of tourism studies in the 1970s shows highly diverse and study of tourist potentialities and accommodation for visitors became important theme (Carter, 1973). In Ireland, tourism was comparatively studied with tourism activity and economic (Johnson, 1973) gain. The aspect of national and its problems and prospects was discussed (Hamilton, 1973) and taxations and employment aspects became the center of study. (Nicholson, 1973). In Netherlands growth of indoor and outdoor recreation was done. (Lambert, 1973) With the help of correlation analysis, population and distance were studied and predictive gravity model was prepared (Moseley, 1973). A series of papers on employment and tourism in mountain areas of Alps with an outline in the

diversity of tourism phenomenon and employment opportunities appeared. (Clout, 1974). Tourism business is concerned with all aspects of knowledge and information. The basic components of tourism are motivation and preferences of tourism in guest and host communities, economics benefit, ecology, quality of tourism services and education (Bagri, 1995).In India, tourism was carried out by Chib, who is known as the 'father of Indian tourism'. He contributed a lot covering different aspects to tourism industry. Other contributors are Seth and Bhat (1993), Bhatia (1991), Kaul (1994), Dhar (1984), Basu and Basu (1984), Goswami (1982), Rai (1993), Sharma (1991), Sethuramalingam (1993), Khanka and Jalal (1983) and Bagri (1995) etc.the study covered elements of tourism from Jammu and Kashmir to Rajasthan.The atlas based study was done by NATMO for the development of tourism industry in India. Prof. Bagri highlighted on the importance of human resource development in tourism sector. Scholors like (Sinha, 1983), Kayastha (1964), Bharadwaj (1973) and Kaur (1985) stressed on the importance of tourism studies in relation to Geography. Climate was considered important element of Indian tourism, where Kaur (1982) emphasized on pilgrim and religious tourism. It was Bharadwaj (1973) a cultural geographer who is credited to have included the importance of cultural element in tourism development. Other stressed on (Mishra and Thangamani 1982) tourism planning. The only contributor in studying impact of tourism was Krishnaswami (1982) who detailed out the economic impact of tourism. Some other aspects of tourism included papers presentation by Singh (1996) and Bhattacharya (1996.1997) wherein adventure tourism is discussed with long listed parameters. In Sikkim, it was Chakravarti (1991) who produced papers on tourism in Himalayan Mountain. Similar paper was presented by Nita Mitra (1991) on environment degradation of Darjeeling Himalayas. Further, Chakravarti explained on tourism in Sikkim Himalayas. Lately in 1991 Jana (1991) edited a volume on environmental degradation and development strategies in India and carried out numerous studies in the subject.

In the field of environment literature are found from the ancient time. In 1960's major environmental aspects were discussed and later in 90's, (Sing 1991), Batta (2000), Shankaran (1998), Husain (1996) came up with extensive literature. The UN declaration, Earth Summit, (1992) followed by Environmental Protection Act, Wildlife Act1972, garbage and hazardous waste handling Act made environment studies more extensive. The Nature, Down to Earth and Hindu environment reports, Himal magazines contributed amply in providing literature in environmental related issues.

PROBLEMS IN TOURISM PROMOTION

The major problems can be broadly grouped into two categories:

A **Physical** The steep slope and rugged topography limits the accessibility of the region. During monsoon rain, landslide and road blockage are commonly found everywhere. Due to rush in peak season, demand for accommodation and infrastructure increases manifold. As a result, the land under cultivation, forest, etc. is heavily disturbed.

B **Socio Cultural** The negative socio-cultural problems are associated with the development of tourism. The local culture and traditions are invaded by foreign culture and local communities tend to imitate western culture. The drug, alcohol etc. prevailing in our society are the outcome of such interaction. During peak season, society faces various problems such as crime, rape, murder and ultimately local people tend to loose their own tradition and adopt alien culture. Price hike, conflict and tension, rural – urban migrations are some sensible unsolved problems.

C **Environmental** An increase in tourist inflow leads to corresponding increase in demand. As a result the following problems are noticed:

i Heavy movement of traffics causing air and noise pollution.

ii Water pollution.

iii Traffic and sewerage problems.

iv Health and hygiene.

V Garbage disposal.

vi Drainage and sanitation.

D **Political** The international relation with the other countries also influences the tourist flow pattern. During political instability and insurgency, fluctuating trend in the flow of tourist movement is recorded. For example an increasing trend in the growth of tourism activity in Sikkim is mainly due to Kashmir and Gorkhaland problems. Besides, some tourist spots are not made open to foreign tourist and special "inner line permit" is required. Recently in Sikkim, the State Government has restricted Kanchanjunga expedition in order to maintain the sanctity of that area.

E **Economic** The Living and maintenance cost exhibit high rate of fluctuation. The concentration of tourists during peak season causes economic problems. It is noticed that fancy price is charged for the goodsy and services. As a result tourism is becoming an expensive phenomenon.

F **Destination management** The rapid flow of tourists adds to multi-problems such as migration, urbanization, rise in pollution level etc.

G **Accommodation** The growth of tourism must correspond to growth of accommodation. During peak season, lack of accommodation is felt in the places like Gangtok, Pelling, Lachung and Lachung.

H **Transport and communication** The transport and communication required is upto the mark due to unsuitable relief feature.

Besides, other associated problems are scarcity of amenities facilities, erosion, problems of law and order etc.

AIMS AND OBJECTIVES

The present work is framed with the objectives of studying the following parameters independently and in combination with overall environmental degradation of Sikkim.

1. To study the type of relief and drainage, climatic zones, and bio-geographic divisions of the study area.
2. To access the population explosion and its impact on environment, distribution of ethnic groups inhabiting various regions and their attitude

towards conservation techniques of natural resources and environmental awareness.

3. To find out the major industrial units, mining and other development programs, vehicular traffic, tourist flow, hydropower causing environmental degradation.
4. To study various tourist destinations in Sikkim and their impact on local inhabitants.
5. To assess overall environmental degradation in Sikkim as a whole with special reference to tourism.
6. To highlight the importance of ethnicity, culture and tradition, art, dance, folklore, fairs and festivals of the study area.
7. To find out major impacts of tourism on environment, society and economy.
8. To study the prospects and practices of eco-tourism in the state.
9. To suggest a plan to improve the economy of the state by tourism with the help of proper environmental planning.

METHODOLOGY

The methodology adopted for the present study include:

Step I Study of relevant books, journals, articles etc. related to tourism and environment (Library work) and framing of questionnaires related to study.

Step II Collection of primary and secondary data.

a) Field visit and collection of field data of various places by sampling (30-35%)

b) Information from other sources related to infrastructure and amenities.

Step III Preparation of maps and diagrams and their analysis by suitable statistical methods.

Step IV Compilation and analysis of data (Laboratory work) and finally preparation of the Thesis.

RESEARCH QUESTIONS

The major questions before researcher are -

1. Is environmental degradation taking place in Sikkim?
2. Are all the tourist destinations facing severe environmental degradation?
3. Is tourism an agent in bringing about socio-cultural, economic changes in the state?
4. Whether, tourism has scope in future?
5. Is tourism development causing environmental degradation?
6. Should there be no tourism development in Sikkim to save the environment and natural beauty?
7. Does eco-tourism practices prevail in the study area?

HYPOTHESIS

The focus of present study is to analyse the present environmental scenario in the state of Sikkim. In the hilly state like Sikkim, industrial development is not feasible hence tourism attributes lion share in revenue generation. The state government has fully geared up to promote tourism. Hence the study of environmental problems due to tourism development is inevitable. The present data shows rapid increase in tourist population and new tourist destinations are opened up with all facilities of accommodation, transport, communication and services. In order to meet the demand generated by the movement of tourists, serious problems have cropped up, which has become the crux of the study.

The major hypothesis can be categorized as follows:

1. The seasonal concentration of tourist affects the carrying capacity of a tourist spots.
2. Economic problems affect the local communities and tourist.
3. There is an impact of tourism on society and culture.
4. Environmental problems such as deterioration of quality of air, water, land and life is associated with tourism development.

5. Destination management and sustainable development remains a far cry.
6. The agents of environmental degradation are mining, deforestation, over population, hydropower development and rural transformation.

SIGNIFICANCE OF THE STUDY

The study on environment degradation in Sikkim is highly relevant in the present day scenario. Firstly the mountainous topography is prone to degradation due to physical factors such as landslide, earthquake, erosion, subsidence, sinking etc. Secondly, in order to fulfill the socio-economic needs industrialization, urbanization, mining, hydropower development, housing, electrification etc. are taking place at faster rate. Thirdly, tourism is vital for Sikkimese economy, hence top priorities has been laid down to develop tourism industry. As a result, three fold impacts of tourism have emerged they are socio-cultural, economic and environmental impacts.

SCOPE AND LIMITATION

The present study aims at finding overall environmental degradation and tourism activity in Sikkim. It is an approach to study the various environmental problems existing in Sikkim and suggestion to improve the same. The current study would take into account the major agents of environmental degradation. The identification of problems will help the planner and decision-makers for planned development and management of tourism and other environmental related developmental activities in Sikkim.

Therefore, the study would be beneficial for planner, decision-makers and Govt. for further development. The researcher shall endeavor to refer the studies being undertaken in different parts of the country, especially relating to environment and tourism.

DESIGN OF THE STUDY

CHAPTER-I Historical and Geographical background of the study area.

CHAPTER-II Population dynamics and socio-economic characteristics.

CHAPTER-III Tourist destinations.

CHAPTER-IV Agents of environmental degradation in Sikkim

CHAPTER-V Impact of tourism – An analysis.

CHAPTER-VI Eco -tourism prospects and practices.

CHAPTER-VII Conclusion and recommendations.

CHAPTER - I

HISTORICAL AND GEOGRAPHICAL BACKGROUND OF THE STUDY AREA

INTRODUCTION

The dichotomy of environmental determinism versus possibilism has been the key instrument in defining the supremacy of man over natural environment and vice versa in the erstwhile mountain kingdom of Sikkim. The present study is a pioneer in analysing history in relation to significant aspects of accessibility, marginality, ecological niche (natural factors) and human settlement with reference to social structure, its mal- adjustment, cultural heritage like customs, traditions and diplomatic revolution etc. (man made factors) Hence, an attempt has been made to synthesize both factors with their spatial location in the historical perspective while adapting in natural environment. There exists a regional disparity in the history, which provides a heterogeneous picture. Hence analysis of historical evidence is important because the interrelationship between human beings and natural environment is as old as the emergence of mankind in the earth.

The past is key to the present, present cannot run independently if we ignore the past therefore analysis on any phenomenon can be carried out in the light of history as every segment of the world has been inhabited long before the dawn of recorded history. Hence it represents the past events with its relation to present developmental scenario of a particular place.

In this chapter, an attempt has been made to analyze the historical overview of Sikkim with regards to its people of multi-ethnic communities found at present in Sikkim. All such aspects have been dealt with in relation to environment in one hand and tourism development and its impact on the other.

1.1 NAMGYAL DYNASTY OF SIKKIM

Sikkim was a kingdom ruled by Namgyal dynasty till 1975 (Table 1.1)), ever since Sikkim became the 22nd state of Indian Union; it retained and uphold the same status till today. The ancient history of Sikkim is not well documented; myth, legend and stories are the base through which writers have made history.

During 13th century, Khye-Bumsa came to Sikkim to seek blessing from Thekong-Thek, Khye-Bumsa in return was blessed with three sons, as a result brotherly relationship grew up. Later the two chieftains signed a treaty of brotherhood at a place, which is known as Kabi.

TABLE 1.1 CHRONOLOGICAL ERA OF NAMGYAL DYNASTY

Name of Kings	Period ruled
PhuntshogNamgyal	1642 – 1670
Tensung Namgyal	1670 – 1700
Chakdor Namgyal	1700 – 1717
Gyurmed Namgyal	1717 – 1733
Phuntshok Namgyal	1733 – 1780
Tenzing Namgyal	1780 – 1793
Tsngphud Namgyal	1793 – 1864
Sidkeong Namgyal	1864 – 1874
Thutob Namgyal	1874 – 1914
Sidkeong Tulku	1914(Feb to Dec)
Tashi Namgyal	1914 – 1962
Palden Thendup Namgyal	1962 - 1975

Source-Sikkim Concise Chronicles (march 20,1963)

On 16th may 1975, Sikkim merged with India and became 22nd state of Indian union. After 1975 rapid developmental activity started to give present prosperous Sikkim (Das, 1995). The traceable history of Sikkim begins from17th century onwards, wherein Namgyal dynasty ruled Sikkim for nearly four century. Till 1975,Sikkim remained as an inaccessible country in the remote corner of Eastern Himalayas. The slow pace of development resulted slow pace in environment degradation as well. The primitive people in Sikkim

were hunter and gatherer, they bank upon jungle for their livelihood and hence environmental degradation was taking place. The process of cultivation started, clearing of forest cover took place and agriculture cultivation started in the valley and slopes of Sikkim Himalayas. After the later half of 19th century, massive development activity along with massive ecological destruction is witnessed in the study area.

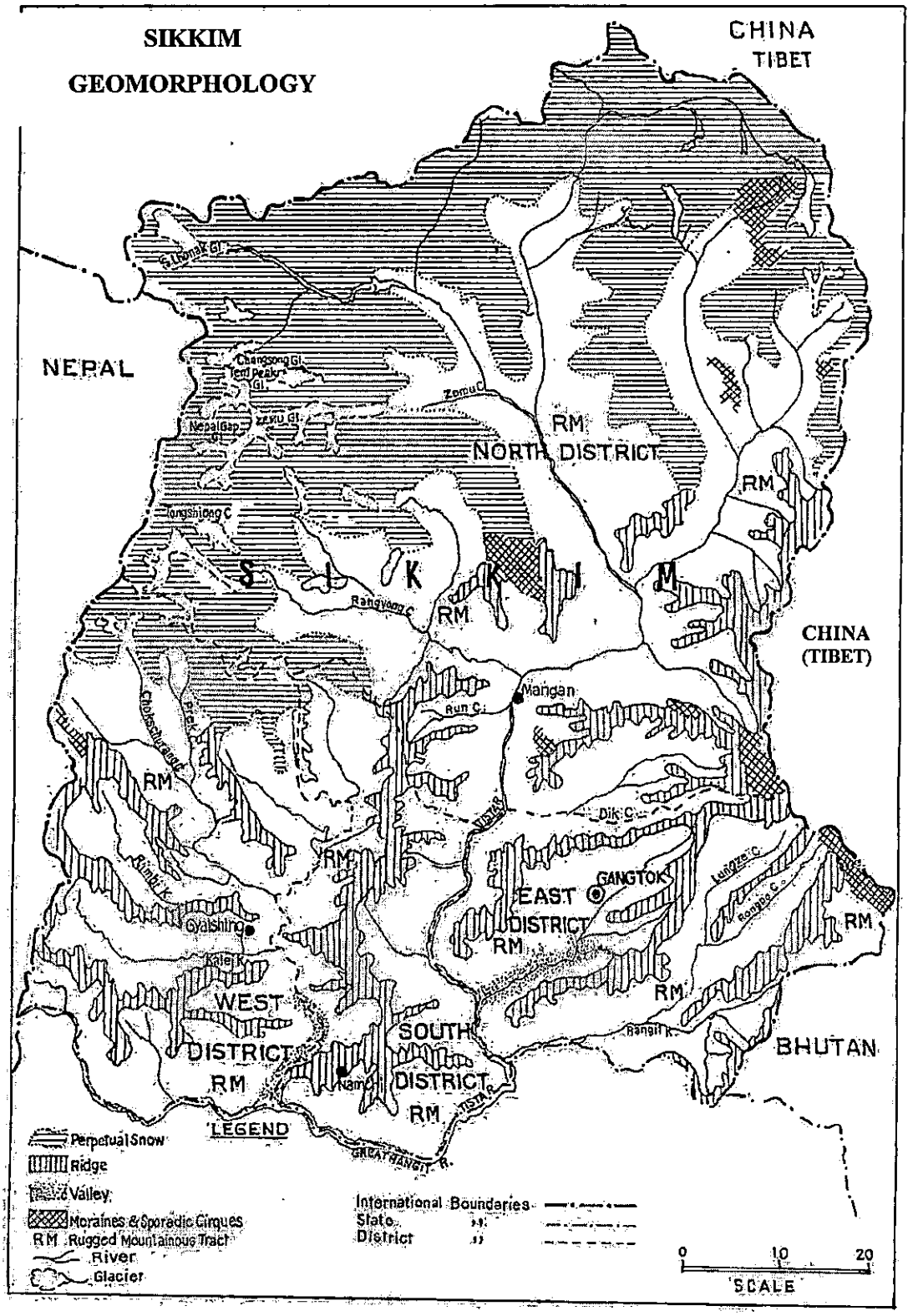
1.2 CULTURAL ADJUSTMENT

Human adjustment of different races in Sikkim from the beginning has brought about uniqueness in cultural set-up; therefore to study its historical background is a matter of vast source of information. Basically the Lepchas, the Bhutias and the Nepalese are main races to contribute to the history of Sikkim. The three communities are affiliated to Hindu, Buddhist and Christian, however Hindu population is in majority. It may be mentioned that nature worshippers are still found in the villages. The belief on *Jhankri Dhami* still persists among the people. Besides, animal sacrifice is seen among the Lepcha, Manfar, Gurung, Tamang, Rai, Limbu, Chettri etc. During *dasai*, goats and ducks are sacrificed in the houses of Chhetris, Limboos and Rais. *Kul pitri puja* is also performed as the rituals of Khambu, Limbu, Chhetris etc. Hence the above communities can be categorized into nature worshipper. Before rushing any patient to hospital, these communities perform ritual formalities; it is a firm belief that doctors never cure illness due to laag lagan. While interacting with a *jhankri and bijuwa*, it is understood that they don't believe in doctors rather they themselves guarantee for the cure of illness. *Jhar phuk* and its belief are deeply rooted into the minds of Sikkimese people. As reported by some *jhankris* at Mangley, while performing and chanting mantras they call river, forest, mountain, wind etc and spiritually request for the cure of disease. The statements show how close are they with the nature.

1.3 HISTORY OF CONSERVATION

The first ever steps towards preservation of environment appeared in 1954,by banning the construction of building within 15.2m from the roadside

Fig-1.1: GEOMORPHOLOGY



(forest notification No.2375/54,Archives). In 1970,yet another notification was issued by imposing restriction on export and import of Lycopodium from Sikkim. (Notification No.1744/forest, Archives)

1.4 PHYSIOGRAPHY

The magnificent and breathtaking range of snow-clad "Kanchandzonga" offers Sikkim a unique paradise on earth. The whole landscape offers a sweeping panorama of mountain ridges, sky and emerald lakes, sculptured in the towering folds of rock strata. Amphitheatre is an artistic impression of Sikkim, as high ridges on the north and west griddle the state from east and west respectively. The variation in relief ranging from 250m to 8595m makes Sikkim a contiguous part of the Lesser and Greater Himalayan zone. Steep hills and steep deep valleys characterize the whole physiography of Sikkim Himalayas. The mountain slopes from north-south direction with well-carved interlocking spurs and water divides form deep and silent valleys.

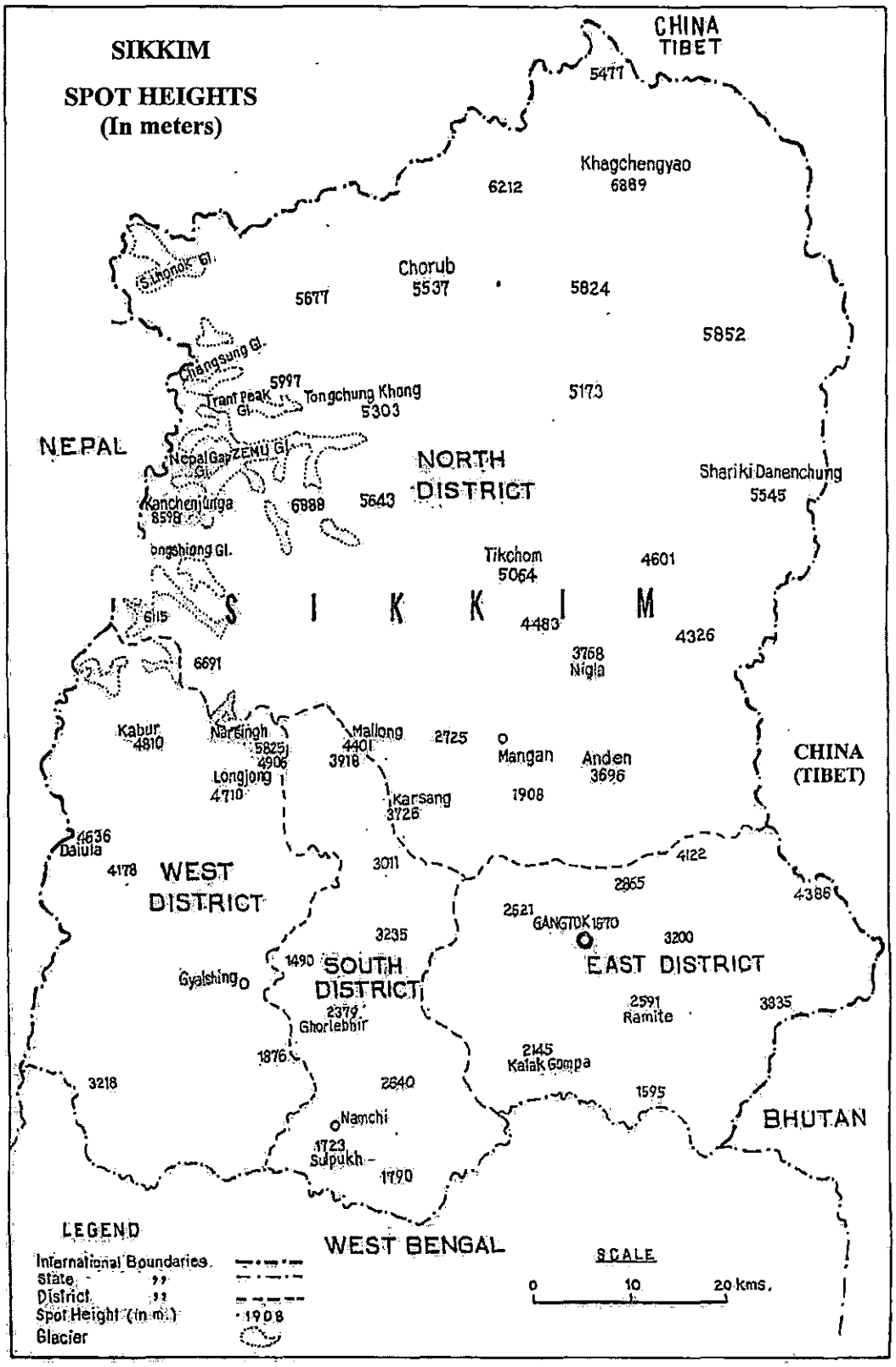
TABLE 1.2: TOPOGRAPHY VARIATIONS ACCORDING TO ELEVATION

Type of land	**Level of elevation (in meter)**
Lower hills	270 – 1500
Mid hills	1500 – 2000
Higher hills	2000 – 3900
Alpine zone	3900 with vegetation
Snow bound land	Very high mountain without vegetation and with perpetual snow cover upto 8580m

Source: Statistical profile 2004-05

The present morphology is the result of existing geological condition where north, west and eastern region comprise of hard gneissic rocks, southern and central lowland is mainly composed of soft and erodable rocks. The geomorphologic setting of study area shows (Fig 1.1) contrasts physical

Fig-1.2: SPOT HEIGHT



features. The topographic variation (Table 1.2) shows classification of hills ranging from 270 meter to 8580 meters (Figure 1.3) featuring similar contours.

1.4.1 Classification of terrain

Physical feature of the study area is also categorized according to varying degree of slope, vegetation and geology. The major types are summits & ridge, escarpments, very steep slopes (> 50%), steep slopes (30 – 50%), moderately steep slopes (15 – 30%), narrow valleys (< 15%) cliffs and precipitous slopes zone of glacial drift, perpetual snow (Das *et all*, 1996)

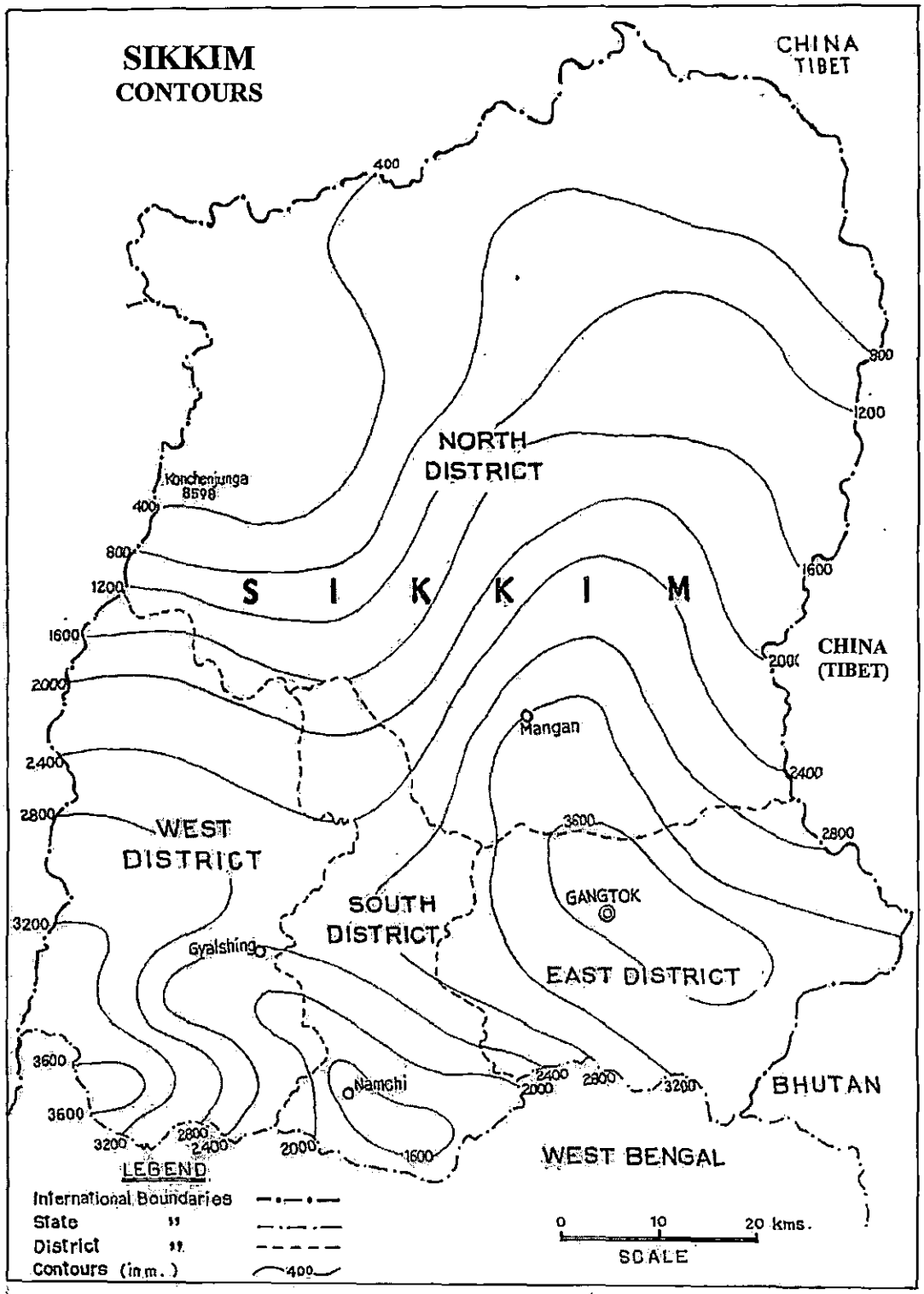
1.4.2 Peaks

The landform features developed in various terrains are snow-capped mountain, snow covered peaks & hills, V-shaped valleys, gorges rapids, canyons, waterfalls etc. The natural beauty of Sikkim is exhibited by the kaleidoscopic view of glaciated peaks. Northern peaks are Lhonak ,Sentinel, Chorten Nyma,Khora Khang,Khora Tso Gna Khang,Mt. Talung at 7375.80m Eastern peaks are Mt. Masunyange at 5882.35m, Lamaongden at 5902.46m, and Paunhri at 6705.27m Western peaks are Mt. Kanchendzonga, at 8581.53m, Mt. Kabru at 7380.37m, Mt.Siniolchu at 6888.14m,Mt.simvo at 6850.35m,Mt. Pandim at 6735.75, Mt. Kokthang at 6145.07m, Rathong at 6735.75m. Besides Tent, Nepal, Langbo and Pyramid peak significant in their scenic beauty. The spot height (Fig 1.2) of important places exhibit contrasting altitudinal variation.

1.4.3 The sacred peaks

The people of Sikkim have been nature lover therefore Government has notified few peaks as sacred peaks. The expedition to mount Kanchendzonga the guardian deity of Sikkim was held in the year 1955 and 1977 respectively. The mountaineers were told to stand 1.82m below the

Fig-1.3 CONTOUR



summit. At present, Government of Sikkim has banned on expedition to Mt. Kanchendzonga. The commemoration of 50th years of assent to Kanchendzonga was observed in Gangtok on 17-18th September 2005. (*Now*, 19-9-2005).

1.4.4 Passes

The state of Sikkim is characterized by high mountain passes and narrow glacier outlets. The mountains remain under the perpetual snow cover through out the year. The eastern and northern regions in Sikkim have high mountain passes. However it is to be noted that the Nathula Pass in East Sikkim is a famous trade route between India and China. Besides, other passes are Sasayla, Kongrala, Nakula, Chortem Nymala etc.

1.4.5 Ranges

The morphology of physical landscape exhibit well defined ranges which demarcates the international natural boundary between the nations. Such ranges are located in the high altitude and inaccessible rugged terrain of the Sikkim Himalayas. The ranges in such hostile climatic condition often act as a barrier and save the country from external aggration. Owing to its inaccessibility, these ranges are well preserved and its pristine beauty remains virgin. The important ranges lying at the frontier of Sikkim include Singalila range, which separates Sikkim from Nepal in the western edge of Sikkim Himalayas, secondly Chola range demarcates Sikkim from Tibet and Bhutan in the eastern edge and finally Pangolia range, separates Sikkim and Bhutan. All these ranges remain under perpetual snow cover and hence the crests (Fig.1.3) of the ridges vary seasonally. These entire passes constitute unexploited alpine tourist destination in Sikkim.

1.4.6 Glaciers

The glaciated region of Sikkim virtually falls towards the upper part of Tista-basin. The roof of Sikkim Himalayas is covered by glacier. Glaciers are the sources of water which drains almost the whole of Sikkim Himalayas.

Important glaciers above 5000m remains under perpetual snow cover; such glaciers are formed along the highly elevated region of West, North and East Sikkim. Due to north-south slope, the melted glacier descends down towards southern slopes forming important glacial features such as Cirques, Moraines, etc.

1.4.6.1 *Glacier complex*

Owing to suitable latitudinal and altitudinal extent, the glacial movement and avalanche are common geomorphic features in the upper parts of Sikkim Himalayas. The contiguous ice and snow cover has given rise to the formation of various glacial complexes. The formation of glacier complex has been found in eight major places. Their origin (Table 1.3) and flow vary in accordance with relief and altitude.

The glacial lake outburst was noticed on 25th September 2005,claiming lives of four mountaineers scaling to Yummo Peak at 6867.41m in north Sikkim (Now daily 28-9-2005).

The Yumthang glacier complex comprises of twelve number of glaciers where as Relli complex has just three complexes. The melting and receding of glaciers have been recorded in Sikkim Himalayas. During the movement of glacier, mass wasting and debris, the topsoils are carried away under the force of gravity. The plants of medical importance are washed away and the stunted growth of vegetation prevails all over the region. The event of (GLO) glacial lake outburst is witnessed in the higher altitudes (Lama, 2001). Therefore in Sikkim Himalayas, especially in the higher altitude eco-fragile area, the landforms are naked and delicate ecological balance is maintained. The tourism activity often takes tourists to such places for adventure tourism. As a result, negative impact on environment is experienced all over the regions.

TABLE 1.3: GLACIAL COMPLEXES

Glacier complex	No. of Glacier
Relli	3
Rathong	4
Talung	9
Zemu	6
Lamgbo	11
Yumthang	12

Source: Jeyaram, K.Murthy, Shrinivasan, Radhakrishnan 1998.

1.4.6.2 *Important Glaciers*

The important glaciers are Zemu, Lhonak, Hidden, Tista Khangse, Chungsang, Langbo, Rathong etc. All above-mentioned glaciers are the major sources of water; streams are originated from the glaciated topography to form the major river system in Sikkim. It is self explanatory that most of the glaciers have their origin in Northern Sikkim. It is to mention that northern Sikkim is the house of biodiversity in Sikkim. Therefore, in northern region, eco- tourism must be developed in harmony with nature.

1.5 LAKES

Due to constant glacial activity and high altitudinal vegetation cover, the lakes are found abundant in the Sikkim Himalayas. There are more than 150 water bodies, which are classified as lakes. (Roy, Thapa, 1996) The glacial activists are the source of water feeding such lakes; accumulated water bodies are often named as *Chho, Tso or Pokhari* in Lepcha, Bhutia and Nepali language respectively.

1.5.1 Classification

The lakes found in Sikkim Himalayas are classified according to their altitude, across the length and breadth of Sikkim's geographical area. According to place of origin, three groups are classified. (Prasad & Sundriyal, 1984); (Rawat, Naitham, 1986); (Roy & Thapa 1996) as High altitudinal lakes, Mid altitudinal lakes and Low altitudinal lakes.

1.5.1.1 *High altitudinal lakes*

These types of water bodies are found above 2600m heights in the areas lying in higher altitude of North and East Sikkim. These are snow fed and remain under snow cover during winter season. Most of these lakes are situated in the remote areas and carry no names. The dimension of the lakes (Appendix I) varies from 10-100 meters and the depth varies from place to place.

1.5.1.2 *Mid altitudinal lakes*

The lakes located upto the height of 2000 m. are categorized under mid altitudinal lakes. In summer some lakes remain dry due to the lowering of water table and high rate of evaporation. Such lakes are *setey pokhari and Kal pokhari* (Roy, Thapa, 1998). Whereas, some lake (Appendix II) are so virgin that even it remains nameless till date.

1.5.1.3 *Low altitudinal lakes*

The lakes are found in low-lying river valleys (Table 1.4) but remain dry in most of the season, the rainwater is the major source of water for lakes. Such lakes are given cemented surface with a view to develop water sports for tourists. (Roy & Thapa, 1998).

TABLE 1.4: LOW ALTITUDINAL LAKES

Lakes	District	Importance
Martam Pokhori	East	Domestic use
Nagi Lower Lake	South	Domestic, religious
Nagi Upper Lake	South	Domestic use.

Source-Roy, Thapa, (1998).

The matter of concern for low altitudinal lakes is the characteristics of seasonality in the supply of water and lake pollution by animal grazing and human interference. Hence environment of these lakes are degraded to a great extent. While visiting Aritar Lake it was noticed that visitors throw

eatable waste in the surrounding and noise pollution cause migration of birds and living organisms.

TABLE 1.5: LAKES -AS TOURIST DESTINATIONS IN SIKKIM

West District	North District	East District	South District
Lam Pokhari	Gurudongmar	Bidang Chu	Yangang
Khechuperi	Chholamu	Changu	Rabong
Laxmi Pokhari	Sima Chok	Menmecho	
Majur Pokhari	Panch Pokhari	Aritar	
Dud Pokhari			
Samiti Lake Pokhari			
Ram-Laxman Pokhari			

Source: Statistical Profile, 2004-05 and field visit 2004.

1.5.2 Lake as a tourist destination

Of all the lakes in Sikkim, Changu, Memencho, and Gurudongmar are the mostly visited lakes by the tourists of domestic and international nature (Table 1.5). The basic features of lake in Sikkim are absence of water sports. However, whitewater sports are gaining importance in Sikkim day by day. Aritar is the only lake in Sikkim, which provides boating facility. Such lakes being located at low altitude are ecologically degraded due to pollution from human and animal interference, remnants of plants and animals etc. of the total number of tourist visiting Sikkim, 75% of them visit Tsango lake due to its prime location, natural beauty and its proximity from the capital town of Gangtok.

1.6 HOT SPRINGS

The hot spring in Sikkim gained significant importance since the dawn of Sikkim's history. Hot water of spring is medicine for the cure of various skin diseases. Among the local population, hot springs are known as 'Tatopani'. Hot water having sulfurous odor when gushes out from the inner earth to the crust, it forms hot spring. During winter such places gain tremendous local tourists. Of all the hot springs (Table 1.6) Ralong, Borong and Yumthang are popular in terms of visitors.

TABLE 1.6: IMPORTANT HOT SPRINGS

Name of Hot Spring	District
Phurchachu at Khadosangphug	West/South
Yumthang	North
Borong (Ranglop Tshachhu)	South
Ralong	South
Yuma Samdongtshachhu	North
Tholung Kangtshachhu	North
Shagyong Phedok	North
Takrumtshachhu	North
Gangyab Chhutshen	West
Zee Tshachhu	North

Source: Notification 70/ HOME /2001

There has been a plan for the development of hot spring for the tourist purpose, in such scenario; there remain every possibility of degradation. The area in and around the hot spring is polluted, during tourist gathering. Littering, open defecation and soil pollution are common in such sites.

1.7 SACRED CAVES

The caves are the typical geomorphic landforms found in Sikkim. Such caves are associated with myth and it bears significance in terms of history and religion of Sikkim.

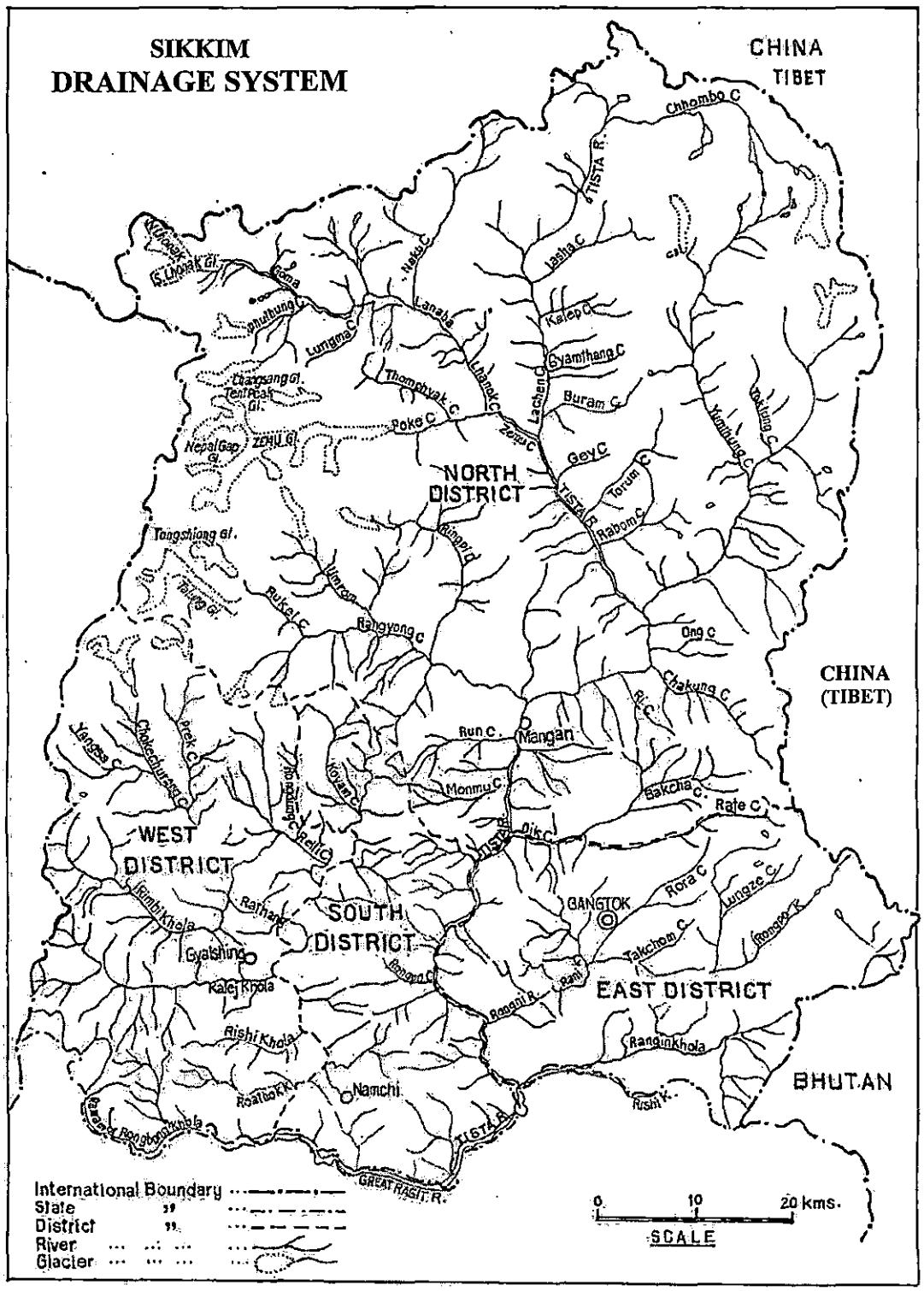
TABLE 1.7: THE MAJOR CAVES IN SIKKIM AND THEIR LOCATION

Name of Cave	Location
Sharchhogbayphug at Sangmo,	South Sikkim.
Khadosangphug at Sanganath,	South Sikkim
Dechenphug above Nampung,	West Sikkim
Lharinyingphug via Kongri-Labdang,	West Sikkim
Phagmorong,	West Sikkim
Tragthungrong,	West Sikkim.

Source-Statistical Profile, 2004

The caves (Table 1.7) have spiritual importance to the people of Sikkim. Such caves have also become the place of tourist importance. Therefore the process of degradation of caves environment is obvious.

Fig-1.4-DRAINAGE



1.8 DRAINAGE SYSTEM

The drainage system can be categorized into water bodies including lakes, streams, rivers and ponds. However, river forms major drainage system in Sikkim. The glaciers and its complexes have been the permanent source of water for the people living in the lower altitudes. The details of rivers in Sikkim are mentioned at Appendix III.

The major rivers in the state are Tista and Rangit (Fig 1.4) The river Tista and its tributaries drain major portion of the state. The river Tista has its source at the glaciated Chholamu lake in North Sikkim. The glaciers such as; Lonak, Zemu, Rathong with the tributaries such as Zemu Chu, Lachung, Lachen Dikchu, Rangpo, Rongi Chu produce distinct drainage system. The river Rangit is fed by Rathong Chu which has its source at Rathong glacier.Other tributaries of river Rangit are Rumbi, Kalej, Reshi Rothak, Rammam and Manpur Khola . The Rangit river finally merges with the Tista as a tributary.

TABLE 1.8: TRIBUTARIES OF TISTA RIVER

Left Bank Tributaries	Right Bank Tributaries
Chhombo Chu	Zemu (Lachen Chu)
Lhasa Chu	Rangyong Chu
Kelep Chu	Rangphap Chu
Gyumthang Chu	Rangit Chu
Burum	Do not have right bank tributaries
Gey	
Tarum	
Rabom	
Lachung	
Ong	
Chakung	
Dikchu	
Rongni	
Rangpo	

Source: Choudhury1998

1.8.1 Tributaries of river Tista

Tista River is the longest and flows from its origin at Cholamu to Rangpo. During the course of its flow, she cuts through deep gorges and canyons. From the steep slope of North Sikkim, it flows with high speed and velocity. In the youthful stage of Tista River, erosional activity is prominent, however, work of river decreases with decrease in altitude. Many other rivers (Choudhary, 98) feed the main river from (Table 1.8) left and right bank.

1.9 CLIMATE:

The prevailing climatic condition of Sikkim varies from region to region, due to variations in topography, soil and uneven vegetation cover. Average annual rainfall ranges from 1300 mm to 4300mm.The maximum summer temperature varies from 21^0-37 ^{0} C and the minimum winter temperature varies from 13^0-23 ^{0} C. Overall climate varies generally from sub-tropical to alpine, depending upon the elevation. Rainfall is heavy and well distributed from May to September. There are two zones which have been classified as maximum rainfall receiving zone and low rainfall receiving zone.

1. The maximum rainfall receiving zone include; Mangan, Ravangla, Damthang, Rayong, Ralang and Gangtok.
2. The rain fed areas are Hilley-Varshey and region include Namchi, Jorethang and Melli.

1.9.1 Classification

The climate of Sikkim according to Choudary is broadly divided into the following types

A-Sub-Tropical Humid (lying below 1500m)

The summer temperature is 35^0 C while the winter temperature is 6^0 C. The average annual rainfall varies from 1500mm to 3500mm. Tadong (1500m) in East Sikkim receives maximum (3000mm) rainfall whereas, Namchi (1500m) in South Sikkim receives only (1550mm) rainfall. Mangan located at 1310m in North Sikkim receives 3200mm, while Dentam at 1372m in West Sikkim receives only 2300mm rainfall. The night shower is prevalent

in the rainy summer. This season remains for nearly six months from April-September.

B-Semi temperate (lying between 1500-2000m)

The annual average temperature ranges from 8^0 C in winter to 26^0 C in summer. This belt is characterized by heavy monsoon rain during June, July and August with the mean annual rainfall of 2400mm. The Station Gangtok records minimum temperature of 2^0 C and mean maximum temperature of 26^0C.

C-Temperate (lying between2000 to 3000m)

The annual temperature ranges from 0^0 C in winter to 15^0 C in summer. Places like Lachen and Lachung in North Sikkim receives 1700mm average annual rainfall. In the areas lying in Lachung and Lichen belt in North Sikkim, the average annual 1700mm rainfall is recorded.

D-Alpine snow forest (lying between 3000 to4000m)

At this belt precipitation takes the form of silt and snow. Tsomgo (Changu) at the altitude of 3840m in East Sikkim receives 2900mm rainfall, whereas, Yumthang in North Sikkim with 3673m altitude receives merely 1400mm precipitation. Further, Thangu at 3812m receives just 800mm of precipitation. During December – February temperature remains very cold with snowfall in most of the higher belts. The higher altitude areas remain without settlements due to harsh climatic condition.

E- Alpine meadow or tundra (lying above 4000m)

It includes snow covered peaks and ridges of high altitude belt. During winter precipitation occurs in the form of snowfall. The stunted growth of vegetation with bare settlement is common in such region. Due to frozen temperature, no permanent settlement is found in this belt.

F- Artic (above 6000m)

The region is characterized by no vegetation and plant life. The entire zone remains under perpetual snow, to name few are Mt. Kanchendzonga, Kabru, Tulung, Tent, Pyramid, Jonsang, Siniolchu peaks etc.

1.9.2 Weather phenomena

The day to day weather condition prevailing over two important stations at the vicinity of Gangtok have been discussed with a view to understand the local physical climatic condition. (Table 1 9) Taking Gangtok as on of the station, it reveals that 21.8^0 C is recorded as the highest temperature in the month of July and the lowest is recorded in the month of' January with 5.8 degree centigrade.

TABLE 1.9: WEATHER RECORDED IN VARIOUS STATION IN GANGTOK (2003)

Year 2003	Temperature 0^0				Rainfall		Relative Humidity		Evaporation		D.P
Month	Gangtok		Tadong		(mm)		%		(mm)		(0 ^{0}C)
	Min.	Max.	Min.	Max.	Gangtok	Tadong	Gangtok	Tadong	Gangtok	Tadong	Gangtok
January	5.8	13.1	7.2	16.5	1.5	1.3	79.0	83.0	1.2	2.8	2.9
February	6.6	13.5	8.4	17.7	6.2	5.0	88.0	86.0	1.1	2.6	5.6
March	9.1	15.9	11.0	21.0	4.3	5.9	84.0	83.0	1.4	2.8	7.9
April	13.0	20.3	14.9	25.0	17.0	15.3	84.0	82.0	1.5	2.9	12.0
May	14.0	21.3	15.9	26.3	20.0	16.0	84.0	70.0	1.5	3.2	13.3
June	16.9	21.7	19.1	26.6	21.9	19.3	95.0	85.0	1.4	2.8	17.4
July	17.7	21.8	20.0	26.3	19.0	17.9	96.0	89.0	1.4	2.8	18.0
August	18.0	23.0	20.2	27.9	14.7	11.7	96.0	79.0	1.6	2.9	18.3
Septembe	17.1	21.3	19.4	26.4	13.4	12.0	96.0	82.0	1.5	2.9	17.5
October	14.0	21.0	16.3	24.6	7.2	9.3	93.0	78.0	1.8	3.2	13.8
November	10.0	16.1	12.1	20.7	0.6	4.4	90.0	76.0	1.4	3.1	9.7
December	7.0	14.7	8.6	17.5	2.2	1.6	78.0	67.0	1.5	3.0	4.8

Source: Department of Meteorology, Govt. of India, Baluakhani, Gangtok

The rainfall in the same month is recorded 21.9 mm. This indicates that the temperature and rainfall are maximum in the month of June-July. The continuous rain and temperature may lead to expansion and contraction of landform and the weak zones may invite landslide, sinking and subsidence. Hence all these factors may lead to various intensity of environmental degradation in the locality

1.10 VEGETATION

Sikkim is a house of natural vegetation with diversified botanical resource. She harbours over 6000 plants species across diverse geographical conditions. The floral diversity comprises of over 300 species of trees, bamboos, orchids, rhododendrons medicinal plants etc.

The major factors controlling vegetation are:

- Climatic conditions such as rainfall, temperature, soil, humidity and moisture.
- Relief including steepness of slope. terrain etc.
- Geology such as rock structure, morphology, rock formation and property of porosity, permeability, softness and hardness.
- Latitudinal and altitudinal variation.
- Soil fertility, erodibility and its chemical composition.
- Porosity, permeability and soil nutrient.

1.10.1 Classification

According to Singh and Chauhan (1998) vegetation are classified into four major types. Each type differs in climatic and physiographic variations.

a-*Tropical forests*

The vegetation found upto 900m above main sea level are categorized as tropical forest, it constitute mainly of tropical moist deciduous to semi-evergreen species with the predominant sal cover. The valley of Tista and Rangit extending upto the border of West Bengal is known for such vegetation.

b-*Sub-tropical forest*

These forests occur at the elevation ranging from 800 to 1500m, along the Tista and Rangeet catchment areas. Ferns and fern allies of Orchid characterize forest cover in this belt.

c-*Temperate forest*

The forest lying between altitude ranging from 1500 to 3500 m are classified as temperate forest, Lachen and Lachung exhibit such vegetation. Temperate forest can be further divided into broad leaved and coniferous forest.

d-*Alpine vegetation*

The altitude of this region ranges from 3500 to 5000m where species of rhododendron, berberies, cotoneasfer etc. are dominant. At the higher altitude

zone of Tsangu, Lachen, Lachung areas, alpine type vegetation with stunted bushes are found. Plants of medicinal value such as Aconilum hetrophyllum etc. are common in Zemu valley along Lachen-Lachung belt. The areas towards Chholamu and Lhonek valley are dominated by the species from Tibetan highland.

Thus Sikkim is richly endowed with natural flora and fauna. The natural vegetation consisting of evergreen trees, grasses, and bushes extends upto 4000m MSL only. At elevations above 5000m MSL hardly any vegetation is found.

1.11 SOIL

Soil is geographically defined as "the naturally occurring unconsolidated upper layer of the ground consisting of weathered rock which supplies minerals particles, together with humus, the most common medium for plant growth". The five major factors affecting the formation of soil are: i) Climate, ii) Relief, iii) Parent materials, iv) Vegetation, and v) Time. Distinct soil type in Sikkim is found in the steep hills, deep valleys, terraces, scarps rides, cliff, and different glacial zones.

1.11.1 Classification

The soil type varies with varying altitude. According to report prepared by National Bureau of Soil Survey and land use Planning Nagpur, major soil type in Sikkim are identified as (Das, *et all*, 1996).

The geographical area of Sikkim has been categorized into five major divisions. The relationship between these physiographic units and soil are elaborated as under.

1.11.1.1 *Soil of summits and ridges*

The factor affecting soil on summit and ridges are climatic and angle and degree of slope. Further micro level classification has been done as per the slope. *Ridge with above 30% slopes*: Soils at this slope is characterized by fine loamy with loamy surface having the property of moderate erosion well

developed in deep and excessively drained areas. The total area occupied by such soil is 11435ha, which amounts to 1.61% of the total geographical area. suitable crop cultivation includes paddy, maize etc. However, major portion of the area is pre-dominantly covered by forest. Soil acidity and erosion are the two major problems associated with such soils.

A. *Ridges with 15 – 30% Slopes*: Soils are drained deep with loamy surface. Rich in humus such soils are acidic in nature. They are classified as Hapludolls and Umbric Dystrochrepts. The total area covered by this soil is 15388 ha amounting to 2.17% of the total geographical area. Paddy and millet are the suitable crops in this type of soil. Major problems associated with such soil include erosion and surface stoniness.

B. *Ridges with below 15% Slope*: Well-drained soil with deep and fine loamy surface with the property of moderate erosion falls within this slope. Soil profile development is slight and hence classified as Cumulic Haplumbrepts and Pachic Haplumbrepts. Total area under such soil is 1974 ha, which spread over 0.28% of total area. Temperate forest is common and paddy cultivation occurs in such areas. Soil erosion is the main problem of this zone.

1.11.1.2 *Soils on side slopes and hills*

Such soils are well developed along the slope of a hilly terrain. Formation of soil on side slopes is greatly influenced by steepness of slopes. Most of the area remains under perpetual snow covered and snowfall is common. Temperature varies from 7.8^0C – 17^0C and rainfall varies from 821mm at Thangu to 1652mm at Lachen in North Sikkim. The other slopes receive 2197mm rainfall at Damthang and 3494.5mm rainfall at Gangtok.

1.11.1.3 *Soils on valleys*

Common in moderately steep slope ranging between 15-30%, slope, characterised by mild summer and cold winter in the northern region. Annual rainfall received at Rangpo station is 2500mm.

Further classifications of valley soils are as under:

a-*Thermic soil temperature regime*: Mainly found along the bank of river Tista, the soil is acidic and rich in humus. Total of 0.77% of area is covered by this soil covering total geographical land of 5448 ha.

b-*Mesic soil temperature regime*: Along the bank of river Tista and its tributaries in northern part, it covers the geographical area of 3225 ha. occupying 0.45% of the total land area.

TABLE 1.10: STATUS OF SOIL DEGRADATION

Soil Degradation	Degree of degradation('000 Ha)			Total
Type	Moderate	Strong	Extreme	Area (%)
Water Erosion				
Loss of top soil	151.7	81.6	12.3	245.6
	(21.4).	(11.5).	(1.7).	(34.6).
Terrain deformation		7.7		7.7
		(1.1).		(1.1).
Total area	151.7	89.3	12.3	253.3
	(21.4).	(12.6).	(1.7).	(35.7).
Stable Terrain				
Under natural conditions				196.1
				(27.6).
Rock-outcrops and cliff				81.6
				(11.5).
Land with no degradation problems				88.2
				(12.4).
Misc. area (Ice cap)				90.4
				(12.7).

Source-Das, Sarkar, Sehgal 1998 (bracket figures indicate values in percentage)

1.11.1.4 *Soil on cliffs and precipitous slopes*

Such soils are classified into two types

a-*Thermic soil temperature regime*. It covers an area of 16692 ha. and shares over 2.35% of total geographical area. Land under this soil is permanently left fallow.

b-*Mesic soil temperature regime*. It is mainly confined to periglacial region of North Sikkim. It covers an area of 69874 ha. and spread over 9.85% total area.

1.11.1.5 *Soils on glacial drifts/moraines/stones*

These soils cover an area of 25468 ha. and share 3.59% of total geographical area. Soil comprises of maraines and boulders. Forest with luxuriant vegetative growth is common. (Das *et all*. 1996)

1.11.2 Severity of degradation

The severity of degradation is expressed by the combination of the degree and relative extent of the type of degradation process. There are (Table 1.10 & 1.11) low, medium, high and very high severity class of soil degradation in Sikkim occupying 14.2, 7.5, and 162.9, 69.6 thousand hectare of area respectively.

TABLE 1.11: STATUS AND SERVERITY OF SOIL DEGRADATION

Soil Degradation	Severity class(in '000 Ha)				Total
Type	Low	Medium	High	Very High	area (%)
Water erosion	14.2	7.5	162.9	61.0	245.6
	(2.0).	(1.1).	(22.9).	(8.6).	().34.6
Terrain deformation				7.7	7.7
				(1.1).	(1.1).
Total area	14.2	7.5	162.9	69.6	253.3
	(2.0).	(1.1).	(22.9).	(9.7).	(35.7).

Source: Das, Sarkar, Sehgal 1998 (Figure in bracket indicate percentage)

CONCLUSION

Historically, state is as old as 1642,when first ever Phuntsog Namgyal was consecrated as King to rule over Sikkim. After it became Indian state, real developmental activities were carried out at a faster rate. The Himalayan state is endowed by mountains, lakes, ranges, caves, passes, rivers, glaciers, with diverse climate, vegetation and soil. The beauty of Sikkim Himalayas lies in high altitude eco-fragile geographical regions. Owing to tourist visit in such fragile areas, mountain eco system seems to have been damaged to a great extent. The lakes are the source of water used in domestic purpose human interferences and animal grazing is rampant. Lakes are transformed into recreation and water sports. Cementisation and concretisation process is

growing in the name of infrastructure development. Concrete footpaths surround the Khecheopalri Lake as a result of lakes drying up slowly. Water table is lowering and lakes are drying up imperceptibly. Broadly, lakes are under constant threat and environment degradation is perceptible to common man. The rapid growth of tourism in lake area has further threatened the ecological base of the State.

The relief, climate, vegetation, soil and other geographic features such as cave, pass, glaciers and hot springs are the major places of tourist interest. It can be summarized that all the resources are tourism products in Sikkim Himalayas. Hence development of such region needs proper planning and management.

This chapter will help the reader to analyze various geographical and historical facts of the study area. The next chapter will throw light on how people strike balance with nature and what are the diverse economic activities performed in such condition.

CHAPTER - II

POPULATION DYNAMICS AND SOCIO-ECONOMIC CHARACTERISTICS

INTRODUCTION

The people in general living together in a community is said to have been living in a society. Individual is the basic unit of a society without which one cannot assume an aggregate. Socio economic characteristics normally refer to the economic structure of an individual collectively representing the social entity as a whole. Socio economic characteristic is a complex phenomenon as it involves physical and social action.

Moreover the study of human groups, social union and their functional relations effect natural environment in different ways. The study of dynamic relationship between unresting man (cultural environment) and unstable earth (natural environment) is must in finding out the socio economic condition of different social groups.

Therefore socio economic characteristics of population manifest the geographical phenomenon of earth surface that are directly related to human activity in an eco-system.

Sikkim lies in northeastern mountain belt therefore identifying socio economic characteristics of its population are significant to understand mountain and human adjustment. It is pertinent to observe nature of relationship between nature, society and human being because each of the element is interrelated and coexisted at a given place and time.

The level of society and human behavior generally controls the factors of environmental degradation. For example in rural area, there is a tradition to get out of home every morning in search of fodder and firewood, a dead man in pyre is burnt by piling firewood of not less than one tree. All these cultivated traditions are directly or indirectly deserting the natural environment at large.

In mountain eco-system the characteristic features of physical or natural environment is essentially studied to understand human response.

The interplay of these two forces often creates a unique blend of nature and culture in a given area. Socio economic characteristics explain the social phenomenon such as life style, customs, traditions, dress code, food habits, occupational structure, ethnicity and other social practices. On the other hand economic characteristics normally refer to the economic structure, which are measured by the rate and magnitude of human developmental activities in a given area. However social, economic and natural activities are interrelated in defining the existing environment. The social advancement is determined by the intensity and degree of mobilization of regional resource.

The present study attempts to trace out the socio economic characteristics of three distinct communities of Sikkim namely the Nepalese, Lepchas and the Bhutias. Though customs and traditions of these distinct ethnic groups vary yet there exist uniformity in social adjustment as a result, beautiful cultural syncretism has evolved in Sikkim. Nevertheless, there exist spatial variations in their social practices, customs and traditions etc, which can be measured by the prevailing lifestyle displayed in a social milieu. Their environment concern and indigenous knowledge system is largely governed by their culture, tradition and way of life.

Demography is a statistical and mathematical study of human population in relation to size, distribution and composition of population. The element and component of demography include fertility, mortality, migration and other minor attributes of population studies. The composition such as birthrate, death rate, migration, sex ratio, density of population and growth rate have been incorporated in this chapter. Human activities their progress and advancement is studied with respect to education, agriculture, livelihood, occupation health etc.

2.1 POPULATION IN SIKKIM-AN OVERVIEW

Sikkim has recorded a total population of 5,40,493, which amounts to 0.05% of the total population of the country. It occupies 0.22% of the total geographical area of India. The total population of Sikkim in 1891 was recorded 30,458, which grew up to 5,40,493 in 2001. The annual growth rate

of India records 2.13%, which is lower than 3.29% of Sikkim during 1991-2001. The sex ratio has drastically reduced from 912 females per thousand males in 1891 to 875 in 2001. Literacy rate of the state is 69.68, which is higher than the national average. The rate of urbanization is slow, only 11.11% population lives in urban centers.

Sikkim has reached 24.4 times growth of population from 1891 – 2001. For the last three decades, rapid growth has taken place. With a mere 22,152 in 1891, State population alarmingly went up to 540493 in 2001. Except for 1911 – 1921 where the growth had declined, rest of the decades have shown phenomenon increase in population. The natural increase however is not accelerated with growth. The rapid rate of growth is due to influx but birth and death rates have been reduced. In the year 1981 birth rate was 31.0 per milli, which was reduced by 24.3 per milli, in 1993, (natural growth rate declined) from 22.1 to 17.4 per milli respectively during the decade 1981 – 1993. The high growth rate recorded during the decade 1971 – 81 may be attributed to its merger in Indian Union. However in West Sikkim growth rate is low which may be attributed to slow migration due to lack of infrastructure facilities. The uneven growth rate of population since 1901 is revealed with 49% in 1911 – 1921 and 34% in 1921 – 31. The decades of 1931 – 41, 1941 –51, and 1951 – 61 have registered a phenomenal growth of 10.67%, 13.34% and 18% respectively. During 1961 – 71 growth rate accelerated to 29% may be due to the onset of developmental work in Sikkim, further, during 1971 – 81 rapid increase with 51% growth rate was measured (Rai Tamang 1998). The annual growth rate of 3.29% in Sikkim during 1991 – 2001 is greater than 2.13%, an annual growth rate of India. Even in 1911 – 21 the average growth rate is higher than in India. The district level decadal variation shows rapid expansion in population in the eastern region, wherein population of 85,621 in 1971 suddenly went up to 178,452 in 1991. Same trend is followed in south district where population of 53,185 suddenly went up to 98,604 in 1991. Whereas in north Sikkim, 13,014 persons were recorded in 1971, which grew in number to 31,240 in 1991, which is comparatively slow rate of expansion.

2.1.1 Population growth

The population dynamics from 1891 to 2001 exhibit a growth of 24.4 times in Sikkim (Table 2.1). It is mainly due to rapid natural growth of population and migration. For the past three decades there has been uncontrolled growth of population.

It is (Table 2.1) depicted that the rate of population growth has been fluctuating in the State. There has been negative growth of population during 1911-1921. This could possibly be due to famine, plaque and epidemic of 1917 and partly due to the death of Gurkha warriors from Sikkim during the First World War. From 1921 to 1971 growth of population has increased steadily. During the decade of 1971-1981 substantial increase at a rate of 5.07 percent per year is noticed in the urban areas.

TABLE 2.1: TEMPORAL CHANGES IN POPULATION OFSIKKIM: 1891 2001

Year	Male	Female	Total	Sex ratio (females per '000 males)	Decadal % variations	Density of population Km^2
1891	11589	10563	22152	912	-	-
1901	39795	28219	59014	709	166.4	8
1911	45059	42861	87920	951	48.98	12
1921	41492	40229	81721	970	-7.05	12
1931	55825	53983	109808	967	34.37	15
1941	63289	58231	121520	935	25.42	17
1951	72210	65515	137725	907	13.34	19
1961	85193	76996	162189	904	17.76	23
1971	112662	97181	209843	863	29.38	30
1981	172440	143945	316385	835	50.76	45
1991	216427	190030	406457	878	28.48	57
2001	288217	252276	540493	875	32.98	76

Source : Census of India, 1981, 1991 and 2001; Sharma and Sharma 1997

This could be mainly due to in-migration that took place after 1975,when large number of job hunters poured into the state. In the year

(1981-1991), population grew at lower rate of 2.85% per year. However in the year 1991-2001, growth rate was high, at 3.29 percent per year. This increase may not be the natural increase in population rather it could be due to in-migration to work in various developmental activities like road constructions and hydro-power projects undertaken by NHPC. The district- wise population growth shows uneven character throughout. With the exception of West District, for which high growth rate was attributed, remaining districts had recorded fall in the decadal growth rate of population between 1981 and 1991. The North District recorded the highest decennial increase by nearly 104 percent in the decade 1971-1981 and the lowest increase of 18 percent during the year 1981-1991 respectively.

According to Risley (1894), Nepalis with 56 percent (including Murmi) constituted a majority of the population followed by the Lepchas (19 percent) and Bhutias (16 percent). There were other constituents like the Khambus and slaves. More than a hundred years later the share of Lepcha population has gone down to 14 percent whereas that of the Nepalis climbed to almost 70 percent with the Bhutias constituting more or less the same proportion (Lama, 2001). All these three ethnic groups have their own language, culture and social practices and have strong socio-cultural bond among themselves (Risley 1894).

2.1.2 Rate of natural increase in population

Broadly the difference between birthrate and death rate is the net increase of population. The net increase therefore is the natural increase of population. The growth of population due to migration is not taken into account while calculating natural increase. When fertility is greater than mortality, natural growth is higher.

The comparative study has been done (Table 2.2) where death rate has always remained lower. This is due to access to improved medical science and proper health care. The crude birth rate in Sikkim has always been lower than the all India average, except 1983,87,88 & 89, in which it has been slightly higher. In the year 1990, there was a sharp declined natural

growth in Sikkim. Comparatively the crude death rate also has been relatively lower in Sikkim.

TABLE –2.2: BIRTH DEATH RATES FOR INDIA & SIKKIM (1981– 93)

	INDIA			SIKKIM		
YEAR	Birth rate	Death rate	Natural Growth Rate	Birth Rate	Death Rate	Natural Growth Rate
1981	33.9	12.5	21.4	31.0	8.9	22.1
1982	33.8	11.9	21.9	31.6	9.5	22.1
1983	33.7	11.9	21.8	34.5	10.9	23.6
1984	33.9	12.6	21.3	31.7	10.2	21.5
1985	32.9	11.8	21.1	33.1	10.7	22.4
1986	32.6	11.1	21.5	32.1	11.7	20.4
1987	32.2	10.9	21.3	33.3	10.3	23.0
1988	31.5	11.0	20.5	33.8	10.1	23.7
1989	30.6	10.3	20.3	31.4	9.1	22.3
1990	30.2	9.7	20.5	26.3	7.3	19.0
1991	29.5	9.8	19.7	22.5	7.5	15.0
1992	29.2	10.1	19.1	22.0	5.8	16.2
1993	28.7	9.3	19.4	24.3	6.9	17.4

Source: Sample Registration Bulletin Vol. 29 No. 2, July, O/o the RGI.

The natural increase in the year 1983, 87,88 & 89 has been slightly higher and in the year 1990, there was a sharp declined natural growth in Sikkim.

2.1.3 Distribution of population

Unevenness is the main characteristic of population in Sikkim. The main factors affecting population distribution include relief, drainage, climate, soil, vegetation, natural resource, agriculturable land etc. Owing to suitable physiography, climatic conditions and land availability for agriculture, East District has remained most populous till 2001. According to Census 2001, out of the total population, East District constitutes 2,44,790 persons followed by 1,31,506, 1,23,174 and 41,023 in South, West and North District respectively. The total male and female population in the state accounts to 2,88,217 and 2,52,276 respectively. The majority of males over female are found in all the four districts of Sikkim.

Owing to its harsh climatic condition and meager land available for cultivation, the North District is sparsely populated in comparison to other Districts. The decadal growth rate in North District (Table 2.3) shows substantial increase to 31.32% during 1991-2001 from 18.09% during 1981-1991

2.1.4 Districtwise distribution of population

The East District is the most populated district, which contributes almost 50% of the State population. The annual growth rate during 1991-2001 has been highest in the East District, which amounted to 3.7%. The decadal growth rate of West District showed a decline from 30.55 % to 25.48% during 1981-91 to 1991-01.Whereas in South District, there has been considerable increase from 29.78 to 33.37 % during the same period.

TABLE 2.3: POPULATION DISTRIBUTION (PERCENTAGE DECADAL GROWTH RATE, MALE-FEMALE RATIO AND DENSITY OF POPULATION IN DIFFERENT DISTRICTS OF SIKKIM)

State/ District	Population in 2001			Percentage decadal growth rate		Sex ratio (females per '000 males)		Density of Population per km^2	
	Total	Male	Female	1981-91	1991-01	1991	2001	1991	2001
Sikkim	540493	288217	252276	28.47	32.98	878	875	57	76
North.	41023	23410	17613	18.09	31.32	828	752	7	10
West	123174	63835	59339	30.55	25.48	915	930	84	106
South	131506	68227	63279	29.78	33.37	892	927	131	175
East	244790	132745	112045	28.60	37.17	859	844	187	257

Source : Census of India, 1981, 1991 and 2001

District wise distribution of population over the geographical area reveals that North Sikkim covering 4226 sq. Km. land is the largest in area but smallest in human population with 41,023.Whereas the East District with 954 Sq. Km. area contributes highest number of population estimating 2,44,790 persons. South Sikkim though smallest in size yet placed in second rank with the population of 1,31,506.

2.1.5 Age composition

According to 1991 census the proportion of children within the age group of 0 – 4 years constituted 39.23%, age group within 15 – 59 years constituted 54.94% of the total population and more than 60 years of age constituted 4.56% population. The total share of dependent population directly or indirectly is around 43.82% and the rest are productive in nature. Total of 54.94% population falling under working group (Census of India, 2001) are the major human resource available with the state at present. However, after attaining the age of 60 years and below 14 years, few numbers may constitute to working class.

2.1.6 Sex ratio

The only state in India with females outnumbering male is Kerala with 1036 female per thousand males (1991). India has experienced ever declining sex ratio with the only exception in the years 1901, 11, and 21.An uneven sex ratio is recorded in Sikkim. The sex ratio of Sikkim is 875 in 2001, which has slightly declined from 878 in 1991. The district wise sex ratio reveals the record increase of sex ratio in the West and South Sikkim from 915 to 930 and 892 to 927 in the decade 1991 and 2001 respectively. (Table 2.4) The sex ratio had decreased from 912 to 709 during 1891-1901, which again went up to 970 in 1921 and later showed sharp decline to 835 in the year 1981. The findings reveal an increase by 43 females i.e. 878 in 1991 compared to 835 in 1981. In 2001, this has also been decreased to 875. Comparison of the sex ratio shows that the North District has the lowest sex ratio. (752 females per 1000 males). The ratio was above 900 in the West and South Districts.

TABLE: 2.4: DISTRICT WISE SEX RATIO IN SIKKIM (1981 – 2001)

District	Years		
	1981	1991	2001
North	789	828	752
East	797	859	844
South	854	892	927
West	906	915	930
Sikkim	835	878	875

Source-Census of India, 1991, provisional totals of 2001

2.1.7 Density of population

The number of person per Sq. km estimates the density of population. The density of population in Sikkim is 76 persons per km^2, which is lower than the national average. (Table 2.5) The main feature of district-wise density showed that density in all the districts have gone up and highest density of 257 persons per km^2 is recorded in East District followed by South and West districts. North Sikkim exhibits 10 persons per km^2, which could mainly be due to inhospitable climatic conditions characterized by forest and snow cover.

2.5 DISTRICT WISE DENSITY OF POPULATION / KM^2

Year	North	East	West	South	Sikkim
1991	7	187	131	84	57
2001	10	257	175	106	76

Source-Census of Sikkim, 2001

In the year 1901, the density of the population per km^2 in the state was around 8, which increased to 76 in 2001. It is evident that there has been remarkable increase from mere 57 persons per km^2 in 1991 to 76 persons per km^2 in 2001.In Indian context the density of population increased from 77 persons in 1901 to 267 persons in 1991.

The density of population in four districts have increased during 1991 to 2001.As in the case of West District, an increase is noted from 84 to 106 persons per km^2 In South District, it increased from 131 to 175 persons per km^2. The East District recorded highest increase from 187 to 257 persons per km^2 from 1991 to 2001 respectively. The North district having nearly 60% of the total geographical area accounts for hardly 7.6% of the total population in 2001. The density of population recorded is 10 persons per km^2, rating lowest in the state.

2.1.8 Literacy rate

Progress and development of a nation depend on the total number of literates contributing to productive human resources. The state has 69.68% literates, trend of increase in 1981, 1991, and 2001 were 22.20%, 46.76%,

and 69.68% respectively. The literates in urban centers constitute 84.82%, which has increased from 69.85% in 1991. The number of literates in rural area constitutes 67.67%, which subsequently increased from 44.14% in 1991. It is estimated that the highest literacy rate is recorded in the East District with 75.57% followed by North, South and West districts with 69.11%, 68.12%, and 59.31% respectively. Among the urban centers, Gangtok recorded with 10,012 persons literates. On an average, Sikkim is positioned in better place than the national standard (Census, 2001) in rate of literates.

2.1.9 Migration

Of the three components of population growth *viz,* birth rate, death rate and migration, the third component has played a significant role in accelerating the growth of population in Sikkim. Migration normally refers to the movement of people from one place to another. The term migration and out migration are used for internal migration, where no national boundaries are crossed, emigration and immigration refers to international migration. Besides, rural–urban, urban–rural, rural–rural, urban–urban migration, seasonal, innovative, intra migration etc. are the basic categories.

The growth of population in Sikkim after merger from 1975 is mainly due to various infrastructure developmental activities. As per census record, Sikkim during 1971 – 1981 recorded about 30% in migration. The rate of male migration is higher than the females. In 1991, the percentage of migrant to the state decreased from 19% to 13% (according to place of birth) and from 16% to 9% by place of last residence.

2.1.9.1 *Types of migration*

The various types of migration are Immigration and Emigration, in migration, out migration, regional migration, rural and urban migration etc.

TABLE 2.6: IMMIGRANTS FROM OTHER INDIAN STATES, UNION TERRITORIES/OTHER COUNTRIES

Immigrants From	Census Year								
	1971			1981			1991		
	P	M	F	P	M	F	P	M	F
Birth Place									
Other states/Uts	11,345	7,876	3,469	33,822	20,780	13,042	31,992	17,948	14,044
of India	(53.88)	(60.74)	(42.89)	(57.45)	(57.38)	(57.58)	(62.58)	(61.69)	(63.74)
Other Countries	9,710	5,091	4,619	25,046	15,436	9,610	19,132	11,144	7,988
of the world	(46.12)	(39.26)	(57.11)	(42.55)	(42.62)	(42.42)	(37.42)	(38.31)	(36.26)
Total	21,055	12,967	8,088	58,868	36,216	22,652	51,124	29,092	22,032
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Place of last Residence									
Other states/Uts	11,551	8,007	3,544	30,660	18,655	12,005	23,319	13,067	10,252
of India	(55.07)	(62.03)	(43.93)	(62.28)	(62.24)	(62.34)	(64.05)	(63.10)	(65.31)
Other Countries	9,424	4,901	4,523	15,570	11,317	4,253	13,087	7,642	5,445
of the world	(44.93)	(37.97)	(56.07)	(37.72)	(37.76)	(37.66)	(35.95)	(36.90)	(34.69)
Total	20,975	12,908	8,067	46,230	29,972	16,258	36,406	20,709	15,697
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source- Census of 1971,81,91,Migration table. (Value in parenthesis indicate percentage) (P=Population, M=Male, F=Female)

In the context of Sikkim, in-migration has been noticed in the year 1962 and after 1975. Firstly it is due to geopolitical problem arising out of Sino-India war and subsequent immigration of Tibetans from Tibet. Secondly, after Sikkim joined the mainstream to become the 22nd state of Indian Union in 1975.During this phase various developmental activities started in Sikkim. Various Institutes and offices were opened and it generated large number of employment avenues. Since the local residents were uneducated, people from nearby states poured into Sikkim to join various institutions and establishment. Further, various central offices were opened and large-scale commercial business also started in this period. The available data on migration, which primarily covers migration by place of (i) birth and (ii) last residence, between 1971 and 1981, Sikkim, recorded a very high level of in-migration, which amounted nearly to 35%. However, in 1991 the percentage of migrants to the state of Sikkim decreased in both categories, viz 19 to 13 percent by place of birth, and from 16 to 9 percent by place of last residence. It is interesting to note that the proportion of male in-migrants exceeds

women. Further it reveals that during 1981 and 1991 a sharp decline was recorded which moved from 61% in 1981 to 57% in 1991).

The study based on the origin of migrants in the 'by birth' category reveals steady decline in the proportion of in-migrants from neighboring countries. The figure indicates that the general decline took place from over 46% in 1971, to 43% in 1981 and 35% in 1991 respectively. Here a distinct line has been drawn where the proportion of in-migration from within the country has gone up from 54% to 65% between 1971 and 1991. Hence, (Table 2.6) by the year 1991, the total percentage of in-migration from within India stood higher than that of in-migrants from the neighboring countries such as Bhutan, Nepal etc.

2.2 WORKFORCE

The concept of workforce is associated with productivity, GDP and economic activities. It is an indicator of economic development of a State. The percentage and rate of workforce availability in a given region describes the degree of well being of that region. Further, quality of human resource and its economic importance also are the indicators of development.

In terms of job undertaken, the population of a place may be distinguished as workers and non-workers; the workers can be further classified into main workers and the marginal workers. A person who has worked for a period of 6 months or more is treated as a main worker and the one who has worked for less than 6 months is a marginal worker. A non-worker is the one who has not worked for any of the above two periods.

The cultivators, agricultural laborers, industrial workers and daily wage earners comprise the main workers while students; household dependents, pensioners and casual workers are non-workers. The Census data of 2001 shows that the total workforce in Sikkim is 48.72% and the remaining 51.28% are non-workers. The available workforce is further divided into 49.9% as cultivators, 6.4% as agricultural laborers, 1.2 % engaged in household industries and the rest 42.4% falls in other categories.

(Table 2.7) There is a gradual decline in the number of cultivators during the period 1971 - 2001 from 81% to 49%.

TABLE 2.7: TEMPORAL CHANGES IN THE OCCUPATION STRUCTURE BY SEX IN SIKKIM (1971 TO 1991)

Sectors	1971			1981			1991		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Cultivators	74.53	92.28	81.00	50.16	79.52	60.10	50.96	71.74	57.84
Agricultural laborers	4.12	3.16	3.77	3.45	3.06	3.31	8.04	7.37	7.81
Livestock, forestry, hunting, fishing & plantation orchards & allied	0.60	0.48	0.55	1.93	0.92	1.59	2.99	1.58	2.53
Mining & quarrying	0.09	0.00	0.05	0.17	-	0.11	0.30	0.05	0.22
Manufacturing, Processing, servicing and repairing.									
(a) Household industries	0.50	0.04	0.34	1.25	0.74	1.08	0.99	0.33	0.77
(b) Other than household industries	1.31	0.26	0.93	3.14	1.29	2.51	3.94	1.88	3.26
Construction	4.85	0.87	3.40	10.47	4.98	8.62	8.84	3.54	7.09
Trade and commerce	3.09	0.48	2.14	5.08	1.00	3.70	6.79	2.08	5.23
Transport, storage & communication	2.27	0.42	1.59	1.55	0.07	1.05	2.62	0.24	1.82
Other services	8.64	2.01	6.23	22.80	8.42	17.93	14.53	11.19	13.43
Total workers	100.00	100.00	100.00	00.00	00.00	100.00	100.00	00.00	100.00
	70933	*40644*	*111577*	*97508*	*49928*	*147436*	*109994*	*54398*	*164392*
% of main workers to total population	**62.97**	**41.28**	**53.17**	**56.55**	**34.69**	**46.60**	**50.82**	**28.63**	**40.45**

Source : Census of India, 1971, 1981 and 1991(Bold Number indicate Percentage)
Note : Values in italic are the total number of workers

It is further interesting to note that the number of agricultural laborers came down sharply from 3.8% in 1971 to 3.31% in 1981 but again increased to 7.81% in 1991.In terms of employment, the other services has substantially increased from 6.23% in 1971 to 17.93% in 1981, but again decreased to 13.43% in 1991. It is a universal fact in the context of Sikkim that after merger in 1975, a large number of vacancies under Government departments were

filled up which ultimately changed the prevailing pattern of workforce in Sikkim.

2.3 ETHNICITY AND ENVIRONMENT

The study of specific community reveals that the developmental activities take place in accordance with their prevailing indigenous knowledge system. An attempt has been made to elucidate the socio-cultural set up of the three communities in Sikkim. Ethnic variations are guided by religious philosophy of an individual. Some communities are nature worshipper and their guardian deities are rivers, mountains etc. that help preserve the mountain environment to a great extent.

2.3.1 The Lepchas

The Lepchas are one of the earliest tribes of Sikkim. They have a legend which says that they originated from *mayel Lyang*, a mythical land at the foothills of Mount Kanchendzonga in Sikkim itself. (Gowloog, 1998) Human interaction with natural environment is as old as evolution of human civilization on the earth but spatial variations exist in them. The factor affecting adjustment is religious practices, nature of economic pressures and fundamental knowledge on natural environment. Due to diverse socio-economic factors, impact on natural environment also varies from place to place. The adjustment pattern of the Lepcha tribe on natural environment is a subject for research because the Lepchas have been dwelling in jungle; riverside and hilly regions in the extreme climate ever since dwelling took place in Sikkim.

The original religion of Lepchas is known as mon bongthing. They indulged in animal sacrifices to placate the various deities of clan, villages, forest, river, wind etc. they are the lover of nature and worshippers of nature especially the Mount Kanchendzonga and believe the role of supernatural elements. Worshipping in jungle is their traditional religious practice but now such practices are vanishing slowly. The lepcha people are mostly concentrated in highland of north Sikkim. The northwestern part of the state is

highly elevated and therefore remains under snow cover almost throughout the year. Adaptation to such elevated area may cause a kind of illness or sickness known as hypoxia, which is caused by the deficiency of oxygen in the tissues of the body. As oxygen deficiency is the major problems. Nevertheless, the Lepchas people are found adapted to this environment.

The above study proves that people bank directly upon nature for spiritual and religious contemplations. Therefore, there exist every possibility of degradation of environment due to excess and uncontrolled use.

2.3.2 The Bhutias

The Bhutias also have similar characteristics to those of the Lepchas. This similarity is in terms of their adoptive responses to the natural environment as Bhutias are generally highlanders. They prefer joint family rather than nuclear one. In the very beginning the lifestyle of the Bhutias was somehow similar to that of the Lepchas. The rapid economic improvement brought about drastic changes in their life. The level of educational attainment is also high and as a result they started to lead higher standard of living. Expansion of economic growth among the Bhutia has abruptly segregated the Lepchas from their milieu. They started to occupy the fertile land of more advanced region and slowly shifted from remote corner to better places. Moreover, interaction with environment is similar as Lepchas, as they both prefer cold climatic region of high-elevated land for living.

2.3.3 The Nepalese

Nepalese population in Sikkim is found in majority and is spread all over the regions. They introduced agriculture and gradually transformed the nomadic society of the Lepchas. The Nepalese are said to be industrious and hardworking (Kuhn Delia, 1962). It is significant to note that the Nepalese have not only influenced the economic activities of this region but also has put impact on social, natural and cultural environment to a great extent. During the land holding system, mass agricultural land was transformed to individual holding and massive environmental changes were recorded. The land was put

to agricultural use and development activities were started even in the remote corner of the State. As a result, new socio-cultural and natural environment came into existence in the state of Sikkim. This phase can be called as the introductory age of environmental degradation. With a view to increase revenue of the state, large jungle were cleared for housing and infrastructure development activities.

2.4. ECONOMIC INDICATORS

Per capita income, productivity and access to natural resources are the basic determinants of economic growth of a region. In Sikkim, people are engaged in multi economic activities for their livelihood. Around 50 % of its population is engaged in primary activity from the very beginning. There is no structural change in the shift from primary to the secondary sector in Sikkim. This sectoral constrain is due to lack of job opportunity in private and public sectors. In Sikkim, the structural shift in economic activities has been slow and stable. (Figure 2.1) The trend in structural shift in the Sikkimese economy of different years show significant structural changes from one sector to the other. The occupational structure reflects slightly increasing trend in primary sector, recording 51.59% in 1980-81 to 52.03% in 1995-96 with a negligible increase of 0.44% only. The comparative figure shows almost non-existence of secondary sector. The secondary (Fig. 2.1) sector reveals marginal decrease from 18.10% in 1980-81 to 13.65% in the year 1995-96. Though tertiary sector show bulky volume yet no phenomenal increase is being noticed in the occupational pattern of its people.

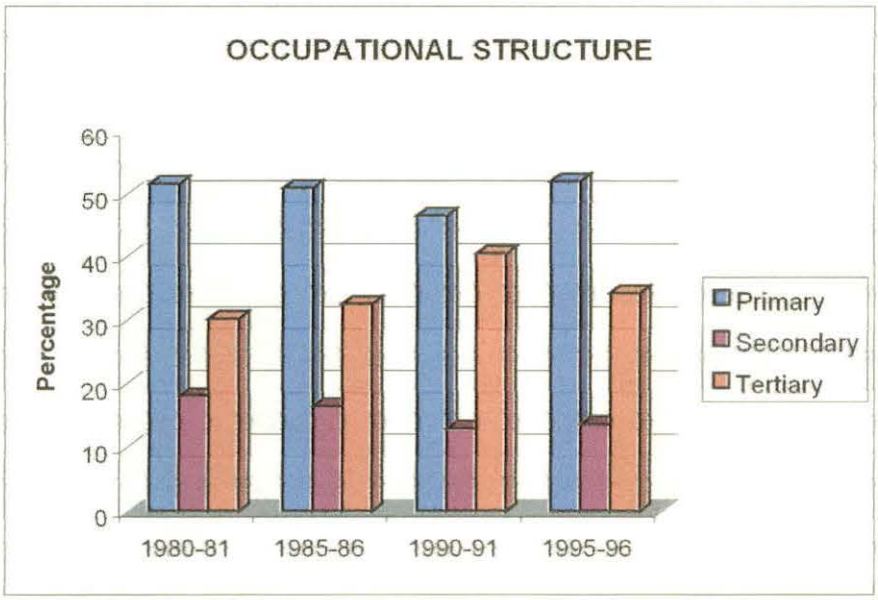


Fig-2.1 Occupational structure

2.4.1 Per capita income

Per capita income is one of the indicators that help exhibit ones social status and economic well being. In areas with high per capita income, the level of consumption is also high and there exist scope of developing industries and services. Besides per capita income, productivity of a region will also help to examine the socio-economic characteristics of a society. Economically well to do region have higher level of productivity.

The per capita income (Fig. 2.1) for the state of Sikkim in the year 1980 was recorded Rs 1,57100 at constant price. The same increased to Rs 34,9,200 in 1991-92. The race for attaining high per capita income is taking place at the cost of existing environment.

2.4.2 Domestic products of Sikkim

The steady economic growth at macro level is reflected both in terms of Gross Domestic Product and per capita income. In Sikkim, both the indicators at constant price have recorded a steady increase (Table 2.8) during the year 1980-1992. The highest growth is recorded in the year 1987 with 20.61 percent.

Table 2.8: NET STATE DOMESTIC PRODUCT & PER-CAPITA INCOME AT CONSTANT PRICES

Years	Domestic product Rs (thousand)	Annual growth rate (percentage)	Per capita. Income Rs. (thousand)	A.G.R (%)
1980-81	489,800		157,100	
1981-82	521,900	6.55	161,100	2.55
1982-83	588,200	12.70	175,000	8.63
1983-84	614,200	4.42	175,800	0.46
1984-85	694,600	13.09	191,,900	9.16
1985-86	755,900	8.82	201700	5.11
1986-87	891,700	17.96	229,700	13.88
1987-88	1,075,500	20.61	267,800	16.59
1988-89	1,149,000	6.83	292,400	9.19
1989-90	1,228,900	5.51	311,800	6.63
1990-91	1,353,200	10.11	336,900	8.05
1991-92	1,442,900	6.63	349,200	3.65

Source : Ministry of Finance, Economic Survey, Government of India, Various issues.

2.4.3 Human Resource

Occupational structure of a population is other fundamental aspect in analyzing the socio-economic characteristics and environment. These characteristics of population provide valuable information on relative density of productive and unproductive population in a society. Availability of population in dependent or unproductive (children below 15 years of age group, old and elderly person 60 years and above) and population in working age group i.e independent or productive population (between the age of 15-59 years) is vital for obtaining the variety of socio-economic characteristics and environmental position in a society. According to the specialization of workers or division of labors, the working population can be categorized into main workers and marginal workers, which depends upon the nature of their economic activities.

The main worker (Table 2.9) accounts for 80.7 % as compared to marginal workers with 19.3% only. The workers are engaged in exploiting, mobilizing, and utilization of resources. Hence their working pattern has close affinity with the natural and social surrounding. As a result, surrounding environment and landscape is constantly changing in Sikkim.

TABLE NO 2.9: DISTRIBUTION OF WORKERS IN SIKKIM 2001

	Number of workers				
Districts	Main	%	Marginal	%	Total
East	92465	79.2	24337	20.8	116802
West	45169	85.1	7962	14.9	53131
North	17572	74.4	6062	25.6	23634
South	57272	82.2	12481	17.8	69753
Sikkim	212478	80.7	50842	19.3	263320

Source: Sikkim Provisional Totals (2001)

2.5 SOCIAL INDICATORS

Education, health and social security are the most vital social phenomenon that acts as indicators to identify socio-economic characteristics of a given society. Each individual's level of educational attainment, state of health and assessment of social security help in measuring the level of satisfaction and prosperity. The social status of people will improve with the improvement in the basic services required in various level of human development. Hence an educated, healthy and secure society provides solid impetus for economic growth. It is necessary for a person to be literate before he becomes educated. Higher level of education provides dynamism to society and helps in improving social upliftment. Socio-economic characteristics differ from society to society, which primarily depends upon the literacy rate and level of educational attainment of its population. So it is important to examine the literacy rate and level of education of the people in order to find out the socio-economic characteristics.

The health of a society reflects the health of environment and his surrounding. Therefore the level of environmental destruction is closely related with level of human development. An attempt further has been made to correlate the various parameters of social indicators with the level environmental consciousness.

It is a fact that higher percentage of literacy rate (84.82%)is shared by urban areas. in all the districts of Sikkim and female rate is comparatively lower than male in all the cases. In rural area, 32.3% are illiterates (Census.

2001) and they depend mainly on nature for their livelihood and their little knowledge on environment may further deteriorate the environment. The progress in the literacy rate is very encouraging in the state but due to absence of further scope for employment in the Governmental sector, the unemployment rate also shows corresponding increase. As a result, the unemployed population again gets back to natural resource for their livelihood. At this point of time further natural destruction may occur at large scale. This has become a menace in every sector of Sikkim's economy.

2.5.1 Health infrastructure development

Health and education are the fundamental necessity of a society. The successive government in the state has given top priority to improve the health and hygiene of Sikkim. Both preventive and curative measures have been adopted to improve the health scenario in Sikkim. The basic development of health infrastructure has been taking place all over the State. Over the years, attention was paid in establishing health institutions of different types, developing health manpower, and launching different (Mukhopadhyay, 1998) health programmes in the State. Consequently, expenditure on health and family welfare has also been consistently increased.

Owing to difficult and inaccessible terrain in some part of the state, it had impact in terms of unmet health targets in the state. In Sikkim year1979-80 showed considerable increase in the number of health institutions are witnessed with a view to provide adequate primary health care services to its rural as well as urban population. The recent data of 2001-02 reflects 5 hospitals, 24 Primary Health Centers (PHC) and 147 Primary Health Sub-Centers (PHSC) in the state. Several efforts have been made to minimize the infant and maternal mortality, in conformity with strategies to achieve goal of health for all. Nevertheless, traditional way of treatment and medicine has continued to play an important role in the state. Many of the modern day health workers including the health worker in the primary health centres are also traditional faith healers. They have still faith on treatment of illness and

disease by super-natural powers rather than medicine. Hence in a typical blend of tradition and modernity, they work in hospital or health center during the day but perform the traditional tasks of a faith healer in the evening. Such practices prevail especially in rural areas.

Moreover establishment of hospitals and primary health centers even in the far-flung areas of Sikkim has brought about some changes in health infrastructure. Despite some proportion of rural society in Sikkim are still in the grip of fallacious traditional system of medicine.

The next significant aspect that can identify socio-economic characteristics is social security. Every society has a number of people who are incapable to perform multi-economic activity. These include sick, old, disabled, orphans, widow and unemployed persons. Under the social security programme, proper assistance should be provided to them. In Sikkim, the government is implementing such type of programs in order to provide social security for them. Among them old age pension, financial assistance for disable persons and widowers and distribution of rice free of cost for people below poverty line are implemented by Sikkim Government is noteworthy.
Since the rural people still have faith on supernatural power and the tradition of practicing herbal medicine is maximum there seems encroachment in medicinal plants. People usually collect medicinal plants either from forest or from close natural base. In such a scenario, it is expected that there is a danger of extinction of valuable species of medicinal plants.

2.5.2 Food habits

Food is derived from nature and cultivation of such food for consumption is carried out in accordance with the traditional system of local people. Food habit accustomed to particular ethnic groups can help in examining existing environment and social set up. The dietary system of Sikkimese people whether be Lepcha, Bhutias or Nepalese, their exist uniformity in the major ingredients of food. This paragraph attempts to analyze the indigenous fermented foods of the Sikkim Himalayas. Such food provides basic components of diet in the various forms of nutrition, flavour and texture.

The traditional fermented foods consumed by the people of Sikkim are *Kinema, Gundruk, Sinki, and sukako masu.* The fermented beverages prepared at each household are widely used by Nepalese, Bhutias, and Lepchas. Indigenous fermented foods are either alcoholic or non-alcoholic (Tamang, 1998) depending upon the custom of People. The basic foods of Sikkimese society include *Momo, thukpa, sel roti, rice* etc. The intake of rice is highest amongst all the communities. All such foods are prepared from the available resource; hence, food habit becomes an element of environment According to food habit, cultivation is carried out in the available land, for example millet and wheat is cultivated for food and alcoholic beverages. Due to rigorous cultivation, the topsoil erosion washes soil nutrients in many ways. For rearing cattle, goat, sheep, yak, fodder plants are not sufficient therefore clearing of grass, shrub, and trees have been taking place thereby endangering the existing mountain environment.

2.5.3 Education

Educational attainment is one of the most significant social phenomena of a society. The two parameters are applied in studying the level and rate of educational attainment and progress.

1. The first parameter is the teacher taught ratio, lower the teacher taught ratio, better is the quality of education. Because in such a situation, teacher can make his approach or pay personal attention to individual student and there will be indifference between teachers and students.
2. Secondly, the measurement of reading, writing and understanding. The population commission of United Nations considered the ability to read and write a single message with understanding in any language is a sufficient basis for classifying population as literate.

   In Sikkim, development of education infrastructure took place only after 1975 when Sikkim merged with the Indian union. It is evident that most of the schools are build up within the walking distance. There are total of 1099 schools (Fig 2.2) catering to the needs of students.

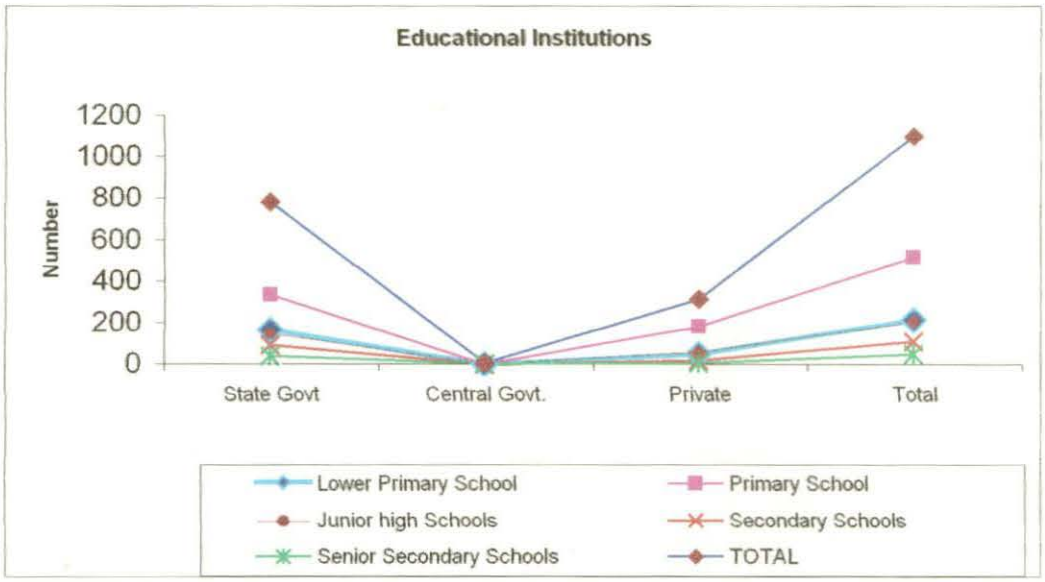


Figure- 2.2 Educational Institutions

Further it can be stated that Government has been paying more attention towards improving the standard of education in the state. Besides the above institutions, a large number of other institutions are imparting primary education, higher education, technical education and vocational education. These helped to improve the quality of education. At present there are three degree colleges, one law college, one research institute of tibetology, one teachers training college, one teachers training Institute, one technical industrial institute, fifty monastic schools, twelve sanskrit *pathsalas* and one blind schools established in Sikkim. In accordance with the increasing number of educational institutions in the state, there records corresponding increase in the number of teachers as well as students' enrolment.

2.5.4 Land use

Land is the most valuable resource for the survival of life on planet earth. The problems of land in India are indeed comparatively more acute. India has 16% of the world's population in just 3% of the geographical area. The cattle population is 13% of the world's with just 0.5% of the grazing lands.

Nearly one-fourth of cattle depend on grazing in forests and pastures. Annually about 220 million tones of fuel wood and 24 million tonnes of fodder are harvested for use. The overall productivity of forest is only 0.7 m^3/ha as against the world's average of 2 m^3/ha. Crop productivity is one-third in India compared to one-half in many countries of the world. Therefore there is immense pressure on the land resources in the country, which is quite evident on the above statistics. As a consequence it is estimated that nearly 40% of the land area (Dhar 2001) in the country is at present degraded in one form or the other and has either already turned into or is steadily turning into, waste lands.

2.5.4.1 *Landuse dynamics*

Land-use in the state of Sikkim are categorized into nine different classes namely, forest, barren land, pasture and grazing land, current fallow land, uncultivated land excluding fallow, fallow other than current, land not available for cultivation, cultivable waste land, and net sown area. The area covered by forest in 2001 is recorded at 44% but in 1990-91 the area under forest cover was 42% of the total geographical area of Sikkim. The area under barren land is 25.37%, pasture and grazing land is16.95%, and the net sown area is 8.91%. As studied, the land under agriculture is 12.3%. There has been slight increase in the cultivable wasteland, fallow other than current fallow land not available for cultivation, cultivated land excluding the fallow and current fallow. The net shown area has shown (Fig. 2.3) a decrease of 0.23% in between 1976-77 and 1990-91

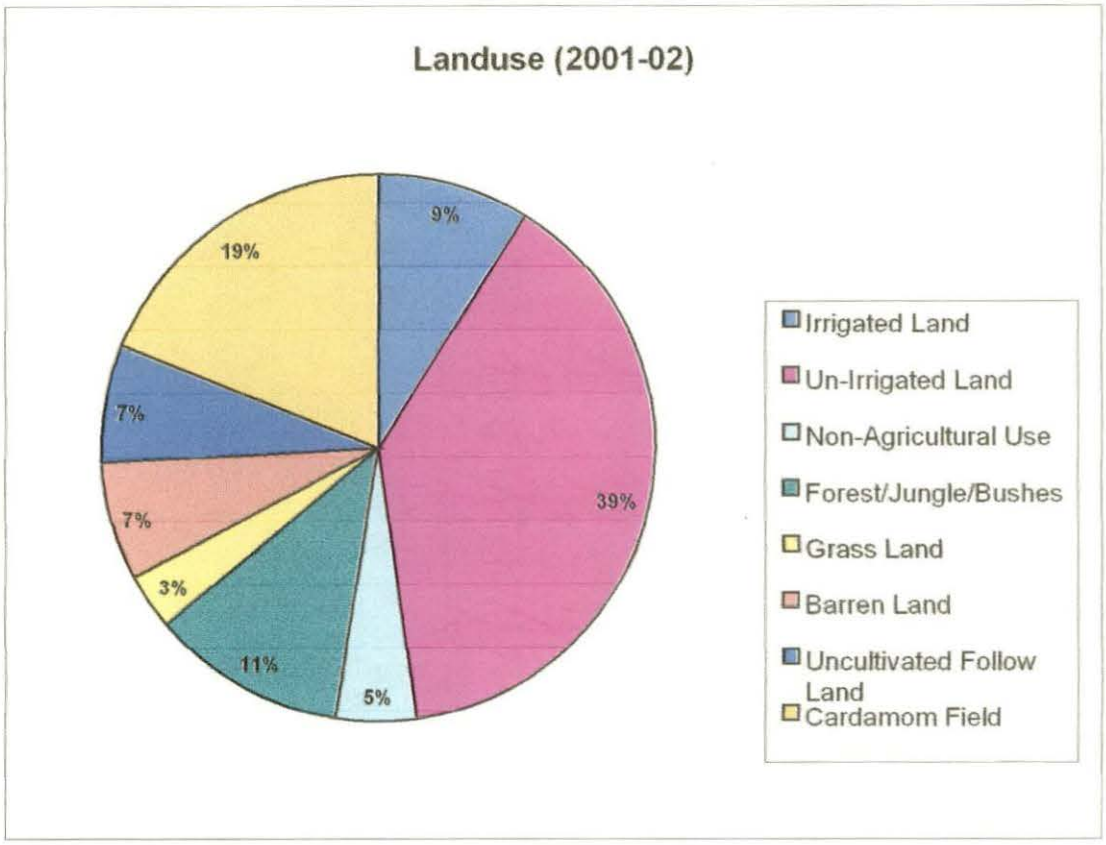


Fig 2.3 – Landuse Pattern

Study showed (Table 2.10) that large areas are transformed and put to agricultural purposes. It is to mention here that vast land in the North Sikkim is under forest cover and remain under the perpetual cover of snow. Therefore increase in population is resulting in shifting of habitation towards higher altitude. Such a scenario may result in glacial receding and loss of natural habitat may cause ecological disturbances.

2.6 FOREST

It is observed from the study that land is under tremendous pressure from overpopulation. The resources are not sufficient to meet the growing demand of firewood, fodder, etc. In the meantime, Government has formulated a policy to encourage investors in industry sector. In such a scenario, industrial effluents and pollution of discharged wastes may create hazard in the locality. Further, no employment opportunity is available with the

government and the role of private sector is virtually nil in the State. As a result, people are directly depending upon natural resources. Thus, there remain every chances of forest depletion in Sikkim Himalayas. Classification of forest area by legal status (Table2.11) shows 82% of total geographic area under various categories of forest land.

TABLE 2.10: CHANGES IN LAND USE (KM^2), 1976-77 TO 1990-91

Land use	1976-77	%	1980-81	%	1990-91	%	% change in 14 years per land use	% change in 14 years of the total land area
Forest	693.80	37.96	2619.83	36.92	2980.00	42.00	+10.62	+4.03
Barren Land	040.10	28.75	1802.50	25.40	1800.00	25.37	-11.76	-3.38
Pasture and Grazing	571.48	22.15	1582.99	22.31	1202.99	16.95	-23.45	-5.19
Current fallow	5.01	0.07	44.28	0.62	39.06	0.55	+679.64	+0.48
Uncultivated land excluding fallow	49.25	0.69	45.60	0.64	108.30	1.53	+119.89	+0.83
Fallow other than current	9.44	0.13	94.74	1.34	92.04	1.30	+875.00	+1.16
Land not available for cultivation	66.13	0.93	116.04	1.64	143.00	2.01	+116.24	+1.08
Cultivable waste land	11.53	0.16	6.81	0.09	98.07	1.38	+750.56	+1.22
Net sown area	649.26	9.15	783.21	11.04	632.54	8.91	-2.58	-0.23

Reporting (+) Increase, (-) Decrease

Source-Sharma and Sharma, 1997

TABLE 2.11: THE RECORDED FOREST AREA IN THE STATE

Geographic Area Km^2	Reserved Forests Km^2	Reserved Forest (Khasmal) Km^2	Protected Forest (Gaucharan) Km^2	Recorded Forest Km^2	% Of State's Geographic Area
7,096	5452	385	104	5841.40	82.32%

Source- Statistical Profile, 2004

The recorded forest area statistics include reserved forests (including tree forest, pasture, alpine shrub and uncultivable Alpine regions such as perpetual snow, glacier and alpine lakes etc.) occupying 5452.40 sq.km and record estimated total forest area is 5841.40 Sq.km. (82.32% of total geographical area of the state). However, as per the revised figure, forest cover records 31.93 Sq.km and tree cover amounts to 39.42 Sq.km. The total forest and tree cover is 46 % of total geographical area (Forest Dept. 2003). It is further studied that hydropower projects have been started along the Tista and Rangit rivers. In the North Sikkim, massive hydropower units are coming up. Along the dam and surrounding areas, merciless cutting of trees are taking place. Soil erosion and earth cutting is voluminous, the entire face of the earth has been disfigured due to landscape cutting. Further, road and building construction is on in the dam and station area. As a result the mountain environment and ecology have been completely replaced by concretes of cements.

2.7 AGRICULTURE

Agriculture is one of the most important factors for determining socio-economic characteristics. Agriculture being a major economic activity of the people of Sikkim Himalayas, it cannot be excluded while examining socio-ecological environment. Most of its population is earning their livelihood from agriculture. Agriculture still is the mainstay of Sikkim's economy and agriculture contributes maximum gross domestic product of Sikkim.

Diverse physiographic features of Sikkim have provided a spatial variation in agricultural practices too. The variation in elevations with rainfall and

temperature regimes allows diverse crop cultivation up to 2000m above mean sea level.

It is an established fact that environment is directly or indirectly affected by the process of agricultural development. The practice of agriculture in the higher altitude is related to soil erosion and other environment degradation problems. Therefore it is a must to justify as to what extent environmental considerations are taken into account while practicing agriculture in Sikkim. In the steep slope, terrace cultivation is practiced by traditional farming system. Such system of farming is responsible for massive erosion of topsoil and manure. In fact Sikkim is the first State in India to introduce organic farming. Steps are being taken to preserve the land and soil fertility but nature is taking its own course in modifying the environment.

2.7.1 Cropping pattern, crop yield and utilisation

It is a notable fact that land under forest cover is 46%, and 12% of geographical area is put to cultivation. Due to adverse climatic condition and rugged terrain, major part of the land remains unfit for cultivation. However, cardamom has helped in preserving the trees in this alpine belt. The type of crop to be grown in the Sikkim Himalayan region is determined by relief and the degree of slope, vegetation type, climatic factor such as precipitation in the form of rain, snow, hailstorm etc, irrigation facility, accessibility and remoteness.

The people of Sikkim have been trying to adopt themselves with the recent trend and demand and have started growing high value cash crop of medicinal importance. The floriculture and other crops, fruits growers have marked their initiatives in the recent years. The changes in cropping pattern have been noticed and area under cereal has declined from 70.16%in 1975-76 to mere 52.16% in1995-96. Wheat, maize and millet cultivation have virtually been stopped in Sikkim. This could be due to shift of farmers from food crop to cash crop. The cultivation of rice is limited to the low lying area of Martam, Mangley, Namphok, Namli, Ranipool Daramdin etc.The cultivation of fruits and vegetables have shown considerable improvement where orange

cultivation is on improving side. The area under vegetables also increased from 0.92% in 1980-81 to 4.17% in 1995-96. Of the important cash crop ginger is widely cultivated in the lower part in Sikkim.

The remarkable change (Table 2.12) in the cropping pattern of cereals, maize, rice and wheat is seen in the nook and corner of the state. The production of pulses and oilseeds have shown increasing trend. Sikkim is favorable for the cultivation of large cardamom and its production has achieved the sixth five-year target of 4.5 thousand metric tones. In 1996-97, the production of ginger has gone down by 4 thousand metric tones mainly because of diseases problems. Besides, production of vegetables oilseeds and fruits, have gone up. In the context of Sikkim, ginger is the main source of earning. The production of ginger increased from 3.2 thousand metric tones in 1980-81 to as much as 29 thousand metric tones in 1995-96.

After 1975 remarkable increase in production of maize, rice, and finger millet is noticed. The horticultural crops, such as oranges, potatoes, and other vegetables showed slow rate of growth in terms of yield. There is remarkable increase (Table 2.12) of large cardamom production from 1975-76 onwards with an exceptional decline in 1991-95.This could be attributed to the disease called *phurkey* and *chirkey,* which is common in Sikkim. However, the yields of major cereal crops such as maize, wheat, and rice, have sustained in the terrace of Sikkim land. The use of chemical fertilizers such as nitrogen, phosphate, and potassium in Sikkim is negligible which is recorded at around eight kilograms per hectare compared to 32 kg in Himachal Pradesh and 72 kg at the national level. Where as in Arunachal Pradesh and Nagaland, the consumption of chemical fertilizers was 1.2 and 4.5 kg per hectares. It is mainly due to government decision to ban on use of fertilizer and encouragement to farmers towards practicing (Pradhan *et all*, 2003) organic farming.

Hence it can be stated that maximum possible use of land has been put to agriculture and tremendous pressure mounting on land is observed. The use of fertilizer and pesticides has polluted the soil nutrient and constant degradation of land is seen due to land wash and landslide.

TABLE 2.12: TEMPORAL CHANGES IN THE PRODUCTION OF MAJOR CROPS (1975-76 TO 1996-97) '000 TONNES

Crops	Years					
	1975-76	1980-81	1985-86	1990-91	1995-96	1996-97
Rice	10.00	10.63	17.05	22.04	21.68	22.06
Wheat	0.15	10.30	11.22	13.08	15.30	14.81
Maize	16.50	28.93	49.25	57.60	56.56	56.63
Finger Millet	3.20	3.84	4.30	4.62	4.75	4.71
Barley	0.50	0.46	1.30	1.18	1.57	1.56
Buckwheat	0.80	1.38	1.38	1.42	1.74	1.61
Total Cereals	31.15	55.54	84.50	99.94	101.80	101.38
Urd	0.60	2.92	2.90	3.05	3.23	3.30
Other Pulses	0.10	0.10	1.70	2.38	2.70	2.69
Total Pulses	0.70	3.02	4.60	5.43	5.92	107.37
Rape Seed and Mustard	0.20	0.90	2.30	2.65	4.39	4.24
Soya bean	0.50	1.81	3.10	3.02	3.21	3.36
Other Oil Seeds	-	-	0.15	0.04	0.04	0.04
Total Oil Seeds	0.70	2.71	5.55	5.71	7.63	7.64
Orange/Citrus Fruits	3.60	7.35	12.10	15.45	8.70	9.00
Other Fruits	1.10	3.00	6.10	8.05	3.30	3.50
Total Fruits	4.70	10.35	18.20	23.50	12.00	12.50
Vegetables	5.00	3.40	23.90	35.00	28.00	30.00
Potatoes	8.00	6.64	26.40	34.97	24.00	27.80
Large Cardamom	2.30	3.50	3.90	3.60	3.60	4.58
Ginger	2.00	3.20	10.90	16.00	29.00	25.00
Rhizomatic Crops	0.10	0.20	1.10	3.00	1.60	1.00
Total Miscellaneous	12.40	13.54	42.30	57.57	58.20	58.38

Source : Department of Agriculture, Government of Sikkim, Gangtok, Sharma & Sharma 1997 & Lahiri 2001.

2.7.2 Crop production

Agricultural development is determined by the ability to produce more crops in a year. Crops production normally refers to the total amount of crops that are produced either from net sown area or from gross sown area. The state is facing insufficiency in supply of crops. It is due to non -suitability of land for agricultural purpose, due to rugged and mountain topography.

TABLE NO: 2.13: DISTRICTWISE DETAILS OF CROP PRODUCTION- (1999-2000)

Sl.No.	PRODUCTION IN TONNS					
	Districts	Maize	Rice	Wheat	Barley	Pulses
1.	North	4.1614	2.0593	1.6498	0.2070	0.0661
2.	East	13.4730	9.9500	4.3100	0.5000	1.5500
3.	South	17.4000	3.4300	2.5900	0.3000	2.0500
4.	West	18.2000	8.0000	4.3000	0.6700	2.2800
5.	Sikkim	52.8344	23.4393	12.8498	1.6770	5.9461

Source: Agricultural Department, Govt. of Sikkim

According to excerpts from Agriculture department, district wise estimation of food grain production indicated that West District topped in the rank of production of cereal crop. It alone shared about 34.5 %, and production from East, South, and North is recorded at 30.0%, 26.5% and 8% respectively. A unique practice prevailing in Sikkim is that the food grains are often used as beverages and often fermented for alcoholic consumption. On the whole, there has been a remarkable growth in the production of food grain in Sikkim. (Table 2.13) However the growing demand still remains unfulfilled due to rapid multiplication of empty bellies.

2.8 ANIMAL HUSBANDARY

Agriculture and animal husbandry go hand in hand in the state of Sikkim. The economic activity in Sikkim started with slash and burn cultivation, herding, trance humane, grazing and landed up with the domestication of animals. The rearing of animals depend primarily on the availability of land for pasture and supply of fodder. The Government of Sikkim has put a permanent ban on the grazing of animals in the forestland. The vacant land for fodder plantation is meager and there is a growing demand of milk and meat in the market. In such a scenario, deforestation is bound to happen.

2.8.2 Grazing land

According to S. Palzor, out of the total 7096 Km^2 land area, about 1,62,392 hectare i.e. 22% is available for fodder production and pasture development in the state as compared to 15% of the total land available for cultivation .The details of the land area (Fig 2.4) and type of grazing ground of Sikkim shows that large chunk of grazing land is covered under alpine pasture (65.92%) and the remaining area under Khasmal land and Gaucharan accounts to nearly 34% only.

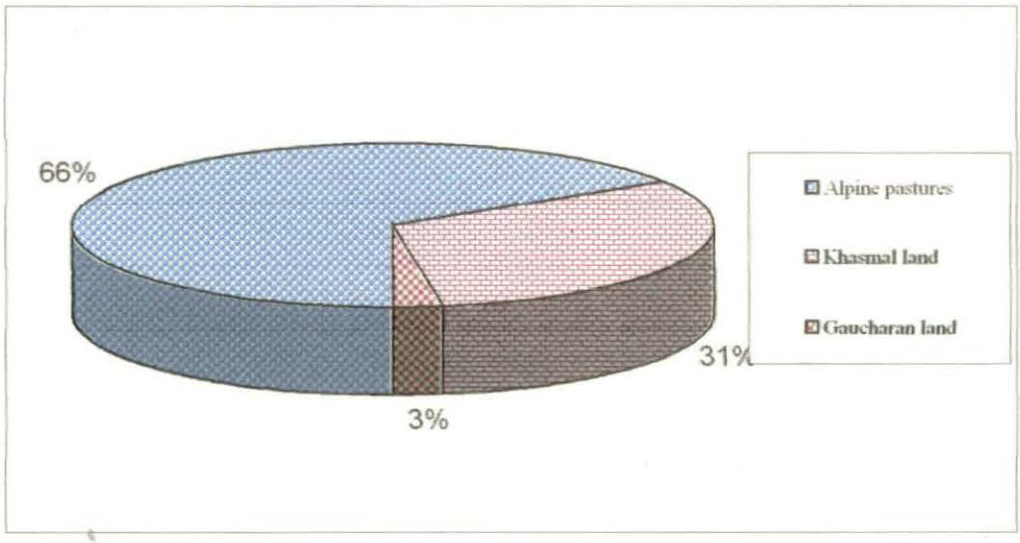


Fig-2.4 Distribution of grazing land

The district wise availability of area (Table 2.14) under alpine pasture shows that North Sikkim records highest in the land availability for pasture in alpine higher altitudes. It accounts to 73% land under alpine pasture. Other districts have negligible area under alpine pasture. This is due to location of North Sikkim in the higher altitude and land being unfit and unsuitable for agriculture.

2.8.3 Alpine pasture land in Sikkim

The alpine pasture land in Sikkim is found in the North district (Table 2.14) of the study area. The pasture is in the form of khasmal and gaucharan.

TABLE 2.14: DISTRICTWISE AREAS OF ALPINE PASTURES (KHASMAL AND GAUCHARAN LAND IN SIKKIM.)

ALPINE PASTURE IN HECTARE					
District	**Alpine**	**Khasmal**	**Gaucharan**	**Total**	**Percentage**
North	90861	21607.23	1200.15	113668.38	73
South	3032	9777.57	1081.96	13891.38	9
West	6487	9188.80	1086.35	16762.15	11
East	6.23	10499.56	902.13	11407.92	7
Total	100386.23	51073	4270.59	155729.82	100

Source-Department of Forest Govt. of Sikkim , 1995

2.9 LIVESTOCK FARMING

The cattle population is highest (Table 2.15) in Sikkim. Besides, poultry goat and sheep contribute lion share in livestock distribution.

Total population of livestock is 8,51,308 in the year 1992.Sikkim with the population of nearly 5.5 lakhs humans have nearly 8 lakhs livestock population. The domestication of animal in each of the rural houses areas is mainly to meet the scarcity of manure, milk, meat and money. In the colder regions, animals like sheep, yak and yeti, cattle, goats are kept in open field for grazing. As a result, many endemic species of plants and grass of medicinal value are lost forever. These are the example of how environment is degraded in the alpine zone.

2.9.1 Livestock population

The variation of livestock population of Sikkim in the year 1977 and 1992 shows an increase of 66% i.e. an increase to 8,51,308 from 5,12,778. The number of buffaloes however decreased by 46% but other livestock number increased during this period. There has been an increase in pig and poultry (Table 2.15) population as well. Cattle population also increased by 27% while yak figure went up by 34% in the same period.

TABLE 2.15: LIVESTOCK POPULATION OF SIKKIM

Livestock	1977	1992	Increase /Decrease in %
Cattle	157546	200035	26.97(+)
Buffaloes	5438	2932	46.08(-)
Sheep	16104	16268	1.02(+)
Pigs	18596	44477	139.18(+)
Goats	88986	114707	28.90(+)
Horses	1186	1789	50.84(+)
Poultry	220927	465751	110.82(+)
Yak	3995	5349	33.89(+)
Total	**512778**	**851308**	**66.02(+)**

Source-Paljor, 1998

The number of indigenous cattle population decreased by around 34% during the year 1977 to 1999. Where it was 14,2,45 in 1977 and came down heavily to 9451 in 1997.This could be due to farmers started selling milk and cross breed replaced (Table 2.16) the indigenous species.

TABLE 2.16 GROWTH RATE OF CROSSBRED CATTLE POPULATION (IN COMPARISON TO INDIGENOUS CATTLE POPULATION IN NORTH DISTRICT)

Year	Number of crossbred	Number of indigenous
1977	Nil	14245
1982	1852	11651
1987	2930	11684
1997	3390	9451
Trend in growth	(+) 100	(-) 33.65%

Source-Paljor, 1998

TABLE 2.17 LIVESTOCK MIGRATION AND MANAGEMENT PRACTICES ADOPTED IN CHHO-LHAMO, (NORTH DISTRICT)

Month	Location	Livestock	Activities
February	Chora below Gurudongmar	Sheep	Lambing
March	Phago	Sheep	Lambing
April	Donkung		
May	Lasher area	Yak	Reno Calving
June	Lasher area	Yak	Calving
July	Lasher area	Sheep	Servicing
		Reno	Servicing
August	Donkung	Yak	Servicing
September	Donkung	Sheep	Servicing
October	Donkung		
November	Donkung	Livestock	Slaughter
December	Chho-Lhamo		
January	Chho-Lhamo		

Source-Paljor, 1998

About 22% of the total area in Sikkim is available for fodder production and pasture development. The three main categories of land available are alpine pasture, khasmal, and gaucharan, which come under the preview of state forest department. The details of migration routes of grazing and different livestock management activities adopted in this region (Table 2.17) predict that the movement of livestock at such high altitude brings about some alteration in the existing ecology of a region. The animal tamper in the barren land causes great loss of flora and fauna, resulting great ecological loose in a given region.

2.10 ENVIRONMENT CONCERN

In the above paragraphs detail discussion is made whereby one can conclude that in the high altitude areas of Cho lamu and Gurudongmar, rearing of livestock is a permanent feature. It is also known that the grazing lands are open and depending upon the season, shifting takes place from one

place to another. Under such circumstances, ecological disturbances are bound to happen. The high altitude plants are prone to degradation in these regions. The movement of livestock at such high altitude brings about some alteration in the existing ecology of a region. The animals tamper in the barren land which causes great loss of flora and fauna, therefore in a given region ecological changes take place.

CONCLUSION

Sikkim, a small mountainous state in the Eastern Himalayas has its own identity of social structure, economic life and cultural values. Diversified physiographic features of Sikkim provide structural diversity in the ethnic population, which is an interesting subject matter for future scope of study. There exist bond of relation between Himalayan population and diverse environmental conditions. The study has been carried out to find out the socio-economic characteristics of this Himalayan people and pressure exerted on environment. The adaptive strategies of particular people in highland and their physiological adjustment and cultural adjustment are unique, so it becomes a food for thought Three main ethnic groups of Sikkim i.e Lepchas, Bhutia and Nepalese are cited here in order to trace out their socio-economic characteristics in relation to man and environment adjustment. This study has given more emphasis on adaptive responses of people of high altitude. All the three ethnic groups are found adapted to such high altitude despite of their typical dietary culture. The Sikkim Himalayan people have provided a diverse nature of socio-economic characteristics and this diversity is measured in terms of their social status and economic structure. However the developmental activity comparatively seems to be taking its shape in economic passion and social organisation for successive years. There lies fluctuation in annual growth rate of both net state domestic product and per capita income at constant price. However there is an increase in literacy rate. Hence this phenomenological study provides detail information about various aspects of socio-economic characteristics of Sikkim Himalayan people. However the study also covered food habit or dietary culture of different ethnic

population of Sikkim. The uses of several types of indigenous fermented foods are consumed habitually by its population. Hence it can be said that socio-cultural set up is closely linked with human dependency with nature. With the growth of human and animal population, number of houses is multiplying day by day. In general, living organisms are directly depending upon natural resource, be it crops or fodder. In order to support growing population, infrastructure development is taking place and massive forest depletion is vivid everywhere. Having analyzed the socio-cultural and economic set up of Sikkim, it is revealed that population is growing in numbers followed by rapid development of infrastructure development. The socio-economic characteristics of people are discussed here for clear understanding of the study area because environment encompasses wide range of parameters varying from human behavior, natural elements and cultural confrontations. Having described the history and socio economic condition of study area, further attempt has been made to highlight major tourist destinations in the next chapter.

CHAPTER – III

TOURIST DESTINATIONS IN SIKKIM

INTRODUCTION

The large spectrum of tourist destination in Sikkim can be studied well by segregation and putting them into four major districts. Owing to variations in climatic condition, vegetation, soil, topography, unique tradition and religion, Sikkim offers (Fig 3.1) wide variety of tourism product ranging from natural to cultural and religious.

In simple, tourism products in Sikkim can be classified into natural, cultural and religious. Attempt has been made to explain district wise tourist hotspot in the state.

3.1 EAST SIKKIM

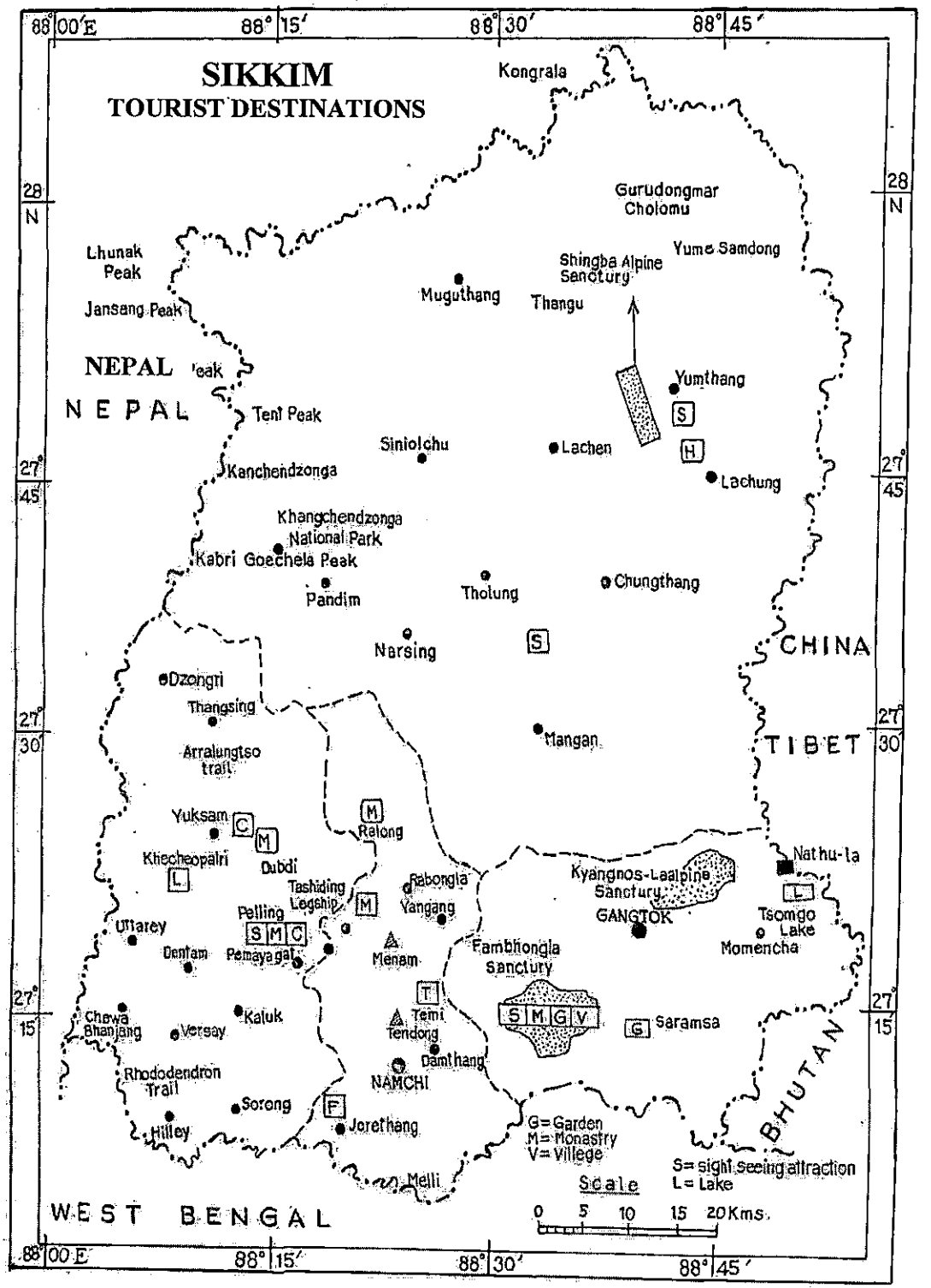
Tsomgo or Changu lake, Baba mandir and Nathula

The *must see* destination lies at 3700 meters, just 38 kms from the capital town of Gangtok. As "Head of all Lakes", is the literary meaning and believed to be one of the holiest lakes for Sikkimese people. The famous Nathula Pass at an altitude of 3779m is located just 20 kms from this point.

While ascending up from Gangtok, kaleidoscope and magnificent aerial view of the valley and water divide add to the natural beauty of this grandeur landscape. To the geographer, Botanist and Zoologist sharp changes in topographic landscape with luxuriant wide varieties of plants and animals are witnessed along the way to Changu lake.The road to Nathula pass where Changu Lake is located is maintained by GREF, BRO. Except for monsoon rainy season frequent landslide, rest of the season exhibit fair weather and well maintained transportation network.

The lake has been the place of worship for native people, even the kings of Sikkim used to perform their religious *pujas* in this site.

Fig. 3.1 Sikkim-Tourist destinations



As the lake is treated sacred, no water sports have been introduced in the lake and no elements of polluting agents are noticed. The lake is perennial and derives water mainly from melting of snow Though the area falls under the zone of Restricted Area Permit, yet it has been made simple to obtain permit either from tourism office or from the travel agents.

Beyond Changu Lake lies Baba Mandir, covered by snow and especially during cold winters, tourists visiting Changu do not forget to visit Baba Mandir. Further 20 kms travel from Changu, famous Nathula pass is located. It remained a major trade route in the past and presumably a major trade route to Lhasa is 400 kms from this point. The trade between India and China is virtually reopened. It is therefore studied that the area holds tremendous significance in the field of trade and tourism.

The available transportation systems include Maruti Omni Van and Jeeps at any point of time. Besides natural destination, Changu attracts local and domestic tourists for recreation, picnicking and day-trippers as well.

Memencho lake

Little away from Changu Lake, there is yet another lake named Memencho. The lake is the source of Rangpo-khola and usually remains frozen during cold winter season. The lake is considered sacred and fish population is tremendous in this lake. Except for few locals, no tourists are permitted to visit this lake till date.

Tashi view point

Little ascend from Gangtok towards northern Sikkim for about 8 kms a scenic hilltop is situation with the name Tashi viewpoint. As the name suggest this spot provides magnificent view of Mt. Khangchen-Dzonga and Mt. Siniolchu. However, sunshine plays a vital role in viewing the scenery. Though garbage disposal pits were kept in the proper place yet few scattered plastic covers were found in the spot. It showed minor threat to natural ecology.

Ganesh tok

It is situated at a distance of nearly 7kms from Gangtok. The point is noted for having a glance of Mt. Khangchendzonga and Mt. Siniolchu. The temple of Lord Ganesha is located on top of the hill. This belt is fairly developed as picnic spot for the local tourists. Other places of importance are The Bulbuley zoological gardens, Smriti *Van* and superb view of Phodong area of North Sikkim, Gangtok and Rumtek town.

Hanumn tok

Situated at higher altitude from Gangtok, there exists a Hanuman temple therefore the place is called Hanuman Tok. Being located on the hilltop, wide view of surrounding area can be had from this point.

Government institute of cottage industry

It is located at an arms length from zero point and state archives. This institute was established in 1957 by Maharaja of Sikkim.The visitors halt here mainly for shopping tibetan painting, t*hanka*, wood craft and woolen items

B2 waterfall

At a distance of 18 kms lies a river that demarcates the boundary of North and East Sikkim. The beautiful river and bridge lies over river Rate-Chu. The natural waterfall descends nearly from 20m above the cliff.

Fambhong-lho wildlife sanctuary

The sanctuary is located at a distance of 25kms from Gangtok with an area of 51.76 Km^2. As per the data, vegetation is dominated by Oak, *Katus*, Champ, and bamboo forests and ferns family. The variety of orchids, rhododendrons etc. are abundant. Besides, faunal diversity of Serow, *Ghoral*, Deer, Himalayan Black Bear, Red Panda and Pheasants like Tragopan, *Kalij*, etc.have their shelter at this sanctuary.

Kyangnos-la alpine sanctuary

The sanctuary is located along the Gangtok-Tsomgo road. Total geographical area covered under this sanctuary accounts to 3,100 hectares. The sanctuary is known for diverse species of Rhododendrons and alpine vegetation. However tourist attraction to this spot is negligible.

Flower show at white hall complex

The flower show is an annual event in Gangtok which is organized at White Hall complex in the vicinity of Gangtok. The flower lovers take part in the annual competition. Wide varieties of orchids are displayed perpetually in this place.

Saramsa / ipecac garden

The nearest garden for Gangtokians, is located at a distance of 14kms from Gangtok, total geographical area covered by this garden is 2.4 ha. The Saramsa garden is famous picnic spot for the domestic and local visitors. Some cases of environment pollution resulting from plastics and eatables are found scattered specially during picnicking.

Nehru botanical garden

The garden is located on the way to Gangtok-Rumtek road. It is located nearly 22kms away from Gangtok but just two kms from the world famous Rumtek Monastry It is built over the geographical area of 36 hectares and exhibit rare and endemic varieties of plants and trees. Some species of rhododendron and orchids are well preserved in this garden.

Tourist village Rumtek

With a view to develop village and ethnic tourism, the concept of tourist village has been introduced in Sikkim. The cottage depicts special features of the three communities inhabiting Sikkim. The tradition and culture of the Sikkimese people are exhibited in these houses.

Rae/ray khola

With the target to cater the recreational need of local populace, the Rae Khola water complex has come up at the distance of 15kms from Gangtok town. The place is best for daylong visitors and picnickers.

Bulbulay himalayan zoological park

In the vicinity of Gangtok, there lies a huge chunk of land developed as zoological park over 205 hectares of land. The place is an ideal for the peace seekers and nature lover. All modern amenities and well preserved flora and fauna is being proposed to be housed in this zone.

Rumtek monastery

The big hall can accommodate nearly 100 people at a time. The art and architectural design of the monastery is magnificent and well painted. The annual dance called *Kagyat* is the main attraction during 28th and 29th day of the tenth month of the Tibetan Calendar. The main dance festival called 'Tse Chu Chaams' is held during the 10th day of the 5th month of the tibetan calendar which falls sometimes in the month of June every year.

Enchey monastery

The monastery was built in 1909 and located at a distance of 3 kms from Gangtok. It is narrated that the lama in the past had supernatural power to fly to Mainam near Yangang in South Sikkim from this point. The cultural festival including 'Chaam' or religious masked dance is performed annually in winter season.

Do-drul chorten (stupa) & the research institute of tibetology

This Institute is the center of Buddhism learning in Sikkim.It is located within a kilometer from Gangtok amidst deep jungle covered with luxuriant growth of vegetation ranging from oak pine to tall trees of varied families. The center is rich in exhibiting vast collection of rare Lepcha, Tibetan and Sanskrit manuscripts.

Ropeways

The breath taking experience of rope way can be had from this point. Till today the ropeways are functional up to secretariat complex. But there are plans for extension up to Ganesh and Hanuman Tok.

Aritar lake

It is located at a distance of nearly 12 kilometers from Rhenock in East Sikkim. An artificial and natural lake especially designed to cater the need of water sport lovers. Luxuriant vegetative growth and tall trees surround the lake. There is a Dak bunglow near the lake for accommodation.

3.2 WEST SIKKIM

The west district is endowed with rich natural, cultural and historic treasure. The first capital of Sikkim, Mt.Kanchendzonga, Dzongri trek and some religious institutions are few attractive showcase located in this region.

Khechopalri lake

The lake is known as 'wish fulfilling lake'. It is located at a distance of 30 kilometers from the headquarter of West District. The lake has been notified by the Government as a sacred lake. It is located at an altitude of 1829m(6000 ft.) along the Gyalsing and Yuksum roadways. It is narrated that the leaves fallen from surrounding trees are picked up by the birds and hence the lake remains clean throughout.

Water falls

1. Changey

It lies on the way to Uttaray in West Sikkim, the white water fall is located at a distance of 12 km from Pemayangtse monastery. The Changey Fall is the main source of drinking water for the people of Pelling and nearby areas.

2. Famrong

On the Yuksum Tasiding route there lies a fascinating waterfall named as Famrong. The area in this belt has been put to paddy cultivation and some picnic spots have come up in the nearby areas.

3. Rimbi

An another waterfall located at 13 kms. from Pelling along the Kheocheopalri road. The fall descends down from 91m (300 ft.) height and perennial in its flow.

Sinshore bridge

Uttaray is situated at the extreme western plank of Sikkim's mainland. It could be one of the highest span bridge in Asia having a total stretch of 193m and a height of about 200m. It is really an ultimate destination in West Sikkim. Owing to its remoteness, many visitors fail to visit the place.

Uttarey

This region fairly demarcates its boundary with Nepal. Owing to its proximity to Singalila range, it would be the best eco-tourism trek route.

Karthok Lake

The lake is located at the vicinity of historic Yuksam site and located very close to the Norbugang Chorten at Yuksam. All these lakes add to natural fragrance in cultural set up and the surrounding areas are naturally rich in landscape.

Pemayangtse Monastery

The Pemayangtse monastery is the splendor of West Sikkim. Located at an altitude of 1975m, this monastery has been recorded as the second oldest monastery in Sikkim. It is situated at the distance of about 6 kms from Gyalzing and was founded by Lhatsen Chempo in 1705 for pure Tibetan monks and celibate. Various Buddhist sculpture, paintings and art is well

knitted in the monastery. In the monastery campus, dance festival is observed annually during the month of February.

Tashiding monastery (lasso)

Literally it symbolizes "the most devoted central glory".This was built in 1717 by Lama Sempa Chembo and affiliated to the Nyinma-pa sect. The distance from Gyalzing is about 40 kms by road. It is believed that the Tashiding Chorten contains ashes of Lord Buddha and wash away sins. The monastery is commonly characterised by prayer flags, Chortens, tibetan art and architecture. Well-carved Tibetan script and sculpture are found in the site. The festival of 'Bumchu' or religious congregation is the center of attraction, which is held on the 15th day of the first month of Tibetan calendar every year. The holy water is kept for a year and during the festival of 'Bumchu' the pot containing water is opened and sprinkled to the devotees. Simultaneously, the holy pot is refilled with fresh water and again kept safe to be opened up in the coming year festival.

Sanga choling monastery

Often argued for the oldest monastery in Sikkim, Sanga Choling monastery was built by Latsun Chembo in the year 1697.Similar architecture with that of Pemayangtse, it is one of the oldest and well maintained monastery of Sikkim.

Rabdantse palace

Rabdanste was the second capital of Sikkim during the reign of Tensung Namgyal. It is located very near Gyalzing at a distance of 2.5 kilometers from Pemayangtse and 130 kms from Gangtok. Due to constant raid from the Gurkhas of Nepal, the capital was subsequently shifted to Tumlong from Rabdantse. The view of Mt. Khangchen-Dzonga is seen clear in sunshine. Archaeological Survey of India looks after the maintenance work.

Norbugang chorten

It may be mentioned that the first king of Sikkim Phuntsog Namgyal was consecrated in the year 1641 and the coronation throne Norbugang Chorten are just located 2 km away from Yuksam. The Archaeological Survey of India has considered the site historic

Yuksam-dzongru khangchen-Dzonga adventure trail

As mentioned in the pre page, West Sikkim comprises of several historic and natural sites for all section of tourists. In terms of adventure tourism, this trek and trial route is the most popular route. Having its potentials in its connectivity with Dzongri and Goecha-la this area serves as a base camp for the travellers. The number of trekkers in a season is estimated at around 2000 which is ample for the sustainability and carrying capacity of this spot.

The Rhododendron Trail

The Hilley-Barsey rhododendron belt is located in the southwest part of this District. During season, blossomed flower and its fragrance further add to its natural glory. Secondly, Nayabazar-Hilley-Soreng-Versay-Dentam Pemayangtse trail lies at an altitude of 305m. Hilley to Versay forms a gentle trek amidst diverse flora including Silver Firs, Hemlocks, Mangnolia and Rhododendrons.

3.3 SOUTH SIKKIM

The South District of Sikkim consists of important places like Jorethang, Namchi, Ravangla, Temi and Yangang. Important hotspots are Valeydhunga and Tendong. The administrative headquarter is Namchi and Ravangla serves as the sub-divisional center.

Tendong nature reserve

The Tendong peak rises up from the Damthang-Namchi landscape and reaches the summit at about 2591m to become Tendong. As legend goes this

peak is the guardian deity for the Lepcha community of Sikkim. Therefore the Lepchas consider this peak sacred and also observe a grand festival named "Tendong Lho Rum Faat" meaning "Worship of Tendong". During *Ram Navami* the Tamangs and other Nepali community from Sikkim and Darjeeling perform annual puja at the summit.

The magnificent view of Chola range, Paunhari peak to northeast, Singalela range to the west, Darjeeling, Gyalzing, parts of Gangtok and Mt. Khangchen-Dzonga can be seen from the summit of Tendong. The Tendong Nature reserve is synonyms to Tendong. The belt is endowed with rich vegetative cover, forest reserve exhibiting variety of flora including *Kharani, Katus, Champ, Malingo, Buk,Malato,kalo siris,okhar,* Rhododendrons etc. The faunal diversity include butterflies, birds and mammals species such as *Ghoral, Badel, Chitwa*, monkey, bear, wild boar, wild cat leopard etc.

Important trek route of Sikkim (Sirwani-Temi Dak Bungalow-Temi Tea Estate- Damthang Base Camp-Tendong-Phalidara-Namchi) touches this spot. It is observed that few tourists from Assam, West Bengal and northeastern states visit this place.

Maenam wildlife sanctuary

The sanctuary is located at a distance of 67 kms from Gangtok and 27kms from Namchi. The sanctuary covers the total geographical area of 3435 hectares and demarcates its boundary with the adjacent reserved forest of Barmalley, Ralong, Ravong, Khop, Lingmo, Dorath,Borong, upper Yangang etc. The road distance to this point is 68 km from Gangtok and 27 kms from Namchi. From the summit panoramic view of Rabongla, Yangang, Khangchendzonga range, Darjeeling side and plains of Siliguri, Fambhang-Lho wildlife sanctuary etc. can be clearly seen. There lies a small monastry called Mainam *gumpa* with the idol of Guru Padmasambhva .The Maenam trek route is often visited by tourist,the route connects Damthang-Rabongla-Maenam Hill-Yangang-Singchuthang-Sirwani . The spot height of Maenam is 3200m. This sanctuary reserves high value medicinal plants and rare species of flora and fauna. The important animal species found are Musk Deer, Blue

Sheep, Red Panda, Clouded Leopard, Himalayan Black Bear, Blood Pheasants, Partridges etc. The Rhododendrons are abundant followed by Bucklenea, Castanopsis , Bamboo, Teak, Sal, species.

The Tourism Department of the State has identified the Maenam circuit (connecting Damthang-Rabongla-Maenam Hill-Yangang-Singchuthang-Sirwani) to be developed for tourists.

Bhaleydhunga, mahadevthan

Within the Mainam sanctuary, Bhaley dhunga forms the Summit of Yangang, Borong,Ravang,Lingi and Lingmoo areas, there are twin jutting out stone cliffs known in local parlance as *Bhaleydhunga and Potheeydhunga.* Two stone cliffs facing each other have historic significance for the people in the vicinity. The folklore suggests that the cooing of a cock and hen in the Bhaleydhunga and Pothidhunga invariably followed with the passing away of one of the denizens of the nearby villagers. But those who perform obeisance on the top of the peak are blessed with prosperity in health and bring good news throughout life. During Nepali month *(Bhadau*) and english July-August, the cliffs are treated auspicious and worshipped by the nearby villagers.Below the peak lies a hoary Mahadev (Shiva)Than (Sthal) known as Mahadevthan, which is believed to be the bestower of all human desires whenever supplicants pay their visits there and perform puja.

Borong hot springs

This is a most visited hot spring in Sikkim and located below the Ralong monastery at a distance of around 5 Kms down the trekking route. Around hot spring there are caves and old monasteries. During winter this place is overcrowded due to flock of visitors and tourists from nearby districts of Sikkim, Bhutan and Darjeeling.

Temi tea estates

The tea gardens are the ornaments for hill stations. Similarly Temi Tea estate provides an excellent view of the landscape and surrounding area.

From this point, the meandering Tista river can be clearly seen. The area spread over 174 hectare of total geographical area and situated along the Highway to Namchi, South Sikkim. The distance from Gangtok is 75kms .

Sirwani bridge garden

It is the boundary between South and East Sikkim. The bridge is build over Tista river, a small halting place and a garden is maintained along the highway.

Namchi town

Namchi, the District headquarters of South Sikkim is 88 kms away from Gangtok, the capital of Sikkim. There are helipad, monastery, rock garden, statue of Guru Padmasambhava and village tourist centers. It lies at an approximate distance of 1400 m and exhibit marvelous natural and cultural tourist destination. Of all the destinations, the tallest statue of Guru Padmasambhava, the finest in Asia is worth visiting.

Around Namchi major attractions are Tandong Maenam, Bhaleydhunga, Jorethang, river Rafting in river Rangit, Sirwani, tea of Temi, Phurchachu hot spring, Doling monastery, Namchi monastery, Tirikhola fall, Rock garden, Sainotar, etc.

Jorethang

It is situated at a distance of 19 kilometers from Namchi, Jorethang is the gateway to West Sikkim. It is a market center with Important shopping place for food grains and construction materials. It shares its border with West Bengal and South and West Districts of Sikkim.

It is developed on the floodplain of river Rangit. The climate is hot and humid and suitable for water sports along the Rangit river.

Ravangla

Ravongla is the Sub-divisional town of South District. It is nearly 26 kms from Namchi. The proximity to Mainam wildlife Sanctuary, Tendong,

Ralong and Borong hotspring, Yangang, Sainotar, Temi, makes this place a hottest destination in Sikkim. There are few cultural and religious destinations in the region such as Gumpa, Manilakhang etc. in the vicinity of Ravangla.

Bon monastery

Historical event shows that bon monastery of Kewzing was built in th year 1984.The coloring and painting in the monastery is worth viewing.

Sainotar

Located on the off side of Singtam-Yangang highway, Sainotar is also named as Mangley and Sinchuthang. It is a major picnic resort in Sikkim developed with river rafting starting point along the bank of river Tista.

3.4 NORTH SIKKIM

The northern district of Sikkim is largest in geographical area but smallest in habitation. Owing to harsh climatic condition set by high altitude, most of the rugged mountains remain in the remote corner. However the government has taken serious thought in the field of infrastructure development. In recent years road and buildings are constructed in a massive way. The remote areas of Hee Gyathang and Zongu are well connected by roadways. Further, hydropower project has been initiated in this district very recently.

This district is situated in the ecologically fragile area, where habitat and entire ecology is delicately balanced. Due to rugged terrain and steep slope, infrastructure development is difficult therefore constant erosion, landslide, and land transformation is rapidly taking place. As a result mass environmental degradation is going in the entire region of north Sikkim. There is a dire need to develop symbiotic relationship between man and environment.

Yumthang valley

The distance from Gangtok to Yumthang is nearly 135kms. It is located in the bank of river Yumthang and the entire valley region is known as Yumthang valley. During peak season of April-May, varieties of flowers blossom to add to the fragrance of Yumthang valley. The valley falls at an altitude of 3,657m and present a showcase of untouched and virgin flora and fauna. Often compared with Switzerland of the East, the melting of snow during the season really makes it worth visiting.

Yumthang hotsprings

With a view to develop health tourism, hot spring is being developed near Yumthang. The hot water through fissure gushes out and people take a dip or bath to cure their illness.

Yumthang flower valley

The entire landscape of the valley is beautiful, from the valley, high range is seen on the top from where white melted snow descends down under the gravity. Besides, interlocking spurs and hanging valleys form magnificent scenery. This area is located in a flat surface at the height of 3,962m. The area is devoid of congestion from over population.

Shingba alpine sanctuary

The sanctuary spread over 4300 hectares area. During May – April the rhododendrons and flowering plants present spectacular perfume and natural beauty. Further, green grass and scrub of alpine climate is found in abundant. Due to over exposure of this area owing to tourist demand, massive deforestation is taking place. Hence environmental problems are serious in this region.

Yume samdong hotsprings

The hot springs at Yume Samdong or Momay Somdong lies at a distance of 23 kilometers from Yumthang. The height of this destination is

4,877m. The river Seba-Chu at the foot of the mountain is the important spot. Besides, this area is close to Donkiala Pass in north Sikkim. Along the green pasture yak herders are ubiquitously found.

Chuba

Literally means an area bounded by two streams (Sebu and Lachung). Located near Lachung, Chuba is believed to be a religious place for the people inhabiting this region. The destinations are Sibu-la Pass and the surrounding landscape covered by magnificent alpine vegetation. The local people do not clear or disturb the surrounding environment with the fear of punishment from god.

Chungthang

It is situated at the distance of 101 kilometers from Gangtok with a township developed at the confluence of Lachen and Lachung rivers. Located at the height of 1981m, it has been developed as a sub divisional administrative center. From this point, the main road bifurcates towards Lachung and Lachen. This place being the junction of two important tourist destinations has well developed infrastructure facility. As myth goes, there lies a rock where Guru Padmasambhava halted and marks or imprints are clearly visible. It is further believed that Guru Padmasambhava sprinkled some grains while sitting on the rock,as a result a large paddy field came up in the locality.

Lachung valley

The Valley of Lachung is situated at a distance of 22kms from Chungthang. Located along the bank of river Lachung, tall mountains look rising above from this point. This region makes the continuation of Chola range". Besides, green pasture and hanging cliffs are seen standing high from the bottom of the valley. People in this region grow potato and apple.

For accommodation, there exist few lodges chiefly, Apple valley resort, Snowline resort, Yakshey Resort, Forest Bungalow and a PWD guesthouse.

People bank upon firewood for cooking and hence threat to nature is alarming. It is seen that the rate of deforestation is massive in this region.

River Bakcha

Located 30kms from Gangtok,lies a scenic reverine along the flood plain of Bakcha river. This road runs from Gangtok to Lachen, Lachung and maintained by BRO. The climate is hot and humid in the summer season. While traveling through this route landslide, sink and subsidence are found everywhere. The nearby destinations from this point are Phodong monastery or Labrang monastery, Kabi and the third capital of Sikkim 'Tumlong'.

Waterfalls along the riverside

While traveling from Mangan to Lachen - Lachung and Dzongu belt, white water falls are conspicuous. The falls derive water from melting of snow and some falls have perennial source of water. Important waterfalls are found hanging in B2, B3, and B5 bridge areas.

Tarum hot springs

This area has tremendous potential for the development of health resort by harnessing thermal water.

Yak race at Muguthang

Due to suitable climate prevailing in this region, Yak is found here for transportation and meat supply to the local population. The traditional Yak race held here can be dated back to 300years.

It is organised during the festival of Drukpe Tseshe, other tourism promotional fairs and festivals are also organized from time to time.

Khangchendzonga national park

Located at an elevation ranging from 1829-8585m the Khangchendzonga National Park is the only park of this kind found in Sikkim. It is situated in the North District of Sikkim and spread over the total area of

850 Sq.Km. Though it falls under North District yet it occupies a small forest area of West District of Sikkim. The area is a botanical paradise for the researchers. The floral and faunal diversity is beautifully adjusted in the natural environment. The important mountains such as mount Narsing, Pandim and Siniolchu partly or wholly falls under the zone of this park The summit of this park is characterized by Zemu Glacier and endangered species of wild grass of medicinal values are found in plenty in the deep jungle, virgin forest.

Kanchendzonga-the third highest peak

The study area Sikkim is synonyms to mount Khangchendzonga the third highest peak of the world. Located at an altitude of 8585m it literally symbolizes the five treasure houses and believed as the guardian deity of Sikkim. The associates of other mountain in this belt are Mount Narsing (5835m), Mount Pandim (6691m), and Mount Kabur on the southern side, the twins, (Nepal Peak, Tent Peak) on the northern side and Mount Simvo (6811m) Mount Siniolchu (6888m) on the eastern side. Among all these mount Simvo, Siniolchu, and Narsing offer magnificent view of snow-clad mountain ranges.

Singhik

At a distance of about 70kms from Gangtok lies Singhik spot. This point is famous for natural scenic beauty and natural environment.

Tung

It is known as a check post where tourists are halted for a while for security checking. Situated along the way to Yumthang, the check post is located at a distance of 85 kms. from Gangtok, 8kms from Chungthang and 22kms from Mangan. The whole region being landslide zone, journey to Tung from Mangan is breathtaking. The foreign tourists Protected Area Permit (PAP) is a must to march beyond this point.

Kabi longtsok

Historically, this place holds a symbolic importance. As the legends go, this was a place where treaty of historic blood brotherhood was signed between the two communities of Lepcha and Bhutias. The statue of which can be seen in the main town of Gangtok. Those visiting North Sikkim can visit the spot, as it is located on the Highway to Mangan-Chungthang.

Phodong monastery

The famous Phodong Bazar lies at 38 kilometers on Gangtok-Mangan highways. It situated at an altitude of 1,737m from Gangtok. The monastery is 2 kms drive from the Phodong township. The name Phodong monastery, means- "The Royal Chapel" and it can be dated back to more than 200 years.

Labrang monastery

It is located just further two kilometers from Phodong and symbolizes as "The lama's dwelling" and built in 1844, immediately after the 3rd capital of Sikkim was shifted to Tumlong. It is noted that the monastery is located on a hillock, which faces the ruins of Tumlong palace, the third capital of Sikkim. Most of the lama's of Labrang Monastery as per local information were Ladakhi farmers.

Tumlong palace

The historic Tumlong was the 3rd capital of Sikkim. The then Chogyal of Sikkim Tsudphud Namgyal established his capital at this point.
It is very near Phodong and Labrang monastery. These palaces have been completely dilapidated and only the ruins are intact.

3.5 LAKES OF TOURIST INTEREST

In Sikkim lakes act as a catalyst of tourist movement. The lake Changu in East District is synonym to Sikkim tourism. Similarly other lakes listed in the table 3.1 are of great significance in terms of tourism attraction.

TABLE 3.1: LAKES AS TOURIST DESTINATION IN SIKKIM

East	West	North	South
Memecho	Majur Pokhari	Guru-Dungmar	Tshang-Dupche
Tsomgo	Laxmi Pokhari	Cholamu	
Bidang Cho	Khecheopari		

Source-Statistical Profile, 2002

The important feature of tourism is that it offers environment as a part of its product. Therefore, the quality of tourism product depends on quality of environment to a large extent. Consequently, there are marked imprint of impact of tourism on the environment, which can be summed up by both positive and negative way.

3.6 FAIRS AND FESTIVALS

Festivals in Sikkim can be classified into commercial, religious and tourism promotional. Other than table 3.2 there are festivals of flower show, Namchi *Mahotsav*, Handicraft mela, *Mangey mela* etc.

TABLE 3. 2: IMPORTANT FESTIVALS OF SIKKIM

Sl.No.	Name of Festivals	Festival months
1	Maghe Sankranti	January
2	Lossar/Sonam Lhochhar	February
3	Guthor Chaam	February/March
4	Bhumchu (Tashiding)	February/March
5	Saga Dawa	May
6	Sakewa	June
7	Tendong Lho-Rum Faat	8th August
8	Pang-Lhabsol	August/September
9	Dasain (Durga Puja)	October
10	Tiwar (Depawali)	October/November
11	Teyongsi-Shrizunga-Sawan Tongnam	December
12	Christmas	December
13	Tamu Lochar	December
14	Losoong	December/January

Source-Statistical Profile, 2004

CONCLUSION

The study showed a variety of tourism product with its cultural, historic & natural significance. The natural tourism product like lake, mountain, passes, wildlife sanctuaries and tracking routes are located in the highly elevated landscape of Sikkim Himalayas. In such spots, road and infrastructure connectivity with modern amenities facilities are provided to lure tourists. With the growing popularity of tourist spots there will be further acceleration in tourist growth. This situation invariably results in growth of vehicle, miscreants and encroachment. As a result, problem of pollution, congestion, contamination and west accumulation becomes common in the tourist destinations. The trekkers, excursionists, picnickers often disturb habitat and temper vegetation. The demand for firewood in the site for campfire etc. encourages illigical collection of firewood from the nearby forest. Hence the tourist destinations are ecologically degraded.

Mountains are diversified area and this diversity is mapped mainly in terms of geological, biological and climatic conditions. Human beings are ancient dwellers in this area. Those inhabiting this belt have to confront with multifaceted hurdles. The plainsmen are mal-adjusted in the mountain environment and tend to suffer from symptomatic, accelerated breathing etc. On the contrary, mountain inhabitants are well adjusted with harsh climatic condition of nature. The mountain lands being located in rugged terrain, several problems are associated with it. As a result not all people are adopted in mountain area and this adoptive strategy of these people has been the subject of interest in ecology and other discipline as well. The Himalayan tourist sites have certain characteristics such as inaccessibility, marginality and fragility of mountain environment. Despite of difficulties the ecological niche can promote the adoptive response to such environment best suited for tourists. There is a complex distribution of biotic communities due to contrasting geographical and climatic characteristics. The tourism products are diversified across the length and breadth of rugged and hostile environment. The areas not suitable for human habitation have been devoted

for tourism activities. It is an established fact that environment is deteriorating in Sikkim Himalayas due to various development process for prosperity.

To know the process of environment degradation, the next chapter highlights the various agents directly or indirectly responsible for environmental degradation in Sikkim.

CHAPTER - IV

AGENTS OF ENVIRONMENTAL DEGRADATION IN SIKKIM

INTRODUCTION

Environment encompasses wide variety of natural habitat present in the earth at various locations under specific biospheric socio-cultural setup. Before pondering into the environmental problems in Sikkim, it is felt necessary to access the current position on richness of biodiversity and overall environmental senario of Sikkim. It has already been highlighted in the forgoing chapters that rich flora and fauna in Sikkim has its potential in the higher altitudinal zones marked by severe climatic condition. Further, it is also seen that the rate and degree of degradation is rapid in the high altitudinal belts. An attempt has been made to underline the existing estimates of flora and fauna in the state of Sikkim.The State animal is Red Panda, state tree is Rhododendron Niveum, state Bird is Blood Pheasant and state Flower is Dendrobium nobile or Nobile Orchid.

This region is recognized as one of the ten mega-biodiversity regions of the world. Sikkim falls under diversed biodiversity hotspot of Eastern Himalayas. This region is surrounded by many countries around the Himalayan zone namely China, Bhutan, parts of the eastern Nepal, Chittagong (Bangladesh) and northeastern states of India including the hills of Darjeeling. Sikkim, being located at the foothill of mount Kanchendzonga offers wide scope for the study of Zoology, Botany, Geography, Geology, and so on. Environment of this region is sensitive and prone to fragility due to large number of tourists pouring into the State. It is estimated that the region contributes more than 26% of the flowering plants of India and has been known as a potential phytogeographic reserve of the country. The region is listed among the world's most critical centers for biodiversity and endemism with 150 species of mammals, 550 species of birds, 650 species of butterflies

TABLE 4.1: PLANT AND ANIMAL KINGDOM IN SIKKIM

FAUNA				FLORA		
SL. No.	Fauna	No. of species	Name of Principal Endangered Species	Sl. No.	Flora	No. of Species / found in the state
1.	Mammals	144	Bharal, Clouded Leopard, Fishing Cat, Golden Cat, Himalayan Thar, Leopard Cat, Red Panda, Marbled Cat, Musk Deer, Nayan or Great Tibetan Sheep, Pangolin, Serow, Snow Leopard, Spotted Lingsang, Tibetan Antelope, Tibetan Fox, Tibetan Gazzelle, Tibetan Wild Ass, Tiger, Tibetan Wolf.	1 2 3 4 5 6	Orchids Rhododendron Flowering Plants Ferns & Allies Conifers Medicinal Plants and Herbs	550(95General) 36(45Varieties) Over 4000 Species 300 9 Plenty (Not enumerated)
2.	Birds	550	Black-Necked Crane (Migratory), Blood Pheasant, Peafowl, Tibetan Snow Cock, Tragopan Phessant, Snow Partridge, Siberian Crane (Migratory).			
3.	Butterflies & Moths	650	N.A			
4.	Reptiles	33	N.A			
5.	Frogs	16	N.A			

Source-Stastistical Profile, 2004-05

and moths, 33 species of reptiles, 16 species of amphibians, 48 species of fishes, 4,500 species of flowering plants, 36 species of rhododendrons; 9

species of conifers, 450 species of trees, 480 species of orchids, 362 species of ferns and allies, and 175 species of wild edible plants (Pradhan 1976, 1979; Pradhan and Lachungpa 1990; Tamang 1993; Rai and Rai 1993; Sundriyal and Sharma 1996; Singh and Chauhan 1998; Ganguli-Lachungpa 1998; Sundriyal 1999). In Sikkim, 40.65% of area (Khangchendzonga Biosphere Reserve 2619.92 km^2; Shingba Rhododendron Sanctuary 43 km^2; Kyongnosla Alpine Sanctuary 31 km^2; FambongLho Wildlife Sanctuary 51.76 km^2; Barsey Rhododendron Sanctuary 104 km^2; and Maenam Wildlife Sanctuary 35.34 km^2) has been brought into protected area management network. The rich flora and fauna therefore is highly threatened and there are symptoms of extinction.

4.1 RESOURCES - PLANTS AND ANIMALS

In order to access the natural resource potential in Sikkim, resource map has been prepared where details of resources are placed in the form of tables and diagrams. Firstly, plant and animal diversity has been identified and then environmental aspect is being discussed at length. The five faunal diversity (Table 4.1) with their species available in Sikkim, shows wide range of natural wealth. In total, there are nearly 550 species of birds found in Sikkim.

4.1.2 Floras

The state is endowed with exclusive variety of natural habitat. An outline of some 29 endemics has been traced out from Sikkim Himalayas. The vegetation cover in Sikkim shows variety of trees and plants located at various heights. Due to variation in climatic condition, plants of unique varieties are found in this region. However, it may be mentioned here that vegetation cover is gradually vanishing from alpine zone due to change in environment and other innumerable factor.

Hooker in his own lines (1906) wrote about the exotics of floral diversity of the Indian subcontinent "to the immigration of plants from widely different

bordering countries, notably Chinese and Malayan on the east and south, of oriental, European and African on the west, and of Tibetan and Siberian on the north". He is the pioneer who gave maiden attempt in studying botanical paradise of Sikkim Himalayas.The Kanchendzonga biosphere has been the house of all such exotic varieties of plant diversity in Sikkim. Most of the species are found in highly elevated regions of Sikkim.Such regions are also the tourist resource of the state. In such a scenario, species are fighting for their survival. The plant varieties listed are not abundant; some species are highly endangered and need immediate conservation. The disturbances and encroachment are very high which led to ecological distruction. Sikkim is a paradise for Orchidaceae and Asteraceae, there are nearabout 450 and 280 species of these families found in this zone.

The rare endangered species of germplasm found in Sikkim are z. *Aconitum novoluridum* Munz. *Calamus inermis* T. Anders, *Cyathopus sikkimensis* Stapf. *Magnolia globosa* Hook.f. *Soulia vaginata* Franch etc., which are (Singh and Chauhan, 1998) being depleted at an alarming rate in other parts of the country due to severe biotic interferences. Therefore, the area has already been identified as one of the hot spot areas of the country

4.1.2.1 *Medicinal plants*

Since time immemorial, the ancient people inhabiting hills and mountains have been known for healing and treating diseases with herbal plant. In Sikkim, practice of such traditional herbal medicine is prevalent almost in all parts of the state. People though uneducated, yet can identify the species and their uses. Sikkim was recognized as the house of medicinal plants only after Hooker's botanical exploration. After a long wait, a work on commom medicinal plants of Darjeeling and Sikkim Himalayas by (Bissau,1956) appeared. According to (Srivastava and Kapaki, 1990) which over 400 plants possessing therapeutic properties have been recorded from the region

In the process of exploring medicinal plants, State Council of Science and Technology in Sikkim created a database on medicinal plants. The Forest

Department of Sikkim under its programme of minor forest produce established 20 trial plots of medicinal plants at different altitudinal zones covering an area of 600 ha (Sharma, 1995). Recently (Gurung, 2002) has brought out a book on the Medicinal Plants of the Sikkim Himalayas. The Sikkim circle of Botanical Survey of India has established extensive herbarium of medicinal plants. The names given in local languages along with the botanical drawings have greatly simplified the identification. Recently a Medicinal Plant Board has been constituted under the Secretary, Forest, wildlife and environment, Government of Sikkim.

There are records of substantial loss of medicinal plants from the mainland of Sikkim. It is reported that in the context of Sikkim Himalayan the situation in herbal plant removal from the wild state was already at a detrimental level as described by (Biswas 1956) " *Chiraita*, Aconite, *Ephedra*, Manjista, Kuth, *Podophyllum*, *Rheum*, *Lycopodium*, Chalmogra, *Ravwolfia* and many others are ruthlessly and crudely collected and sold outside the state." A study by (Rai and Sharma, 1994) highlighted the spots, which were resplendent with jatamasi reported by Gammie in 1894 but so far very few individuals are encountered. A large amount of herbals (jatamasi 26,160 kg, kutki 4,840 kg, aconite 7,880 kg as per Forest Department record, 1990-91) was obtained from Lachen but it remained as a past experienced. The report of a recent survey carried out at Lachen area in April 1999 reveals a less than 80 kg consignment of kutki and the other two species were of negligible amount. The list of restricted and protected medicinal plants; trees are placed at (APPENDIX IV)

4.1.2.2 *Rhododendron*

Sikkim is synonymous to rhododendrons. It was after 1849, Botanist Hooker came up with the pioneer work on 'Rhododendrons of Sikkim-Himalaya' that glimpses of rhodondron of Sikkim was known to all. The American Rhododendron Society carried out the study on Sikkim rhododendrons since 1971 and the then royal family took serious interest in this regard. The continent of Asia is known as the homeland for

rhododendrons and many species of rhododendron had been lifted out of the region during British rule. About 98% of the Indian species are found in the Himalayan region out of which 72% are found in Sikkim. Undoubtedly, Sikkim could rightly be called the *'cradle of Himalayan rhododendrons'*. The major threats to rhododendrons are deforestation and unsustainable extraction for firewood and incense by local people. These alpine plants may be wiped out from the biota in short time if proper conservation measures are not made. It supports a wide range of biodiversity especially birds and butterflies, which attracts a large number of visitors in the region thereby adding to the state and local economy. More than 90% of the World's natural population of rhododendrons is from southeastern Asia stretching from the northwestern Himalaya through Nepal, Sikkim, eastern Tibet, Bhutan, Arunachal Pradesh, upper Burma, western and central China. The genus Rhododendron, having about 50 species in India, is mainly distributed in the Himalayan region (1 species in southern India) and is one of the most neglected groups of plants in terms of scientific inquiry so far. There has been no substantial effort on the estimation of total number of species, sub-species and varieties of rhododendrons.

4.1.2.3 *Orchids*

Sikkim is the land of orchids. The climatic condition prevailing in Sikkim is best suited for orchid growers. She has about 480 species of which some varieties are domesticated as pot plants or indoor plants as ornamental plants. The orchids like cymbidiums and soft-cane dendrobiums have been placed on top of the world of orchids, it is mainly due to their progenies from Sikkim. Hence, Sikkm can be called as the *storehouse of orchid.*

The Orchids of Sikkim have also been endangered due to deforestation and human exploitation. Many of the species are on the verge of extinction and in case of others the populations have been substantially reduced. This process is in continuation and orchid's natural habitats are being disturbed. Unless timely action is initiated, (Pradhan, *et all*, 2004) the state definitely will loose its orchid wealth at a very fast pace. An ambitious and workable

programme needs to be chalked out to protect, preserve and restore orchids of Sikkim in their habitats. Biotechnological tools can be made good use for rebuilding and replenishing already dwindled numbers of different orchid species.

4.1.3 Fauna

The outstanding works in recent memory are on birds by Salim Ali, (1959) who reported as many as 430 bird species. His studies showed that Black necked Crane, Himalayan Griffon, Lammergeyer, Tibetan Snowcock, Snow Partridge, Snow Pigeon, Horned Lark, Snow Finch and Mountain Finch are a few of the many species of resident endangered birds of the trans-Himalayan region. There are also several species of migratory birds which over fly this region and use the high altitude lakes as stopover sites to rest on their journey across continents. Further, inclusion of migrants could round off the number of bird species in Sikkim to about 550 (Lachungpa, 1998). There is also (Chettri, 2000) a compiled list of rare and endangered birds of Sikkim, which fall in different schedules of Wildlife (Protection) Act, 1972. Some of the schedule I species of birds are Blood pheasant, Crimson horned pheasant, Forest eagle owl, Himalayan golden eagle, Lammergeyer, Monal pheasant, Sparrow hawk, Tibetan snowcock and White breasted dipper . As many as 52 species of water birds belonging to 10 families mostly from the Trans Himalayan zone and high altitude river banks of north Sikkim have been reported. Some of these are Ibis bills, Redshanks and Brahminy Ducks. Some of seasonal visitors are Geese, She duck, Widgeon, Gadwall, Teals, Mallard, Pintail, Shoveller, Pochards, Merganser, Black necked Crane, Crakes, Moorhen, Woodcock, Snipe, Redshank, Sandpiper, Stint, Ibis bill, Avocet, Plover, Lapwing, Gull, Grebe, Cormorant, Egret and Heron (Ganguli-Lachungpa 1998 & Pradhan *et all* 2004)

According to Ganguly Lachungpa about 150 species of mammals belonging to 28 families have been recorded from Sikkim.According to Chhetri there are nearly 19 mammals of Sikkim under endangered or rare category, as per the schedule of Wildlife (Protection) Act, 1972 and in the IUCN red

data book. The most important schedule I species of mammals are Bharal, Clouded Leopard, Great Tibetan Sheep, Himalayan Thar, Marbled Cat, Musk Deer, Red Panda, Serow, and Snow Leopard.

Where as Tamang P, 1993 reported 48 types of fishes in Sikkim belonging to hill stream such as 23 genera, known variously as *Balm, Asala, Bhitti, Khasray, Challay, Chirkey, Chepti, Gardi, Theyr, Katlay, Sahar, Buduna, Titay, Gadela, Jalkapoor, Gonch, Gona Machha, Dhodray, Kahray, Lulay, and Kabray or Hilay.* Further Haribal, 1991 recorded 650 species of butterflies and moths in Sikkim.

4.2 DEFORESTATION AND ENVIRONMENTAL DEGRADATION

In the long journey from cradle to grave forest is human's first friend. Ecologically, forest changes the course of an eco system. It is often viewed about the economic significance of forest but pondering into the system it reveals that well knitted food chain and food web exist with delicate balance in the eco system. The problem of rain-wash, flashflood, landslide, have caused massive degradation of forest in the recent past. Sikkim being a Himalayan sloppy region, rate of deforestation is exorbitant. The rural people in Sikkim directly or indirectly depend upon forest resources; cooking coal, fodder and fuel are derived from forest resource. The clean air is derived from forest; vegetation determines the type and quality of soil and climate in a given region.

Forest is invaluable property of a nation and also the livelihood of rural mass. Forest resources determine the size of domestic animal. In the present scenario, forest provides raw materials to the modern massive industries. Further, natural habitats including numerous animals and microorganisms, nutrient rich soils having high organic value thrive in the places covered by luxuriant vegetative growth. The forest areas in Sikkim may decrease due to construction of hydro power plants, airports and other constructional activities. There are instances where endangered species of Orchids and Rhododendrons are collected by the local people and trekkers and sell them off in the illigal market to earn their livelihood. The faunal diversity such as

black buck, leopard, cat, golden cat, Himalayan bear fighting battle for their survival.

4.2.1 Deforestion senario in Sikkim

Deforestation has been a menace, which endangers the fragile eco-system of Sikkim. Destruction of natural vegetation in the high altitude areas, alpine zones have threatened the flora and fauna. Due to pressure on land, forest areas are often encroached for gaining agricultural development. To fill the belly of large population, forestlands are converted to farming areas. The cardamom growers in Sikkim have been shifting towards high altitude areas. The depletion of forest resource has a wide-ranging impact on ecological balance ranging from the extinction of rare flora and fauna to changes in climatic conditions, desertification and floods. Because of habitat destruction large number of plants and animals are in the endangered list and some of the natural attractions of Sikkim are disappearing. The maintained level of forest cover helps in maintaining water table but encroachment is prominent in the vicinity of forest area. Many private lands in the state share its boundary with the forestland. It is very difficult to monitor the extent of encroachment because of lack of resources, manpower and technology. The rate of encroachment is severe in rural area; it is mainly due to lack of clearly demarcated boundary and lack of knowledge in forest laws.

4.2.2 Land diversion

The pressure of encroachment on forestland shows notable figure. As per the 1998 estimate, total of 590 hectares forest land of Sikkim was diverted for development related activities. There was an increase in 1998-99 by another 10 hectares of forestland diversion to other activity. Total of 147 hectares of forestlands are proposed to be diverted in future. (Statistical Profile 2004) There are many cases (APPENDIX V) showing diversion of forest in Sikkim.

The concept of compensatory afforestation is found best recorded in Sikkim. It is carried out in the places where deforestation has been carried out

for the purpose of development. Approximately over 1000 hectares of CA has been completed. It clearly indicates that unprecedented forest depletion is taking place in the name of development in Sikkim.

4.2.3 Commercial deforestation

In 1951, purely commercial deforestation practices prevailed in Sikkim. Under this scheme timber used to be floated through the rivers. There were no urban centers in Sikkim and the entire area was covered by forest wealth. During this time merciless vegetation clearance took place to give way to construction projects. The timbers were cut for house construction and also supplied to meet the demand of industries.

4.2.4 Forest fire

In Sikkim, forest fire is not a new thing. The forest fire is caused either accidentally or by village community. With a view to add to agriculture land, forest are often put to fire, secondly, unwanted grass cover is wedded through fire so that manuring is not required. People in general and farmers in particular are not aware of the loss of forest cover and its impact on environment. Hence, further depletion is possible to great extend.

4.3 ENERGY CONSUMPTION AND ENVIRONMENTAL DEGRADATION

The energy consumption pattern in Sikkim is different in rural and urban areas. The traditional sources of energy consumption are widely practiced in rural Sikkim whereas modern system is used in the urban centers. Using firewood, animal dung and crop residues fulfill the traditional system of energy needs. Biomass has been a vital part of the state energy source.

4.3.1 Fuel consumption pattern

Since most biomass fuel is used in domestic cooking, energy wastage from biomass conversion is very high. Fuel wood covers nearly 85% of the total energy consumption, (Table 4.2) which is basically obtained form forest.

The comparative picture of four districts in Sikkim reflects predominance of forest wood as source of fuel for cooking purpose.

TABLE 4.2-DISTRICTWISE TYPE OF FUEL USED FOR COOKING (in percent)

District	Wood		Coal		Kerosene	
	Rural	Urban	Rural	Urban	Rural	Urban
East	82.03	8.44	0.13	0.67	10.63	53.16
West	92.96	61.81	0.01	0.00	2.28	16.75
South	87.37	44.23	0.10	0.14	6.12	16.35
North	92.95	62.42	0.02	0.00	4.91	24.43
Total	87.40	29.35	0.08	0.39	6.60	36.26

Wood is main fuel for cooking purpose even in the urban areas of West and North Districts. Unlike the popular belief that electricity is increasingly replacing conventional sources of energy, (Table 4.3) not even 1 % of urban and rural population use it for cooking. In the North District, LPG consumption is still relatively low which indicate a high degree of dependence on forest resources. It can therefore be well appended that deforestation and environment degradation is unprecedented in Sikkim.

TABLE 4.3: ELECTRICITY AND LPG CONSUMPTION (in percent)

District	Electricity		LPG		Others	
	Rural	Urban	Rural	Urban	Rural	Urban
East	1.00	0.59	5.75	36.73	93.25	62.66
West	0.30	0.84	3.85	20.10	98.86	79.06
South	0.49	0.64	5.54	38.29	93.97	61.07
North	0.42	0.00	1.52	12.73	98.06	87.27
Total	0.61	0.58	4.86	33.02	94.53	66.40

Source: Gyatso and Bagdass, (1998)

TABLE 4.4: MAJOR PROJECTS IN THE PIPELINE

Name of Project	Capacity
Rolep Hydel Project	(2x3) Mw
Lachungchu Stage II	(2 x 1-5) Mw
Lower Kalez Hydel Project	(2 x 1.5) Mw
Rangpochu Hydel Project	(2 x 500) Kw.
Bagachu Hydel Project	(2 x 2) Mw.
Ribdi-Bhareng Micro Hydel Project	(2 x 50) Kw
Kissimey Khola Hydel Project	(2 x 100) Kw
Teesta Hydro Electric Project Stage III	
Teesta Hydro Electric Project Stage V	

Source-Statistical Profile, 2004-05

4.3.2 Salient features of Sikkim electricity

Light is an important source of energy, which is required by every household. In Sikkim, power need is fulfilled only by means of hydropower supply. Being a hilly region, hydropower generation is feasible. Hence massive water resource in the state is exploited accordingly. The main river namely Tista and Rangit are the sources of hydropower. Besides huge project, small rivers are also harnessed for generation of power in the state, it include river Rimbi, Kalez, Rothak, Rongnichu etc

4.3.3 Hydel projects under construction and undertaken

The following projects are under construction.

Purey Khola Micro Hydel Scheme (2x100) KW, Rathongchu Hydroelectric Project (3x10) MW (Scrapped in 1997), Diversion of Ralli Khola to Mayongchu, Rabonchu Hydroelectric Project (3x1) MW.Other projects (Table 4.4) in pipeline are also equally contributes to power supply in future.

4.3.4 Environment concern

The rivers harnessed for power generation is located in the high altitude areas characterized by steep slope deep forest with thick vegetative cover. The construction of dams and tunnel results in massive destruction of existing flora, fauna and biodiversity. Sikkim has been identified as rich waterpower generating station; NHPC has taken up various hydropower

projects in the state. Though environmental clearance has been acquired from the Ministry, yet virtual collapse of environment is seen around the power stations in Sikkim.In the Balutar-Singtam-Dikchu power plant area, concretes have replaced the entire landscape. The construction of roads and bridges, buildings and diversion of water through tunnel have killed millions of living organisms. The nearby households complained of crack and sink due to over use of explosives and blasting. Marine life has dried out with the diversion of river Tista.It is found out that water scarcity due to drying up of water sources have posed serious threat to life and people inhabiting this region having the only alternative to leave the place.

4.4 INDUSTRIAL DEVELOPMENT AND ENVIRONMENTAL DEGRADATION

It is a universal fact that economic development started after industrialization. It is also an established fact that industrialization has its adverse impacts on natural environment. Therefore it is accepted that the rate of industrialization has resulted in rapid rate of exploitation of natural resources, thereby generating several environmental degradation and ecological imbalance. The unlimited resource required for industry has exploited and extinguished natural resources. Firstly, natural resources which maintain ecological balance are used as input for industry and secondly, the left over natural resources are polluted by industrial wastes such as polluted water, toxic gases, chemical precipitates, aerosols, ashes and smokes etc. These effluents further pollute air, water, land and soil leading to uncontrolled environmental degradation. In Sikkim, environmental degradation through industrial activities is found not much problematic, because industrial growth could not take place vigorously in the state. According to the data of 1995-96, industrial sector has shared only 13.65 percent in Sikkim. However, it is a fact that the virgin environs of Sikkim are being polluted by the use of plastics, packets and waste materials.

4.4.1 Status of industries in Sikkim

After merger in 1975 there has been considerable increase in the industrial activity in Sikkim. Several attempts were made to learn from other Indian states regarding industrial development but due to lack of feasibility all went in vain The current status of industrialization of Sikkim is standstill .The Government has been promoting industrial setting environment, wherein large chunk of agricultural land has been notified as industrial belt. At present, there are 929 industrial units registered in the small scale sector, but only a small number of units are functioning, remaining have been virtually closed down due to various reasons and only two medium scale units are functioning in Sikkim.

The reasons for the failure of many industrial units are manifold. One of the main reasons is lack of infrastructure building, transportation and market. Secondly it is due to physical inaccessibility and difficult terrain of Sikkim Himalayas. To create employment opportunity industries are coming up but the rate of growth is negligible. The fragile ecology is already overburdened by cementization and concretization of infrastructure development. There is rapid growth of concrete building construction to meet the seasonal demand created by tourists. Every house is in the process of change from mud, thatch to brick and cement concrete. Hence, environment by and large is adversely affected.

The districtwise distribution of industry shows dominance of industries in eastern part of Sikkim. Their number reduces as we go up to higher altitude. In northeren Sikkim, number of industrial establishment has sharply reduced to few numbers. This is due to increase in distance and remotness in location. It is revealed (Table 4.5) that undulating and plain area is progressing towards industrial establishment.

Though Sikkim lacks infrastructural development in setting up of industries, yet the industrial units have been increasing rapidly. Industries ranging from small scale to medium scale are growing up constantly. In the Rangpo- Mining belt, various large-scale industries have come up. These

industrial clusters are characterized by population change, release of effluents, land degradation and ecological threat.

TABLE 4.5: DISTRICT WISE NEW INDUSTRIAL UNITS

East	South	West	North
Rangpo, Majitar, Bardang, Singtam, Topakhani, Martam, 32 Mile, West Namli (Radong), Samlik, Marchak, Ranipool, Tadong, Deorali, Gangtok, Burtuk, Bhojoghari, Pangthang, Penlong, Adampool, Rumtek, Ranipool, Saramsa, Aho, Chota Singtam, Namchey Boong, Lal Turning, Pakyong.	Lower Kitam, Manpur, Mazitar, Jorethang, (along the state highway) Karfektar, Chisopani, Nandugaon, Namchi, Boomtar, Mamring.	Rothak, Piplay, Baiguney, Reshi, Legship, Naya Bazar, Budang, Soreng,	Mangan, Lachen, Lachen.

Source- Statistical profile, 2004-05.

4.5 POPULATION AND ENVIRONMENTAL DEGRADATION

The expansion of population in Sikkim has taken place with the corresponding expansion in agricultural cultivation. However, one of the reasons for rapid growth of population can be attributed to Indo-China War of 1962, where large number of Tibetan population flew to Sikkim as refugee. Secondly, in 1975 large number of people migrated to Sikkim to be employed in various institutions of Government and non-Governmental establishments. As a result rapid process of construction of new houses, buildings, industrial complexes, roads and buildings etc. started to give the present form.

In the present scenario, Sikkim is under tremendous pressure of population. It (Table 2.1) shows phenomenal change in population from 1991-2001 with a growth of 24.4 times in Sikkim. The density of population was 8 people in 1901, which creased to 76 persons in 2001. The substantial increase from 57 persons in 1991 to 76 persons per sq. km. is recorded in 2001. It is very conspicuous even to laymen that increase from mere 22,152 population in 1891 to nearly 5,40,551 in 2001 is a red signal of pressure on natural environment, (Table 2.3). At such condition supremacy of men will

prevail over nature and the eco-imbalance may lead to severe damage of eco system.

4.5.1 Environment concern

At this rate of population explosion there can be no sustainable development. The carrying capacity of a geographic unit cannot support the corresponding increasing in population growth. The over utilization of resource will invite the reduction of millions by natural catastrophe. Environment at this stage will not be able to sustain the starving millions with supply of fresh air for breathing.

4.6 POVERTY AND ENVIRONMENTAL DEGRADATION

Poverty is the free gift of over population. When available resource fails to support the teeming millions, food scarcity is natural. The large section of our people are still deprived of the basic minimum needs. Due to shortage of gainful employment, the poor section of Sikkim's people generally bank upon agriculture, forest, and natural resource. Therefore pressure on natural resource is maximum. The collection of firewood and forest produce in rampant in the rural areas. The downtrodden population has been heavily banking upon the ecology for their livelihood. Therefore, environmental degradation is massively taking place in Sikkim. In such a poverty-ridden economy, collection of firewood and illogical selling of forest produce are common. Hence, poverty also acts as a tool of degrading natural environment. Late Indira Gandhi pointed out once that 'poverty pollutes environment'.

4.7 URBANISATION AND ENVIRONMENTAL DEGRADATION

Tremendous pressure of population in urban centers can be attributed to natural or migratory growth. Further, expansion of new urban centers due to industrial expansion and development activities are responsible for rapid growth of urban population. Therefore, urbanization is a factor for several types of environmental degradation and pollution in Sikkim. The trend of

urban growth in Sikkim is in its progressive pace. Due to the functional disparity between urban and rural in terms of wealth and availability of job opportunities in the urban centers, concentration of population is found in cities and town areas. It can be noticed that there has been gradual increase in the rate of urbanization in Sikkim since its merger in 1975.

The main reason for the shift from rural to urban include

- Availability of amenities facility in Gangtok, Namchi, Jorthang, etc.
- Concentration in Gangtok is mainly due to capital city and access to offices.
- Job opportunity and training availability for human resource development.
- Gangtok is access to college and university and quality schools.
- Seasonal employment during tourist season.

Gangtok has been suffering from traffic congestion, drainage, sewage treatment and solid waste management. As a result, waste generation is high and environmental degradation is resulting in the form of sudden outbreak of waterborne diseases, stress and respiratory diseases.

4.7.1 Population distribution in towns

There are nine major towns, Mangan in the North, Gangtok, Tadong, Singtam and Rangpo in the East, Namchi and Jorethang in South and Gyalshing and Nayabazaar in the West. There are other small and non-formal bazaars in Sikkim where population is highly concentrated. Though, Sikkim is a rural agrarian society, the size of population in terms of man land ratio is not supportive. But in aggregate about 88 percent of its total population is concentrated in rural area. The distribution of population in these nine major towns (Table 4.6) reflects Gangtok as thickly populated town growing to attain the status of city.

TABLE 4.6: POPULATION OF TOWNS

Gangtok	25024	29162
Singtam	3868	5431
Rangpo	2080	3724
Gyalshing	717	828
Nayabazaar	1045	996
Mangan	803	1248
Namchi	630	978
Jorethang	1939	2968
U.Tadong	NA	14670

Source: Sikkim Provisional population totals, 2001

But if we ponder into the size of population in rural and urban areas of Sikkim, it reflects that the percentage of urban population to total population in the year 2001 forms only 11.10% in comparison to rural population which shared a high percentage of 88.9.Increasing urbanization means phenomenal increase in the concentration of human population in limited space, resulting multifarious problems associated with the management of buildings, roads and streets, sewage and storm drains, pucca surface area, vehicles like motor cars, trucks, buses, motor cycles, scooter etc. Number of factories, urban wastes, aerosols, smokes and dusts sewage waters etc. cause several environmental problems.

4.7.2 Site allotment

The allotment of sites for the construction of individual house needs no explanation as the number has increased from 42 in 2001 to 63 in 2003-04 (Table 4.7) All the sites allotted are located mainly in the urban center. As a

TABLE-4.7: SITES ALLOTTED TO SC/ST/OBC/OTHERS

NUMBER OF SITES ALLOTED					
Year	**S/C**	**S.T**	**OBC**	**Others**	**Total allotments**
2001-02	5	11	20	6	42
2002-03	7	19	21	5	52
2003-04	3	19	29	12	63

Source-Dept. of UDHD & Profile, 2004

result, various new colonies have been emerging in the periphery of towns. In Gangtok, a new colony has emerged at 5th mile, where around twelve houses are erected in the last two years. The barren land located at the vicinity of Gangtok has been virtually filled with jungle of concretes.

When such urban sprawling takes place the space meant for garden and playground are converted into concrete as a result there is bound to have negative impact on environment.

4.7.3 Environment concern

The gaseous emissions form stacks into the atmosphere, liquid effluents, and solid wastes produces have polluted air, water and land environment. The thick smoke is always seen rising in the atmosphere near mining ground industrial complex. The few industries existing in Sikkim have already made local people feel the deterioration of existing ecology. Continuous release of pollutants into the environment particularly over the years has a cumulative effect on the flora and fauna, domestic animals and man. The disposal of solid wastes in certain industry posing a serious problem due to lack of space, it is noticed in the areas lying between Rangpo-mining belts. Besides direct environmental pollution at the site show glaring examples of resource depletion. Hence, measures must be initiated in time to establish industry in an ecofriendly manner.

4.8 CONSTRUCTION OF ROADS, BUILDINGS, HOUSES AND ENVIRONMENTAL DEGRADATION

As mentioned earlier, men are active geomorphic agents in terms of inadvertent and planning activities, which finally can affect the morphology of various form of landscape. Modification of terrain by engineering works, quarrying, mining and construction of large number of houses and buildings are prevalent in Sikkim. Such phenomena have always been changing the configuration of the earth's surface mainly by the process of weathering, erosion and mass wasting. Slope land area is the common physiographic

characteristics feature of Sikkim. Human adaptation to such types of land is a success story of human adaptation in the mountain terrain. The humans having been adapted to such environment needs basic amenities. In the process of providing basic amenities, several types of constructional activities such as housing buildings and roads come up. As a result, natural environment eventually fall pray of environmental degradation. Some major impacts of humans' construction activities in hill slopes are landslide, earth flow, mudflow, debris flow and mass movement. Angle of slope determines the rate of all loss and erosion. The steep slopes are readily capable for the occurrence of erosion processes. Different types of erosional agents such as wind, running water, glacier etc. are more active in the area having high degree of slope. The unloading of overlying materials by the construction activities including construction of bridges roads and buildings may expose the underlying rocks and erosion takes place on earth-exposed surface in two main ways. Firstly, it can easily be washed away in bulk under the influence of gravity. Secondly, disintegrated and exposed materials are blown away by means of chemical weathering. Hence, this type of degradation of environment is most common in the rugged areas of Sikkim Himalayas.

4.8.1 Buildings and houses

The quarters and other buildings are continuously constructed (Table 4.8) by Buildings and Housing Department of Sikkim. Besides, there are other governmental buildings, which are under construction. In Gyalshing, there is a construction of hospital having the capacity of 100 beds on it.

Table 4.8 NUMBER OF RESIDENTIAL BUILDINGS CONSTRUCTED DURING THE LAST 15 YEARS

Residential Building/Govt. Housing	No. of Constructions
Class I Quarters	64
Class II Quarters	256
Class III Quarters	881
Class IV Quarters	1027
VIP Quarters	27

Source: Building and Housing Department, Govt. of Sikkim, 2003

This work is under progress and likely to be completed by this financial year 2005. There is a construction of Limbu community center at Tharpu, West Sikkim and construction of infrastructure facilities in trekkers' complex at Yoksum, West Sikkim and work of these both are in progress. There is another construction of tourist information centre at Pemayangtse, West Sikkim. The site has just been handed over to the Tourism Department for utilization purpose. The huge sports complex and Kanchendzonga sports complex at Gangtok have come up in the recent years. Besides, individual, commercial, industrial and institutional buildings are mushrooming across the length and breadth of Sikkim.

4.8.2 Roads and bridges

Road is the lifeline of Sikkim. Government has prioritize the road connectivity even in the remote corner of the state and construction of roads is the initial process of environmental degradation. The current status of roads in Sikkim (Table 4.9) mentions rapid increase in the length of road from 1997 to 2001.

TABLE 4.9-LENGTH OF ROAD MAINTAINED BY SPWD IN KILOMETRES

LENGTH IN KILOMETERS			
Year	Surface Road	Unsurfaced Road	Total
1997-1998	849.35	926.00	1775.35
1998-1999	837.35	923.00	1760.35
1999-2000	849.35	927.00	1776.35
2000-2001	930.35	927.00	1857.35

Source: Roads and Bridges Department, Govt. of Sikkim

In the above-mentioned figure, the length of roads showed neglegible declined in the year 1998-99, (TABLE 4.9) it is due to transfer of road construction (around 34 kms) to Border Road Organisation at that time. However, maintenance of all these roads is under the perview of Roads and Bridges Department, Govt. of Sikkim. Besides, there are (Table 4.10) other roads connectivity maintained by Border Road Organization.

4.8.2.1 Roads *maintained by Border Road Organisation*

Sikkim being a border state, National Highway 31 runs through the heart of town and cities. Boarder Road Organisation maintains (Table 4.10) National Highways and Sikkim public works department maintains state highways.

TABLE 4.10-Road maintained by BRO as on 31-02-2000

Road Particulars	Length (in km)
National Highway	41.00
Surface Road	577.10
Unsurface Road	53.00
Total Road Length	671.10

Source: Project Swatik, Gangtok

Among all types of constructional activities, roads are the need and it is essential too, for building infrastructure and regional development. In Sikkim roads are constructed even in the fragile and rugged topography in order to established linkage between several remote far-flung areas with the hinterland. Hence, human adaptation, responses and interferences into the fragile geological structure of Sikkim are subject of research because it relates to deterioration of environment.

4.8.2.2 Bridges

Bridges connect the difficult and inaccessible areas in the rugged terrain of Sikkim. The construction of bridges is difficult, as it involves environment loss and public involvement. However, rapid connectivity (Table 4.11) is going on in all parts of Sikkim.

TABLE 4.11: BRIDGES CONSTRUCTED TILL 2003

YEAR	NO. OF BRIDGES CONSTRUCTED			
	North	East	South	West
1995-96	5	2	5	3
1996-97	5	3	5	2
1997-98	8	4	4	6
1998-99	8	5	5	7
1999-00	14	8	9	15
2000-01	3	2	2	3
2001-02	4	2	2	2
2002-03	3	2	2	3
Total	50	28	34	41

Source-Statistical Profile, 2004

4.8.3 Environment concern

The roads, bridges, and dwelling houses are the basic necessity for human living and also the symbol of economic development. Sikkim has unique geographical feature where relief sets the limit of development. Construction of roads, bridges and buildings have to be done at the cost of massive eco-degradation. In any construction activity, deforestation, erosion, silting, subsidence followed by drilling, plumbing, blasting takes place at large. Large volume of topsoil eroded by earth cutting, debri from rock clearance are washed away. The biotic wealth is not counted and million of habitats are destroyed during the process of construction. Sustainable development remains a far cry, unless there are movements like Chipko, Narmada Bachao etc. No environmental studies are done prior to construction. Similarly, eco degradation is becoming a usual phenomenon in the process of infrastructure development in Sikkim.

4.9 GROWTH OF VEHICLES AND ENVIRONMENTAL DEGRADATION

Distance in modern times is being progressively reduced with subsequent improvement in transport and communication facilities. So development of cheap and efficient means of transport is necessary for the

progress of a developing region like Sikkim. There are several mode of transport such as roads, railways, waterways, airways etc. and availability of this entire mode primarily depends upon the economic structure of a region and physical feature governing its location. Sikkim being a Himalayan state, roadway is the main system of transportation. Therefore vehicles as transporting agents are the basic economic arteries of this Himalayan region. For an economist, vehicles are the lifelines of state's economy but for an environmentalist, it is an unnecessary evil. The adverse impact of vehicles in environment have many folds; firstly, number of vehicles are increasing day by day in Sikkim and these rapid increase in number of vehicles have resulted in air pollution. Secondly, the rate of road accident has increased with the increase in road traffic. Thirdly, the heavy vehicles can produce more vibration while running through the fragile zone, which leads to disastrous environment in Sikkim's fragile ecology.

Gangtok, the capital of Sikkim is a loci of a large number of vehicles concentration due to the regional development and functional structure of this area. In Gangtok only, there are approximately 20,879 vehicles, which were registered in the year 2001-2002. Besides, there are number of unregistered vehicles found in Gangtok having the SK-TC number plates and vehicles from other states, especially from West Bengal. The details of total (Fig 4.1) number of registered vehicles found in Sikkim according to its types are as given

4.9.1 Vehicular Growth –a trend

The position and trend of total number of vehicles registered by its type are recorded for successive years as on 31st March 2001. Moreover, there are other registered vehicles too, which are categorized by its series and the number (Fig 4.1 & 2) of such vehicles are represented as SK-01, 02,03,04 etc. The Sk 01 series denotes all motor scooter, motorbike an two wheelers, Sk 02 represents Goverenment and private vehicles, Sk 03 comprises of trucks and goods carriers and Sk 04 means all the taxi permit vehicles.

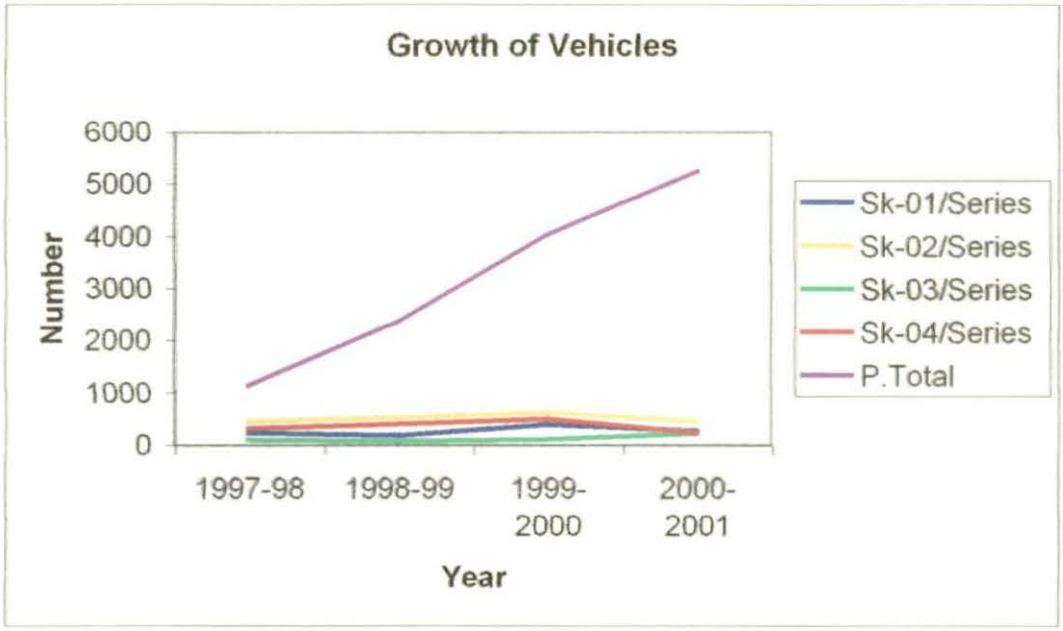


Fig 4.1 –Trend of Vehicular growth

Numbers of vehicles determine the rate of pollution in a given place at a given time. Increasing number of vehicles keep the road busy, parking has become a major hurdle and vehicular pollution levels have gone up. Petrol and diesel are major fuel used as an energy source for the locomotion of vehicles. Therefore liberation of these fuels in the form of smoke produces toxic fumes and degrade environment to a greater extent by polluting the air.

4.9.2 Environment concern

The growth of vehicle is directly associated with level of pollution. As defined by WHO, air pollution is substances put into air by the activity of mankind into concentrations sufficient to cause harmful effects to his health, vegetables, property or to interfere with the enjoyment of his property. Hence, the internal combustion engines that need a mix of air and fuel to burn and produce energy to move the vehicle cause vehicular or automobile pollution and these burnt gases that come out of the exhaust have the potential to cause pollution.

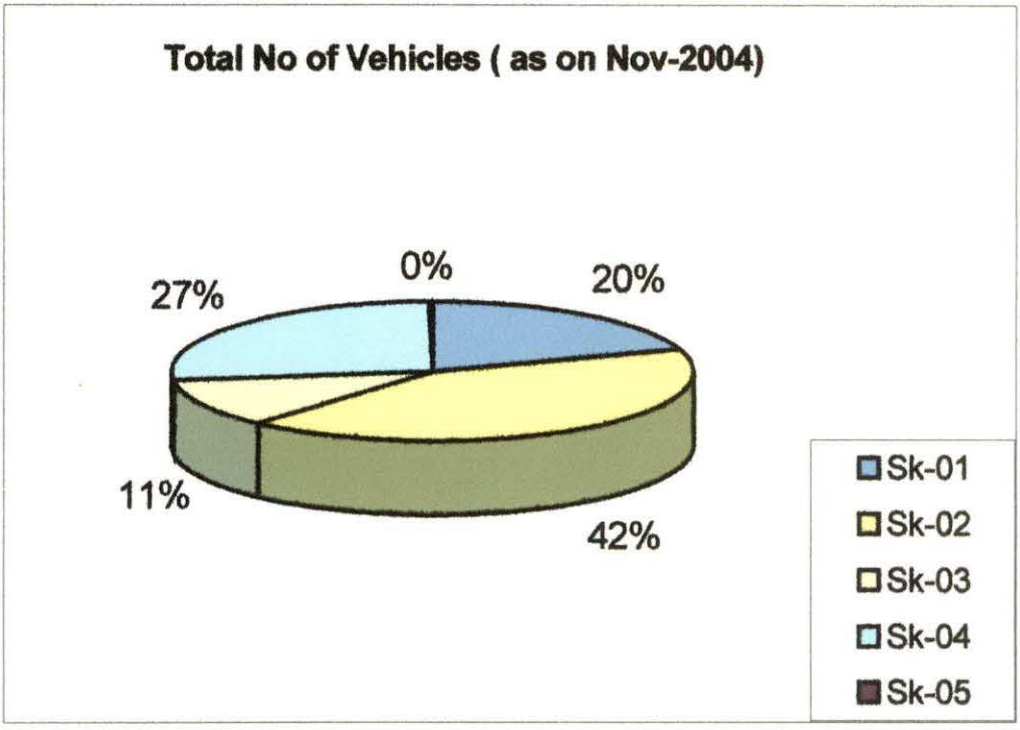


Fig-4.2 Total number of vehicles registered

Hence, internal combustion engines that need a mix of air and fuel to burn and produce energy to move the vehicle cause vehicular or automobile pollution and these burnt gases that come out of the exhaust have the potential to cause pollution. Therefore vehicles are considerably accounted for one of the active agent of environmental degradation. Besides registered vehicles, there are uncounted number vehicles entering from Siliguri, Darjeeling, Kalimpong and neighbouring states and countries. Trucks are found in large number for carrying essential commodities, goods and services, vegetables and raw materials such as rod, cement, sand, stone chips etc. Private vehicles from Bhutan, Nepal and West Bengal are found in great number during the tourist season. All these constitute greater degree and level of environment degradation in Sikkim.Air, noise and atmospheric pollution has replaced fresh atmospheric condition in the state of Sikkim. Initiation for the cultivation of Jetropha plant for bio-diesel is yet to introduce.

4.10 TOURISM DEVELOPMENT AND ENVIRONMENTAL DEGRADATION

Tourism is the only smokeless industry in the world which creats millions of employment opportunities in various service sector across the globe. Tendency of human beings to visit different places to perceive the scenic beauty of any environmental setup is a matter of fashion in present day scenario. Hence, exploitation of natural environment by human beings is a key factor in deteriorating environment. It is most essential to examine the physical environment before assessing the impact of tourism. Therefore, it is essential here to describe about physiographic features in one hand and natural parameter on the other. Sikkim is the loci of tourism attraction. There are several conditions which are contributing for this phenomenon.

Firstly, the snow-capped mountain has provided a unique face that gives a fanatic moment to the passion of nature while perceiving its appeal. Secondly, the climatic conditions of this Himalayan region play a predominant role in attracting tourist from extremely hot regions.

Thirdly, Indian plains experience hot weather and plain people search colder regions for leisure. Fourthly, culture and adventure attract tourists from all over the globe.

Hence, Sikkim has become an abode of tourism environment and hence tourism development is taking place at a very high cost. The Sikkim Himalayas as a whole is a tourist's paradise. The snow-clad mountains, crystal lakes, greenery, wilderness and alluring flora and fauna are the major attractions for the tourists. The main objectives of this paper lies on tracing out the current pattern of tourist flow and impact of tourism trade on environment. Inflow of tourist over Sikkim can be classified into (i) Domestic and (ii) Foreign. Most of the tourist flow is observed from mid March to mid June and September to November. Indian tourists mostly pour in the months of April-May and October-November during the time of festival holidays. This season offer them a good opportunity to enjoy the scenic views of mountain and the invigorating climate of Sikkim.

4.10.1 Tourist profile

Tourist traffic is increasing annually in Sikkim. In the year 1980 only

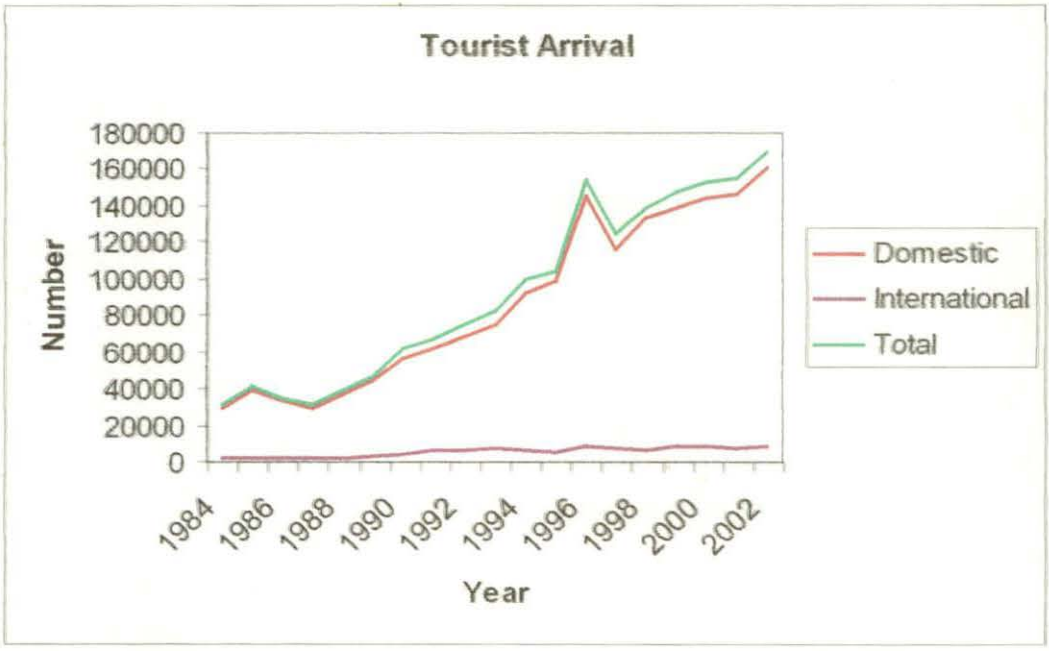


Fig-4.3-Tourist arrival in Sikkim

15,434 tourist-visited Sikkim, out of which about 83% were Indians and 17% foreigners. Since 1984 there has been a steady increase in the tourists flow. In 1989 about 46,416 tourists arrived Sikkim in which 96% were domestic and 4% from abroad. As depicted (Fig-4.3), there seems no decline in the rate of tourist population. In the year 1995,tourist flow crossed the mark of one lakh and reached 1,52,997 in the year 2000. Further in 2002,total of 18,35,267 tourists visited Sikkim.

Tourism business has become a seasonal affair, the concentration of tourists is seen during two seasons in a year. There are several factors controlling movement of tourists in Sikkim, namely, adverse climatic condition in January and heavy rainfall and landslide during monsoon season. Both domestic and international flow has declined during the month of July, August and January.The months of April and May show heavy rush. (Fig 4.4 & 4.5) This could be attributed to summer heat in Indian plains and vacation period of students in the Border States.

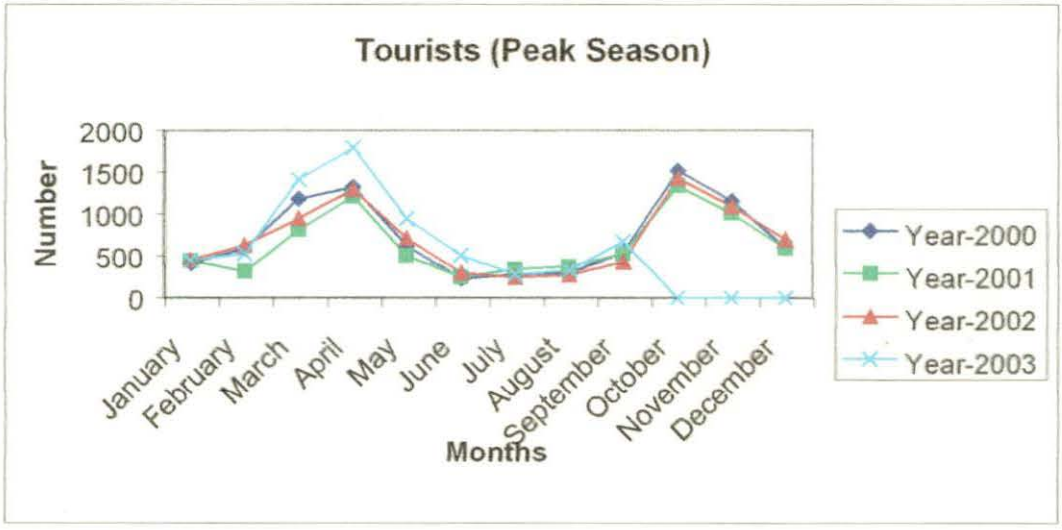


Fig-4.4 Peak season estimate of international tourists

4.10.2 Projection

The estimate on arrival of domestic and foreign tourist for the period of 15 years have been taken into account. The projection (Table 4.12) shows tourist traffic forecasted by TES, Master plan shows massive possible increase in influx of tourism from 1,18,000 in 1996 to 3,71,700 in 2011.The estimate if reflects true then Sikkim will have no accommodation for tourist. The destinations will be congested and there will be shortage of basic amenities and supply of food grains.

TABLE 4.12: PROJECTION TILL 2011

NUMBER OF TOURISTS			
Year	**Domestic**	**Foreign**	**Total**
1996	110500	7500	118000
2001	163900	13800	177700
2006	236400	23600	260000
2011	333300	38400	371700

Source-TEC, DOT, GOS

According to quantitative assessment (Table 4.12) based on present flow of tourist, available infrastructure and tourist destination; it is revealed that East District will outnumber other districts in tourist population.

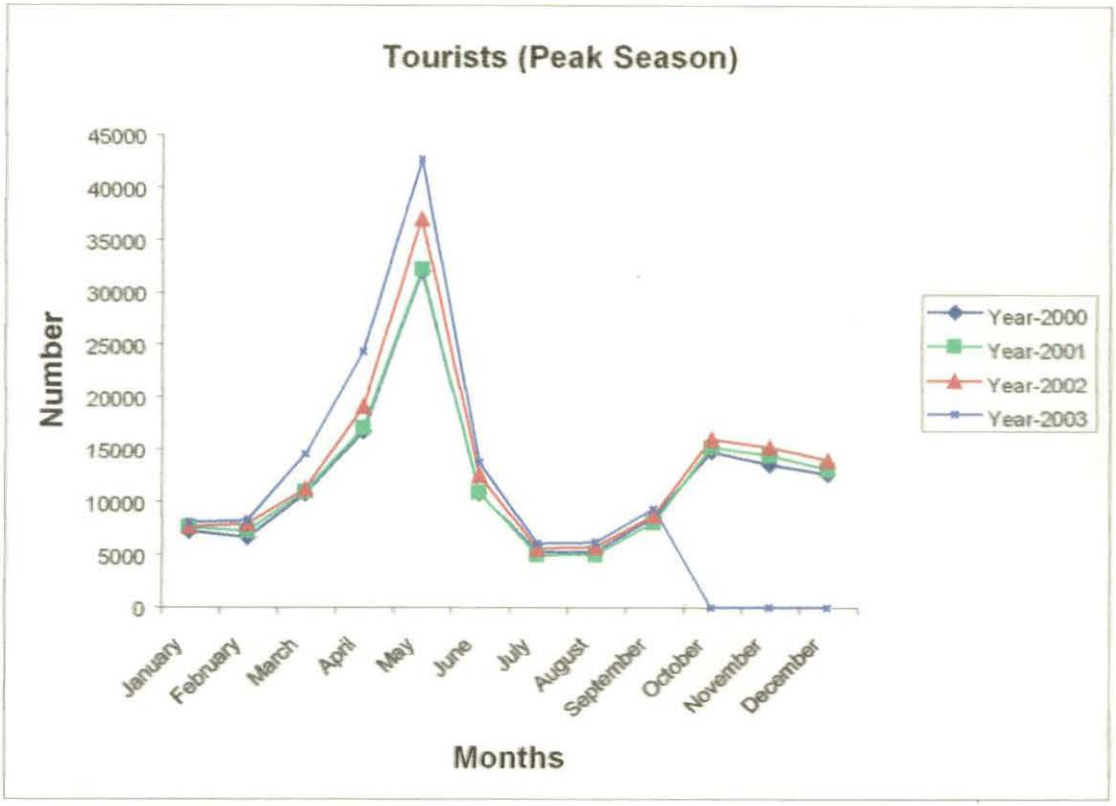


Fig-4.5 Peak season estimate of domestic tourists

In the year 2011, East Sikkim shall have nearly 2,78,800 tourists, (Table 4.12) where as North District shares only 16,300 tourisrs. International tourists prefer natural and cultural products. So, sight -seeing tourist segment is developing in Sikkim along with trek and trial tourism. However, scale of mount Kanchendzonga has been banned to preserve the sanctity and belief of local people. As a result, Nepal still maintains equal growth despite of several insurgency problems.

4.10.3 Environment concern

The fragile zone of mountainous Sikkim is sensitive and prone to degradation. Among all, tourism is one of the most significant activities, which led to degradation of environment. The lack of ecological balance due of expansion of tourists over an environment has given rise to the following major negative feedback.

a. ***Pollution***

Several types of pollution takes place due to tremendous increase of tourists' pressure. Spillages of oil may produce water pollution and air is polluted mainly by vehicular emission. Noise pollution is caused due to transportation and entertainment. Moreover soil pollution takes place due to improper waste disposal management and regular use of plastics. Due to the expansion of vehicular traffic, rate of pollution has tremendously increased, causing various diseases such as bronchitis, lungs related diseases, respiratory and pulmonary problems, headache, heart problems etc.

b. ***Erosion***

The land degradation, landslides, subsidence, citation are common phenomena at the construction site, the infrastructure development and growth of tourism is taking place at the cost of ecological disaster. Tourism is related to construction of hotels and amusement parks, which in turn pollute the ecological mileau. In Sikkim, construction of airports and five star hotels are coming up at high speed. Therefore further erosion is expected at large scale.

c. ***Change of habitat***

The floral and faunal diversity is at stake along the trekking route, the luxuriant vegetation and rhododendrons are uprooted by growing number of trekkers. The deforestation has resulted in extinction of plant and animal species.

d. ***Piracy and plastics***

In the parks and wildlife sanctuaries, trekkers even pluck the flowering plants for their personal gain. Proachers and guides often collect fuel and firewood from adjoining places and virtually destroy the existing eco-system. There have been many incidents of bio- piracy in Sikkim.

4.11 MINING ACTIVITY AND ENVIRONMENTAL DEGRADATION

Owing to its Geological and Geographical setting, Sikkim is not feseable for industrial establishment but mineral resources are found in many places in Sikkim. The Department of Mines and Geology has been exploring

the sites for mineral excavation from time to time. At persent, the potentials of minerals in Sikkim are coal, dolomite/limestone, marble, base metals, quartz/quartzite, talc, silliminite/kyanite, graphite etc. The distribution of each mineral and their environmental consideration has been drawn.

4.11.1 Mineral resources

According to Mines and Geology estimates, following are the distribution of mineral found in different parts of Sikkim Himalayas.The listings and their environmental consideration has been drawn accordingly.

1 *Coal*

The coalfields in Sikkim are widespread in the 'Rangit Valley Tectonic Window'. Geological Survey of India (GSI) carried out detailed studies of coal around Namchi Public School. After drilling, a reserve of 1.4 lakh tones was estimated in the area. Lately, the State Department of Mines, Minerals & Geology have been carrying out investigation of coal and areas of coal occurrences have been identified. Latest study at Reshi indicated a reserve of 70,000 tones. In Reshi area, coal deposits if exploited may cause severs problems causing environmental degradation

2 *Graphite*

Graphite is versatile mineral chiefly used in foundry facing, lead pencils, lubricants, paints, polished, cubicles, electrodes, dry batteries and others. Graphite in Sikkim occurs over parts of West and North Districts. Workable deposits are located at Chitre-Dariely and Dentam-Uttarey areas of West Sikkim. This graphite on an average contains 40-60% fixed carbon. For commercial purposes beneficiation is necessary. There is ample scope for development of this mineral. Uttary belt of graphite is in the extreme westerm region of the state with delicate natural vegetation. Hence, ecological threat must not be undermined.

3 *Sillimanite*

The industries making spark plugs, insulators, cement, ceramics, glass making, metal smelting and so on require it as raw material.

Investigation of sillimanite in the State shows occurrence of the mineral in the form of boulders and in situ lensoidal bodies at the headwaters of Rothak Khola (West Sikkim). The boulders alone show a tentative reserve of 1000 tonnes. The 50m thick sillimanite/kyanite bearing band is reported to extend along the strike of the country rock over 25m from Changey Khola to Sardung (Pelling-Dentam road section).

4 *Quartzite*

Occurrence of high-grade quartzite with over 92% silica, suitable for ceramics, glass, refractory industries and others are found in East, West, and South Districts of the State. At present quartzite occurrence of Rani Khola-Manasari area of West Sikkim are being mined by M/s Sikkim minerals Pvt. Ltd. The total estimated reserve in the area is 681,250 tonnes. But the reserves are found in fragile ecological condition. Therefore ecological disturbances are very much associated with it.

5 *Talc*

Talc in Sikkim is reported from Rani Khola-Mansari area of West Sikkim as intercalation in quartzite deposit. As estimated, reserve of 80,000 tonnes of this mineral is in the leased area of M/s. Sikkim Mineral Pvt. Ltd. There is scope of further development of mineral in the adjoining areas

6 *Limestone and dolomite*

Sikkim has extensive deposits of dolomite with bands of limestone in the Rangit Valley tectonic window. Exploratory work was formerly carried out by GSI. The State Department of Mines, Minerals & Geology continued it and the work is in progress around Reshi-Mangalbary and Namgaon area of West Sikkim.

7 *Marble*

The term marble is derived from the Greek word 'marmors' meaning a shining stone. Generally defined, marble is a metamorphosed rock formed by recrystallization of milestone. Marble is widely distributed in India but the occurrences of economic importance are limited to only few States. Marble is chiefly used for building construction as walls and floors.

Sikkim is endowed with sizable deposited of marble around Chungthang and Tsangu. Much attention was paid to this mineral for viable commercial exploitation

8 ***Base Metals***

As regards to the poly metalliferous deposits in the state, copper-lead-zinc deposit at Bhothang Rangpo is being exploited by Sikkim ining corporation. The corporation has been in operation for the past 30 years. Other base metal deposit under consideration of the Government is the Dikchu Copper-Zinc Project. The techno-feasibility study of the Dikchu project was carried out by the mineral exploration corporation (MEC) of India.

9 ***Thermal Water***

According to GSI record, there are over 300 hot springs in India. Suraj Kund in the Hazaribagh District of Bihar measured the highest temperature of 87 degree centigrade. From the chemical composition point of view, the Indian waters fall under four main classes. The majority of the springs occur in broad belt following the regional tectonic trends Sikkim has a long tradition of faith and belief on hot spring as medicinal value. Every winter people take a dip in the hotspring to get rid from various skin diseases. There are at least 8 known springs in Sikkim. Of them, Phurtsa Chu (Khandu Sangphur), Borong and Polot of South Sikkim and Yumthang, Tarun and Tolung of North Sikkim are the well known ones. There are also a large number of uncharted cold springs in the State. Investigation of few hot springs in the state were conducted in the field on the geology of the area around the springs, the flow of the springs, their temperature, pH and dissolved gasses such as CO_2 and H_2S.

The geological environments play an important role in influencing mineral composition and radioactive characteristic of the waters. Thermal spring such as Yumthang, Tarun and Phurtsa Chu are locally enjoyed for their therapeutic values. Among them, Phurtsa Chu is the most popular and enjoys religious sanctity. There is ample scope to develop the mineral spring resources of Sikkim. The hot springs of the state are also capable of developing into tourist resources.

4.11.2 Environmental impact analysis in mining and quarry areas

The environmental impact analysis has been done in the mining centers located in the fragile ecological condition of Sikkim. According to Negi (1982 and 1985), the mining activity involves blasting, earth digging, quarrying, excavation and extraction. As a result, following impact on mother earth is noticed.

- The environmental problems caused during the extraction of the mineral from the quarry face various problems as discussed. Due to removal of the topsoil and vegetative cover, the quantity of water seeping into the earth's surface is considerably reduced, thus lowering the water table. Loss of vegetative and topsoil cover also leads to erosion. Open cast mining methods means the loss of valuable land, which could have been put to other uses such as forestry, wildlife protection or agriculture. Explosives like dynamite are used in quarrying operations. Explosions cause shock waves to pass through the country rocks. Prolonged use of dynamic weakens the country rocks over a large area and may lead to frequent landslides.
- The excavation debris is allowed to roll down the hill slopes from the quarry face. This results in the formation of scree like features. The sliding mass of debris covers valuable arable land, forests roads and canals, which lie in its path. It even encroaches open human settlements.
- The dust generated during quarrying and other operations is causing health problems for the labourers. Aesthetically speaking, these white scars give an ugly look to the lush green hills.
- The above illistration shows that the potential mineral reserve is found in extreme ecologically frazile zones of Sikkim. Exploration in this area not only create problem of displacement of habitat but also led to massive loss of existing environment.The entire area gets affected by pollution and rise in temperature. The paragraph showed that places like Dentam, Bul, Damthang, Namchi are in ecologically delicate

position. Hence mining activity at such places would be no less than adding fuel to fire.

4.12 WASTE ACCUMULATION AND ENVIRONMENTAL DEGRADATION

Environmental pollution is one of the major problems the world is facing and pollutants are byproducts of man's own action. In developed countries, lakes and rivers are polluted with wastes from industries, pesticides, herbicides, fertilizer and chemicals and with exhaust gases of automobiles and industries etc. In the under developed countries, pollution is mainly caused by population explosion. The rapid growth of urbanization has encouraged the migration of population from village to urban areas. This in turn has given way to environmental problems like waste water generation and their disposal, garbage generation and their disposal, air pollution due to increase in vehicular traffic and industrialization, which result in contamination of water bodies. Unplanned dumping of wastes, sewage has resulted in unhygienic and poor living condition.

4.12.1 Solid waste

Rapid rate of urbanization has posed a serious threat to the urban environment in many countries and Sikkim is no exception. Solid wastes constitute all solid discarded material derived from industry, agriculture, commercial and other trade practices. With the rapid improvement in technology and growing consumerism, sophistication has increased manifold. As a result, products designed for cunsumer satisfaction is highly attractive and use of plastics and synthetic items are growing day by day. As aresult, no dumping space is available. Therefore improper disposal has caused severe environmental problems.

The World Bank (1998) has reported that urban areas of Asia produce about 760,000 tones of municipal solid waste per day, or approximately 2.71 cubic meters per day. In 2025, it is expected that quantities will increase to 1.8 million tones of waste per day or 5.21 cubic meters per day. It also reported that India generated 0.46 kg/capita/day producing 114,576 tones /day in 1995 and is expected to generate 0.70 kg/capita/day producing 440,460 tones/ day

by 2025. As per the report of UDHD, Sikkim generates 0.45kg/capita wastes. The total quantity of municipal waste generated at Gangtok is approximately around 42 tones per day. The only study carried out by the State Pollution control Board reveals the following findings on the state of solid waste management in Gangtok.

4.12.1.1 *Sources of solid waste*

It may be mentioned that, Gangtok is the only major town in Sikkim from where large-scale solid waste is generated. The solid waste comprises of domestic waste 34.19%, commercial and institutional waste with 28.1%and 19.2% respectively. Waste from agricultural activities is 3.17%, industrial and other waste 0.12% and 15.22% respectively. The total municipal waste generated in Gangtok town is approximately 27,000 kg/day. The per capita generation of solid waste is approximately 0.385 kg/day as per the report of Urban Development and Housing Department, Government of Sikkim.The constituents of solid waste in urban area reflects Commercial 28.10,domestic 34.19,institutional 19.20,agriculture 3.17,industrial 1.12 and rest 15.22 do not fall under any category.

Domestic waste are derived mainly from households, it includes kitchen waste, papers and cartoons, plastics, glass, textiles, leather, metals, ashes and garbage. Major producers of institutional wastes are schools, colleges, offices, banks, hospitals and religious places. It comprises of articles like paper and cartoons, food waste, glass, plastics, hazardous and pathological wastes. Commercial waste are produced at large scale by markets, tea stalls, restaurants, hotels motor repair shops, and factories. Such centers produce polythene case, strings, foam, bags, disintegrated metals, nail, glass waste, paper cases and spoiled and discarded goods. The natural waste consist of leaves, tree branches and carcasses of animals also form considerable part of solid waste in Sikkim.

4.12.1.2 *Composition of solid waste*

The composition of solid waste varies from place to place and time to time. There are food wastes 51.50% paper (10.80%) grass (13.80%), metal (0.60%), glass (0.40%), miscellaneous degradable (10.80%), miscellaneous non-degradable (10.00%) inorganic substances (1.60%). Waste generated in Gangtok town give an alarming result where, food waste constitutes 51.50%, glass 13.80%, paper 10.80%, plastic 0.50%, glass 40%, metal 0.60%and other degradable and non degradable (Pradhan *et all,* 2004) constitute 30.80% respectively. Western eating habit such as packet food, canned cold drinks, milk in sachets, chips in pouches, plastic ropes and carry bags, dry fruits in tin is responsible for rapid increase in the volume and content of solid waste

4.12.1.3 *Waste collection in Gangtok town*

In Gangtok, the responsibility of waste management lies with the Urban Development and Housing Department (UD and HD), Govt. of Sikkim. As stated by UDHD, there are two types of waste collection.

i -Commercial complex collection- In this, bins are placed at specific points depending upon the population and distance. In the main bazaar site and road site, wastes are collected every morning by the municipal vehicles.

ii-House collection- Every morning municipal vehicle collects waste from individual household.

The commercial establishments have been made mandatory to keep dustbins in front of their establishment. According to the interim report of the Supreme Court, every 130 persons should have a bin for the collection of waste materials. (Down to Earth 2000). In Gangtok town, dumping of waste into the jhora and streams are traditional habit that die-hard. The jhora, nalla and backside of the tall buildings are filled with solid waste in Gangtok and surrounding area. As a result these produce odour and bad smell frequently around the town.

4.12.1.4 *Transporation and disposal*

The department of Urban Development and Housing Department is the nodal agency of waste management. Wastes are being collected from the disposal bins and are transported by trucks to the disposal site on a daily basis. The disposal site is located at Marchak at a distance of around 15 kilometers from the main town. During transportation, truck full of open stinking garbage gets scattered along the roadside as well. The timing has been set for the movement of vehicle collecting garbage from different corners. As per the report received from UDHD, there are 7 trucks specified for the collection of waste. During the collection process obnoxious odor is produced causing nauseating and vomiting tendencies. The wastes are many times scattered along the road while transportation which poses serious threat to environmental and health.

4.12.1.5 *Plastic waste*

Though the state government has put a ban on use of plastic since 1997 yet there seems amply available plastic packed eatables in the town. However, strict rules are enforced in the state regarding plastics and polythene bags etc. With a view to make Sikkim free from non-degradable waste, a fine worth Rs. 5000/- is charged for contravening the law. But the eatables packed in plastics are commonly found in all the places as tourists snacks such as mineral water, pepsi, namkeens are packed in plastics.

4.13 NOISE POLLUTION

With the constant increase in vehicular population and entertainment units of Sikkim, there is a rapid rise in noise level. Noise population is directly associated with human health and surrounding environment. The quantitative measurement of noise is done on a logarithmic scale called "decibel" (dB). According to The World Health Organization (WHO) standard level of 45 dB is considered to be safe noise level for a city. By international standard a

noise level upto 65 dB can be taken as tolerable. In this contaxt noise level of various places around ggangtok has been studied.

The main source of noise pollution are vehicular, commercial activities, construction activities, loud speakers at ritual centers, schools, generators, music centers etc. The residential area of college valley, Tadong, Deorali Govt. quarters and development area and commercial area showed sharp variation. In the market areas high sound level is due to vehicle horn. However, during Durga, Laxmi, Diwali, Biswakarma, Saraswati puja time, temples generate sound pollution.

The report of State Pollution Control Board shows that, noise level is fairly high in all the areas in Gangtok. However, through the launching of public awareness campaigns and enforcement of traffic guidelines and rules, noise level can definitely be brought down and stabilized at a non-pollutant level.

4.14 AIR POLLUTION AND ENVIRONMENTAL DEGRADATION

Air is an important constituent of atmosphere. There would be no life without air in the atmosphere. Various life forms in the earth are supported by air quality. Health of a human being and animals are controlled by quality of air prevalent in the atmosphere. The whole universe will come to and standstill if the flow of air stops for a minute. When air is polluted, there are health hazards. Pollution of air is caused by emission of CO, NOX; HC etc. According to WHO, air pollution may be defined as follows: "Substances put into air by the activity of mankind into concentration sufficient to cause harmful effect to his health, vegetables, property or to interfere with the enjoyment of his property." However definition may vary from time to time. It may be mentioned that Gangtok the capital town of Sikkim is most polluted than other parts of the State. Theoretical source of air pollution include matter, which gets released by the burning of fossil fuel such as coal, petroleum and emittion include-

(a) Fine particles which include carbon particles, metallic dusts, tars, resins, aerosols, solid oxide, nitrate, and sulphates.

(b) Carbon particles largely carbon particles and heavy dust that is quickly removed by gravity from air;

(c) Sulfur, oxygen and nitrogen compounds

(d) Halogens and Radioactive substances.

(e) Dust and atmospheric suspended particles.

In the context of Gangtok, automobile including diesel and petrol motors are the prime polluter. It is estimated that nearly three-fourth of the carbon monoxide and two-third of the hydrocarbons and nitrous oxide are emitted by vehicle population in Gangtok. Besides, other pollutants include, pesticides used in agriculture, dust from agriculture practices and fields burning, construction industry, dust from road and building construction, industrial emission from Rangpo, mining areas. Along the roadside, pollution has caused is massive destruction of existing flora and fauna. Vibration due to heavy vehicles is giving sleepless nights to the people inhabiting NH31. The number of registered vehicles in Gangtok has been increasing day by day. (Fig 4.1) In Gangtok average 30,000 liters petrol and 15000 diesels is consumed per day and this figure has steadily increasing (SPCB, Pradhan *et all* 2004). The high pollution level is also attributed to steep gradient and the narrow streets of Gangtok. In general, low temperature prevailing in the hill regions trap poisonous gases in the ambient atmosphere. This phenomenon causes health hazards to pedestrian and roadside inhabitants.

4.15 WATER POLLUTION AND ENVIRONMENTAL DEGRADATION

It is a widely accepted generalized fact that water will be the cause for third world war. Needless to mention that cold war has already begun between the individuals, states and nations. The bone of contention in the city like Kathmandu, Darjeeling has been on water. As per the data, it is stated that, seventy percent of the earth's surface is covered by water. Of which 2.5 percent fresh water is available for human consumption in day-to-day life. An accounts of fresh water resources of world shows that, nearly 75% is

perpetually remains frozen under ice sheets and glaciers, around 24.5% contributes to ground water and remaining 0.3% and 0.06% are found in rivers and in the atmosphere.

With the increase in human heads, demand of water has increased manifold. On the contrary resource depletion is exorbitant and water sources are drying up day by day. As a result tempering, human interference and pollution are prevalent in the important water source areas. Due to all such problems, fresh water is being polluted. In the context of Sikkim, important water sources are lying in the high altitude belt, where there is massive environmental degradation. The water bodies in the lower belt is characterized by dumping of garbage, animal and human encroachment and this is defined as: "water pollution, which changes the quality of our surface and subsoil water to such a degree that its suitability either for human consumption or for the support of man's natural life process will decrease or cease:"

4.15.1 Drinking water quality

The report based on the study conducted by SPCB for Gangtok and surrounding area has been placed herewith for accessing the level of pollution. Drinking water is supplied to Gangtok town by the Public Health and Engineering Department. The source of drinking water is at Tamzey at an altitude of 4200 m above mean sea level. An army base camp is also situated besides this stream.

The water from Tamzey is stored at 10^{th} mile and 4^{th} mile Rateychu tanks and before distribution it is stored at Selep tank (1800 m) where chlorination takes place after which the water is supplied through pipeline network to different parts of the capital town Gangtok.

The analysis shows that there is microbial contamination at all the study zones and microbial density is highest during the monsoon period and lowest during the winter or dry period. The findings further revealed that the water is contaminated when the run-off rainwater gets mixed with the source of drinking water along the open canal through which water passes before

reaching the point of chlorination and distribution. In view of unrestricted cattle grazing and also the presence of an army camp at Tamzey, the source of drinking water, it is feared that the microbial contamination may also be due to open defection by the cattle (Pradhan *et all*, 2004) and the humans.

4.15.2 Environment concern

With the rapid increase in population of humans, vehicle, houses, due to heavy influx of tourists and migration, short supply of amenities have been felt in Gangtok in particular and Sikkim on the whole. The environmental pollution by soil, water, and air has been discussed at length and highlighted that ecology is in threat. The menace of solid waste and bio non-degradable waste are piling up in the state. Activity like road sweeping and drainage inadequacy are some glaring happening in Sikkim.

4.16 NATURAL CALAMITIES and ENVIRONMENTAL DEGRADATION

Physiographically, Sikkim is being hemmed in between the impassable Himalayas gifted with frequent landslide and natural calamities. The major landslide belts across the four districts of Sikkim are: Bhusuk, Barapathig, Changey Senti, Namcheybong, Parakha, Bordang, Lueing, Kumrela, Tadong, Phadamchen and Sirwani in the East, Lingi Payong, Kateng, Turung, Kewzing, Heingdam (Legship), Shyampari and Soda in the South district, Mangnam-Kurchey, Sakyong, Chewrey Boley, singhshhore (Uttarey), Reshi, Daramdin, Rumbuk and Beyong-Tikpur in West district and rang-Rang, meyong, Lanthey Khola and Ritchum (Lama, 2001) in the North district. Nature takes its own course and form in stabilising striking balance between man and biosphere. The natural calamities are the manifestation of maladjustment of isostatic balance in the form of catastrophes. Calamities could be in the form of earthquakes, landslides, forest fires, floods, flashfloods, avalanches, mass wasting, subsidence, drought etc. The event of landslide, falling of rocks and trees, floods, drought is commonly prevalent in hilly state like Sikkim. The horizontal and vertical tectonic movements of Himalayas result in development of various faults. As a result, earth

movement is disturbed and led to devastation of crust and its formation. In such condition, endogenetic and exogenetic geo-tectonic forces are responsible in bringing about catastrophes on the surface earth.

Calamities such as earthquakes, landslides and flash floods are taking place in Sikkim and massive devastation of life and property is experienced. The natural calamities are harmful not only to human being but also to plants, animals and overall ecosystem. The loss of several endangered plants and living organisms are due to radioactivity and terrestrial activities. Some of the natural disasters prone to Sikkim Himalayas are dealt with in depth.

4.16.1 Earthquakes

Sikkim falls under Zone IV of the Earthquake Vulnerability Mapping; therefore earthquake in this belt will not be an astonishing fact. The sudden movement of earth crust is the result of either vaocanic eruption or by faulting and displacement of rocks. Three classes of earthquakes are recognizable; (a) tectonic, (b) volcanic, and (c) artificially produced. Compared to the last two classes, the tectonic type is by far the most devastating and frequently occurring in the Himalayas (Gaur, 1998). For the hilly tract of Sikkim earthquake is a major threat to its people. The measures to predict earthquake and to measure its intensity are the broad task before the planner and decision makers. However a humble beginning has been initiated by Department of Science and Technology in installing seismographs at various locations in Sikkim. However, earthquake remains as a major threat in destroying and degrading the existing environment.

4.16.2 Landslides and flashfloods

Landslides are seen in every hillslope in Sikkim. The mass of earth and rock charged with water from rain and melting of snow when percolates through the crack and joints, results in causing slides. The steepness of slope and degree of saturation are the factors controlling landslide in Sikkim. The main causes of landslides are cloudburst, sudden high rainfall and

temperature, perpetual waterlogging and removal of vegetation on the slope. The sedimentary and metamorphosis rock predominates this area with the composition of dolomite, sandstone, shale, mica schist quartzite etc. The fragile geological structure of the terrain due to faulty rock formation is the main cause of landslides in Sikkim. Incidents of landslides are lower where the rocks are in anticline faults, i.e. the direction of layers embedded in the slopes is away from the direction of the slope. Lack of vegetal cover is certainly another cause of landslides. The excess run off causes the formation of gullies and scouring of the banks of the streams also cause landslide. Building of houses, roads, water supply schemes and hydropower projects, and biotic interference in the form of indiscriminate felling of trees overloads the carrying capacity of the soil and thus causes (Lama, 2001) landslides. Case histories of three major landslides during the early 1960 in 7th mile on Gangtok- Kupup highway, Rangrang and New Vong on North Sikkim highway suggest that these landslides occur mostly due to hydrological reasons. In recent times the landslide in Sikkim has been triggered by high intensity of rainfall. The worst damage due to rain was during 1968 when there were heavy and continuous rains for almost 72 hours. The damages was extensive and spread over almost all parts of the state when the entire lifeline was disrupted due to washing away of roads, bridges, power and water supply lines etc. It took several years to restore the damages and bring back the life to normalcy. The recent damage caused by high intensity rainfall was on the night of 8th June 1997, when rainfall measuring 233 mm, working out to be 20 times more than average of the same period of the previous years causing heavy damages in Gangtok and surrounding areas. (Lama ,2001) The rainfall of 24th September 2005 has taken nearly 15 lives and more than 100 houses in Mangzing and Rakdong Tintek.The cases of roadblock and broken bridges are numerous. (Personal visit, 2005)

Landslides, rock fall and debri fall causes massive damages to life and property in the state. During the monsoon rain, roads are blocked due to falling of tree and landslide activity. The National Highway linking Siliguri with Gangtok and beyond are highly vulnerable to massive landslides.

4.16.3 Glaciers, glacial lake outburst floods (GLOF) and avalanches

In the northern Sikkim, glacial activities are common phenomena that occur in high mountain ranges. The movement of glaciers such as Rathong and Zemu have caused in uprooting natural vegetation of the region. The debris and barren land is seen in the higher altitudes. The soil and natural vegetation are washed away every year in glacially active regions. In the glaciated tract, glacial lake outburst floods (GLOF) are a common hazard. Sikkim also has had glacial lake outburst floods in the past. Frequency of GLOF has increased because of global climatic change, global warming and acid rain. The Onglokthang glacier also feeds the Tista. A detailed study conducted by scientists and environmentalists of the Khangchendzonga Biosphere Reserve in1995; found that the Onglokthang and Rathong Chu glaciers are receding rapidly. This could spell disaster for Sikkim's fragile ecology. With the threat of global warming looming large, it is of paramount concern to study the status of glaciers and the impact of global warming on Sikkim. A study team reported that since the Little Ice Age, the Onglokthang glacier had retreated by about 500 m and the Rathong Chu glacier by 600 m. Sikkim's largest glacier, Zemu, had also retreated by 3-4 km. If the glaciers continue to recede, it could spell disaster for Sikkim's sensitive economy and may even lead to devastating floods and ultimate dryness in rive Tista (Lama, 2001). Sikkim is no exception to glacial outburst and loss of natural environment. In the North Sikkim such geomorohic features are noticed in the higher climatic belts. Recently, such activity was seen at Lachung valley that washed away vital installations and habitat including yak and yeti of this region. In the cold deserts region of Gurudongmar and Cholamu, avalanches cause widespread loss to natural environment. The loss of vegetation; grassland, trees and bushes are some of the must happening ectivity in north Sikkim. Nurseries and fresh saplings are virtuallu destroyed every year. As a result there is a disturbance in overall biosphere.

The Glacial Lake Outburst and avalanche claim four lives of mountaineers on 26th September 2005.The mountaineers, while attempting to

scale Chomo Yummo peak in North Sikkim (Sikkim Express, 28 sept 2005) died at the height of 6768.42m above the MSL.

4.16.4 Drought

Drought is a condition where there is scarcity of rain and water for a long spell of time. Lack of precipitation causes hydrological imbalance therby reducing the water table. In Sikkim, west and southern regions are adversely affected by drought hit. The most affected crops are rabicrops and cash crops like cardamom, ginger and orange, drought also caused scarcity of drinking water in acute conditions. As per the report of Agriculture Department, the total rainfall recorded in between October 1998 and 31st March 1999 was 93.34 percent, which is less than the rainfall in the last 25 years. The drought is characterized by loss of crop yields and gain in unproductively. During drought period farmers of Kitam, Gom and rain fed areas shift sowing of seeds for few months. The drying of land leads to failure of cardamom cultivation. The estimated loss of large cardamom plantations was about 60% in the unprecedented dry spell. The north district in Sikkim alone produces large cardamom worth of Rs. 200 million annually (Lama, 2001). The above facts reveal the danger of drought in causing massive environment and economic loss.

4.16.5 Hailstorm, frosts and strong wind

The hailstorm, frost and strong wind are commonly prevailing natural activities in Sikkim. The loss of crops, soil, and vegetation are common characteristics. In the year 2002, repeated hailstorm received at various places in the state damaged crops including cardamom, maize etc. With the marginal land Sikkim devotes for cultivation, each year's natural calamities take away nearly half of its produce.

4.16.6 Forest fires

Forest fire is caused by natural and human ways. People knowingly set the forest on fire with a view to add nutrition to soil and clear the jungle for cultivation. Secondly, in bamboo dominated areas, when two bamboo trees strike against each other, firing takes place. There are instances that some grazers and farmers light fire in the forest for the reason mentioned in above paragraph. Such fires not only damage forest but also the entire ecology and habitat. Ground vegetation and small faunal components are totally burnt disrupting the ecological balance. The animal and living organisms are disturbed and they tend to migrate to other places. Topsoil is washed away and the nutrient balances are disrupted to large extent. During the field survey it was found out that there was a great forest fire in upper Lingi and Upper Borung, Famtam during 1997-98. (Personal interview, 2005)

4.16.7 Environment concern

The natural calamities are expected to occur at any point of time. The lower altitudinal valleys like Kitam, Jorethang belt are affected by flood and drought where as higher altitudes like North Sikkim are affected by glacial activities. On top of that landslide, debri fall, soil erosion, tree fall are ubiquitous during rainy season. During monsoon rain, hailstorm and snow fall in winter cause severe loss of biodiversity. The people have become blind in amassing wealth and have given up their noble thought towards mother nature. It is felt that the carrying capacity of the crust is overburdened by the by rigorous use. Therefore, environment health of the state is suffering from multi-ferious ecological challenges.

CONCLUSION

In bio diverse natural region of Sikkim the remote areas are being networked with roads and bridges, knowing that construction of road is directly related to environment displacement. Transportation is done through unsurfaced narrow road passing through delicate habitat natural zone. In such zones the following problems relating to environment are studied.

The new road construction is extremely dusty and whenever a vehicle passes by, a large quantity of dust is blown high into the air. During winter, atmosphere is polluted and dust settles on the trees, grass, nursery and shrubs growing along the road. Besides being a health hazard for the inhabitants of the nearby villages, labourers and truck drivers, this dust has resulted in the clogging of the leaves, blocking of the stomata and several other loss to plants.

Such senario is noticed during winter season in almost all over Sikkim. All roads are not metalled hence, dust powder adds to air pollution. The roads around the hydropower projects at Balutar and Dikchu display such exhibition.

The vehicles used for transporting the mineral are usually diesel powered. They emit toxic fumes that have blackened the roadside flora. This is more marked on steep climbs. Cracks have developed on the leaves of the affected plants and many of them have begun to shrivel up. At some points along the tract affected by fumes, higher forms of plant life have vanished. During rainy season, the road at Namli, Rangpo, Sirwani, B2 remains virtually closed. Around 5th mile area of Gangtok, sinking and subsidence are normal along the roads.

Since orchid itself is a tourism product, orchids in the wild, along with the rhododendrons and primulas, could become major tourist-products in this belt. It has been suggested to open the trial route followed by J.D.Hooker and promote as a hooker's trial of 1848-50.Such trek and trial may further lead to environmental damage and bio piracy as the trial covers all the botanical garden of Sikkim.

The environments of orchid in Sikkim are in poor state, because of massive biotic interference due to deforestation and human exploitation. It is estimated that many of the species are on the verge of extinction and their population have been substantially reduced. Steps must be taken to protect it from tourist influx.

The various faunal species in Sikkim have very important role in maintaining ecological balance of the region as they represent different tropical levels in the ecological food web. The conservation values of these

faunal species are of importance not only to the state, but also for the region, the country and for universe. The present study highlights that there are danger of disturbance on food web and food chain system due to rapid endangering of living organisms.

Environmental degradation vis a vis extinction of endangered species must be further studied, so that assessment is made and preservation methods are applied. The main threats include-population influx in such regions, land use transformation, human interference, habitat degradation, forest cut and fires, constructional activities, landscape fragmentation, continuous grazing and hunting, unplanned tourism, lake pollution, loss of soil nutrients and lack of conservation knowledge amongst local people. As discussed, nearly 65 plant species have been identified as threatened in the Sikkim Himalaya that includes many valuable medicinal plants (Maiti and Chauhan, 2000). As many species as 19 mammals and 11 birds are also threatened that includes animals like snow leopard, musk deer, red panda, Himalayan thar etc., and birds like blood pheasant, monal pheasant, sparrow hawk, forest eagle owl etc. A study (Chettri, 2002) shows that, important trek and trial route of Yuksum and Dzongri belt in the West Sikkim showed immense pressure on its natural resource, mainly due to massive tourist influx in these regions during past two decades. The grazers lack knowledge on valuable medicinal herbs and they take no step for conservation. However it is needless to mention that some farmers in Sikkim are expert in practicing herbal treatment; therefore poachers of this type pluck the plants ruthlessly.

It may be mentioned that inclusion of barren areas under protected management network will not enhance biodiversity conservation. The local populace must be trained to be aware in the process of conservation.

This chapter highlighted vividly on various agents that are responsible for degrading surrounding environment. The next chapter further focuses on impact of tourism on nature, culture and economy.

CHAPTER - V

IMPACT OF TOURISM – AN ANALYSIS

INTRODUCTION

There exist a close functional relation between man and environment ever since the evolution of life on took place earth. Ever since human being appeared on planet earth, they have fully exploited the physical environment for their selfish gain. In order to fulfill unmet aesthetic and material needs, human beings have been exploiting natural environment, thereby putting pressure on existing ecology. Man as a geomorphic agent, effect geomorphic processes by various engineering works such as quarrying, mining, excavation, dumping and tourism development activities.

The survey of tourist and local people was conducted in various places in Sikkim with the objectives to understand the thinking, attitudes & behavioral pattern of domestic and foreign tourists.Thus in order to meet these objectives, a primary data collection was carried out especially in the main tourist magnetic spots. During the time of survey, several tools and techniques were adopted while collecting primary data such as interviewing with tourists through questionnaires, field observations, diary maintain, problem prosing approaches etc, to obtain the factual information. The survey was conducted in the month of April-June, October-December, and August-September 2004-05. The survey was targeted at both domestic and foreign tourists at Gangtok, Pelling, Changu and North Sikkim. The total number of responses rate is 380 and the number of domestic tourists and foreign tourists shared 239 and 81 respectively.

As per the survey, majority of the domestic respondents were from the neighboring state of West Bengal, which shared about 53 percent, the total foreign tourists were basically from Europe and the Southeast Asian countries. The respondents were educationist, industrialists, students and

businessmen. There were respondents who were trekkers, meditator, and editor also.

5.1 DEMOGRAPHIC PROFILE

The survey reveals that majority of the domestic tourists visiting Sikkim hail from the neighboring state of West Bengal which accounted for (53 percent) of the total tourist population. Besides, tourist flow was seen from Maharastra (16 percent), Delhi (11 percent), U.P (9 percent) and Gujarat (4 percent). The tourists visiting Sikkim from other states of the country were mainly from Uttaranchal, Rajasthan, Kerala, Punjab, Bihar, Haryana, Assam, Orissa, Himachal Pradesh and Tamil Nadu. In aggregate, these states shared about 7 percent of the total number of Indian tourists. It may be mentioned here that tourist generation from northeastern state seems to be negligible. According to the tourist's survey of 1992, which was conducted by the Bureau of Economics and Statistics, about 61 percent of the domestic tourist were from West Bengal. Hence in order to enhance this huge neighboring domestic tourist market, a sustainable tourism development program for the state having the objective of promoting quality tourism is sine-qua-non.

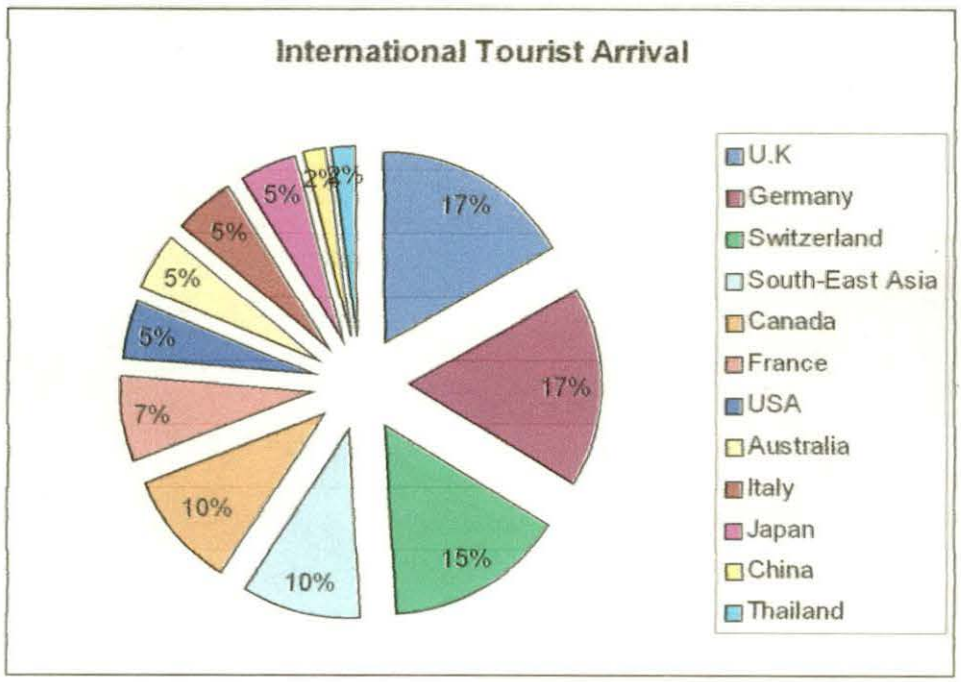


Fig 5.1-International tourists flow

5.2 TOURIST ARRIVAL

The inflows of tourists from overseas are also found in large number. It remained a fact that European countries are the major tourists generating countries in the world. Among the foreign tourists the survey suggested that majority of tourists originated in U.K and Germany and both the countries shared equal number of about (17 percent) each, which is followed by Switzerland (15 percent), Canada and South East Asia (10 percent), France (7 percent), USA (5 percent), Australia (5 percent), (Fig 5.1) Japan (5 percent), Italy (5 percent), Thailand (2 percent) and China (2 percent).

5.3 AGE SEX COMPOSITION

The survey was intended to acquire first hand information on distribution of age and sex composition of the tourists in Sikkim. The division of tourists on the basis of age and sex has been done for the purpose of studying their behavioural perception. Accordingly, the respondents were categorized into three major age groups and they were further classified on the basis of their sex. The first category (Table 5.1) comprised of below 20 years of age, followed by 20 to 40 years of age and above 40 years. The survey revealed that the tourists were either domestics or foreign and the ratio of local tourists was virtually nil. Around 55 % of tourists had attained the age above 40 years. Of which, male shared 41 percent while female shared 14 percent only. Around 43% respondents were from the age group of 20-40 years. Of which male shared 30% and female shared 13% only. The respondents below 20 years were negligible in numbers.

TABLE 5.1: AGE SEX PROFILE OF TOURISTS (IN PERCENTAGE).

Age Group (in years)	Male	Female	Total
Below 20	1	1	2
20 to 40	30	13	43
Above 40	41	14	55
Total	72	28	100

Source: Field Survey,2005

5.4 TRAVELLING PATTERN

In order to gather information on the pattern of tourist flow in Sikkim, survey found out that domestic tourists travel mostly with their family members. Around 60 percent of domestic respondents (Fig 5.2) were found traveling with their family members compared to 22 percent in case of foreign tourists. Around 56% foreign tourists comprised of individual tourists.

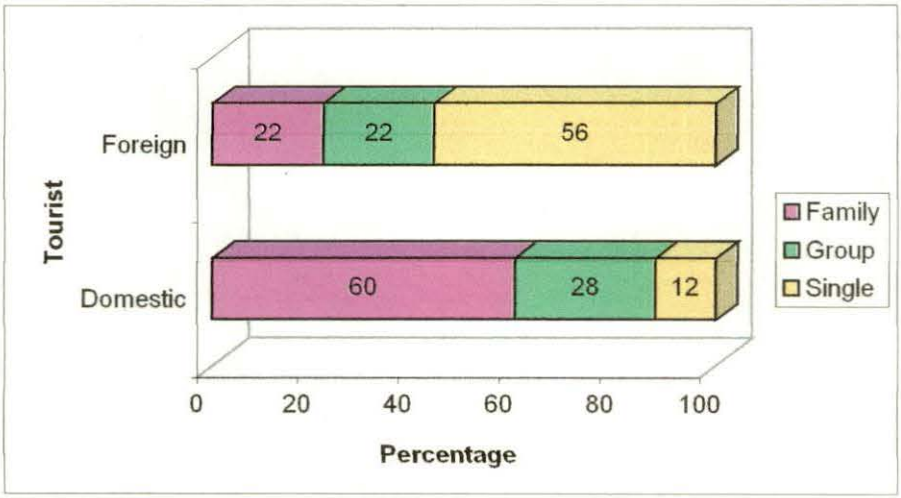


Fig 5.2-Travel pattern of tourists

5.5 OCCUPATION STRUCTURE

The occupation pattern and distribution of tourists (Fig 5.3) revealed that 88% of the foreign respondents were private entrepreneurs and Indian tourists as entrepreneurs were 8% only. On the contrary 44% of domestic respondents were holding Government jobs. Total businessmen and students shared 48% of domestic tourists. It means 48% domestic tourists including businessman and students visit Sikkim during their holidays. Hence during school holidays, growth of domestic tourists increases manifold.

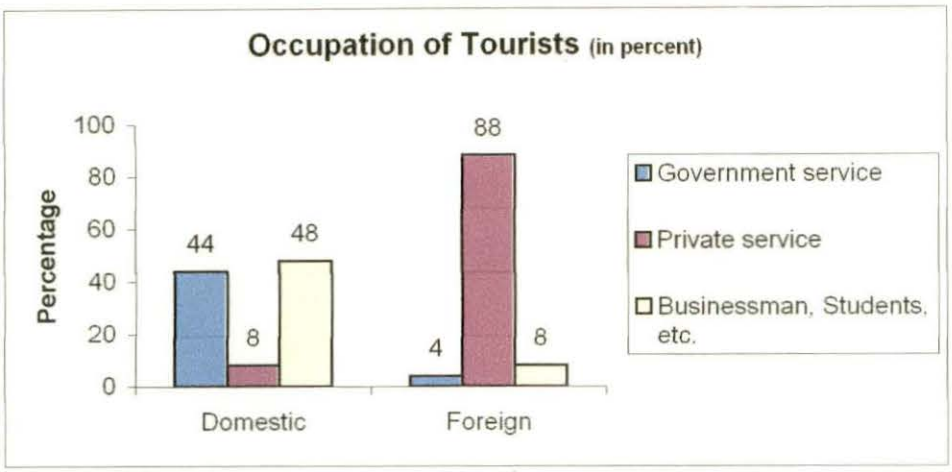


Fig 5.3 Occupational Structure

5.6 INCOME DISTRIBUTION

According to income range tourists were classified into three groups namely, below Rs 50,000, Rs 50,000 - 100,000 and more than Rs100, 000 respectively.

TABLE 5.2: INCOME GROUPS OF FOREIGN/ DOMESTIC TOURISTS (In Percent)

Income group (In Rs)	Domestic	Foreign
Below 5,000	25	Nil
50000-10,0000	55	34
Above 100,000	20	66
Total	**100**	**100**

Source-Field Survey,2005

The respondents were not open to reveal their income. However the majority of foreign tourists i.e. (66 percent) have been authenticated to have their annual income of around Rs100, 000 and above. In the case of domestic tourists only 20 percent were categorised within the income group of Rs100, 000 and above. Majority of domestic respondents i.e. (55 percent) have their annual income recorded between Rs 50,000 -100, 000. The (Table 5.2) clear picture about income structure of both foreign and domestic tourists is self-explanatory. The survey analysis indicated that majority of domestic tourists i.e. (55%) coming to Sikkim belong to the income group falling between

Rs50,000 - 100, 000. Therefore high spending tourists are generated from foreign countries.

5.7 PSYCHOGRAPHIC ANALYSIS

The main objectives were to find out the impact of tourists on themselves and to the host population. With this given parameter the nature of tourists with their background and their perception towards various conservation practices are being traced out successfully. Both the domestic and international tourists reflected their information with respect of travel purpose, length of stay; transportation facilities availed by the tourists and exposure to local cultural practices and overall opinion on Sikkim as a travel destination.

5.8 PURPOSE OF TRAVEL

The main aim was to examine the motivation factor and tourists perception towards natural and socio-cultural aspects vis a vis sustainability. Concerned for environment was also given due consideration before drawing the conclusion.

It (Fig 5.4) reflected that 80 percent from international and 73 percent from domestic tourists visit Sikkim for pleasure and leisure. It is mainly due to paid holiday system of service introduced by various nations in the world. The survey reflected that about 20 percent of the foreign respondents were religious tourists belonging to Buddhist religion. During survey some respondents were found coming to Sikkim for adventure-oriented activities as well.

The tourist survey indicates that 75 percent of respondents came to Sikkim for sightseeing and pleasure trip and religious purpose constitutes 4 % only. Besides, educational tour and research activity also motivated 15% of tourists.

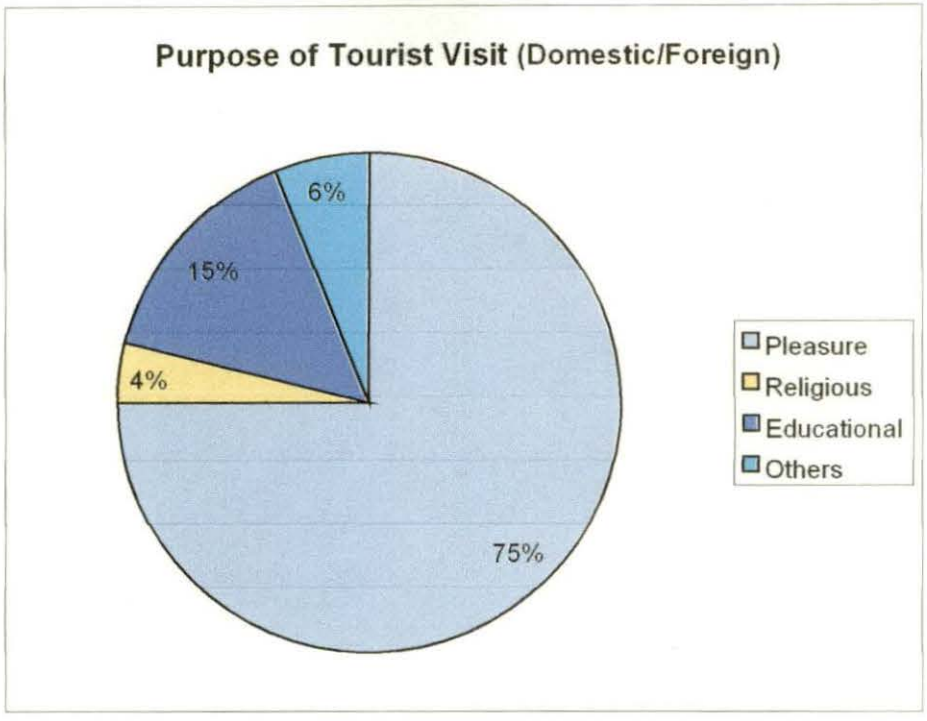


Fig 5.4 Purpose of visit

5.9 LENGTH OF STAY

It is analysed that the domestic tourists on an average stay for hardly 3-4 nights while the foreign tourists excluding the trekkers stay for an average of 4-6 nights. Most of the foreign tourists were found to have spent long duration. The main reason for staying longer period amongst the foreign tourists could be non-dependent family member in their respective family and long available paid holidays, as they are individual holydayers. Whereas in Indian context, tourists constitute entire family members, hence they get back in time to look after their household affairs. Each Indian household has dependant family members. Further, domestic tourist is seasonal and holiday pattern is controlled by school vacation. The tourists from West Bengal can visit Sikkim and stay for a week. It is due to proximity and nearness to tourist destination.

5.10 SOURCES OF INFORMATION

It includes matter pertaining to marketing strategy adopted for the promotion of tourists. What makes tourist visit Sikkim? It is revealed that

tourists get informed through friends, information center, travelogues and medias.

TABLE 5.3: SOURCES OF INFORMATION FOR TOURISTS (IN PERCENTAGE)

Source of Information	Domestic	Foreign
Information center	33	31
Friends	55	26
Travelogues	-	43
Others	12	-
Total	100	100

Source-Field Survey, 2005

The information about Sikkim as a tourist magnetic land is basically derived from friends, who had already visited the spot. Besides travel guide, information center and internet serves the purpose. Almost 55 percent of the domestic respondents and 26 percent of the foreign tourists get information about this mystery land through friends or relatives. As in the case of foreign tourists they gather information through various travel books and travelogues. (Table 5.3) The information center provides information to nearly 33 percent of domestic tourists and 31 percent of international tourists respectively.

5.11 TRANSPORTATION ANALYSIS

The transportation analysis with respect to tourism can be examined in three different stages. Initially, from origin to entry point to Sikkim i.e. Bagdogra, New Jalpaiguri or Siliguri. Next point starts from pick up point to destination (Gangtok or any other tourist magnetic place of Sikkim). As roadway is the only mode of transportation network in Sikkim, taxi and private vehicles are important agents of transportation. Hence the mode of transportation availed by tourists for movement within Sikkim is mainly by bus, taxi and private cars. According to information acquired from survey, it revealed that about 86 percent of the tourists had used taxi as the medium of transportation within Sikkim in order to visit different tourist magnetic spots. Remaining 7 percent had used bus and 7 percent remained uncategorized.

5.12 EXPOSURE TO LOCAL CULTURE

Culture here refers to the customs, beliefs, art, way of life including food habit, dress coding etc. of a social organization at a given time and place. There is spatial variation in cultural practices among the different groups of people living therein. Tourists coming to Sikkim from different parts experience the cultural peculiarity of native place. Some tourists were eager to explore and perceive new cultural environment and some trying to unfold it. The social and cultural attributes of population in Sikkim exhibit variety of ethnic, religious and socio-economic groups. These multiplicities of ethos have different life style. Tribal groups especially the Lepchas, Bhutias have typical dress coding peculiar for a newcomer. In dietary culture, there are several types of indigenous foods used in Sikkim and most of the tourists were also fond of it. Thus not only the physical phenomenon but also the cultural phenomenon has played prominent role in nursing tourism environment in Sikkim. The ethnocentric views of tourists visiting Sikkim revealed that maximum number of tourists preferred testing local food, drink, mix with local people and wear local traditional dresses.

TABLE 5.4: TOURISTS ADAPTALILITY TO LOCAL CULTURE

Particular	Foreign	Domestic
Local food tested	71	65
Local drink tested	66	57
Mixing with local people	68	71
Wearing local traditional dress	39	32

Source-Field survey, 2004-05

It is depicted that (Table 5.4) the cultural attributes of Sikkim has also influenced tourists in many ways. Majority of tourists showed keen interest in visiting villages where the traditional culture is predominantly rehearsing. Almost all the tourists were fascinated to perceive these types of environment and sought solace in the tranquility of villages. Therefore delicate culture is subject to tourist exploration.

5.13 PROBLEMS IN TOURISM BUSINESS

Travelling or visiting a place for pleasure is the main characteristic features of tourists. Therefore activities associated with providing accommodation, services and entertainment forms diverse tourism activity. Sikkim being mountainous region, beautiful snow capped mountains, exotic plant and animal, clean environment, favourable climatic conditions, hospitable people and mystic culture are beautifully juxtaposed in close harmony with civilization. All these ravishing nature of this land are the ideal conditions that are creating pleasure for tourist lots. The inaccessible track of mountain belt, rugged topography and highly sensible zone for landslides owing to very step slope of land and fragility are some of the major problems for tourists in Sikkim. All these problems faced by tourists are analyzed and reflected (Table 5.5) accordingly.

5.5: PROBLEM FACED BY TOURISTS IN SIKKIM (Both Domestic and Foreign)

Parameters of Problem areas	Percentage of tourist to total
Transportation and communication	46
Health and Hygiene	26
Road network	35
Peoples Behavior	06
Information Services	18
Others	22

Source-Field Survey, 2004- 05

The major problem is associated with transportation and communication or road network. Regarding transportation facilities, the only roadways linking Sikkim is 31 National Highway and major tourist vehicles are jeeps, bus and taxi services. There is no railhead in this region. However there exist a helicopter service from Gangtok to Bagdogra. The only road network in Sikkim is frequently suffered from several types of natural calamities such as landslide, earth flow etc. which obstruct transportation activity. Transportation facility generally aims at distance decay and this distance is not simply a question of physical distance in terms of kilometer but

also a question of cost, time and comfort involved in mobility. Hence, it is appropriate to talk in terms of economic distance, which is determined by the mode of transport. The distance is a prime concern for travelers thus, transport plays a crucial role in creating tourist magnetic environment. The (Table 5.5) indication of road transport as major hindrance is self-explanatory.

5.14 INCOME FILTRATION

The main objective of collecting information about expenditure pattern of tourists visiting Sikkim is to evaluate the contribution of tourism towards economic structure of the state. Hence, in order to obtain clear picture in this aspect, six main items are recognized under which a tourist would be expected to spend. It includes travel, transport, food, accommodation, recreation and other category. The pattern and volume of expenditure helps in studying rate and trend of income generated at various level of service center. The percolation of income towards rural area is controlled by degree and availability of surface transport. The expenditure on tourism diversifies through transportation to different focal point of a backward region.

5.15 EXPENDITURE ANALYSIS BASED ON RESPONDENTS

Both domestic and foreign tourists spend about 41 percent on transport (Table 5.6), 22 percent on food, 19 percent on accommodation, 8 percent on marketing and 6% for recreation.

5.6: EXPENDITURE ANALYSIS OF BOTH DOMESTIC AND FOREIGN TOURISTS

Items	Percentage to total
Travel or Transport	41
Food and beverage	22
Accommodation	19
Marketing	08
Recreation	06
Others	04
Total	100

Source –Field Survey, 2005

5.16 OPINIONS ON SIKKIM AS A TOURIST DESTINATION

About the liking and disliking Sikkim as a tourist destination, the survey findings revealed that around 46% of the domestic and 28% of the foreign tourists considered Sikkim as preferred destination in India. They were basically impressed by natural scenic beauty of snow-capped mountains, exotic flora and fauna, mystic culture and all hospitable people. This entire phenomenon has provided a most favorable condition for Sikkim to become a tourist destination. Around 9% of tourists were found unwilling to revisit Sikkim. Almost all the respondents were in favour of advising others to visit Sikkim. On being asked, the respondents suggested the following measures to improve the situations. It include a) Vehicular exhaust to be strictly checked and anti-pollution norms to be provided at the major tourist attractions b) Provision for operation of dustbins at the loci of highly tourist concentration zone for the management of solid waste product or garbage in order to keep the city clean. c) Need for creating environmental awareness among the local people as well as tourists who are coming to Sikkim. d) Unchecked price of commodities, entertainment and infotainment for tourists in the evenings. e) Need of tourist police. f) Improvement in the behaviour of driver. g) Check on neglect of domestic tourists. h) Improvement in inhospitable and alien treatment found in North Sikkim.

5.17 REASONS FOR THE GROWTH OF TOURISM INDUSTRY IN SIKKIM

The fundamental bases for the growth of tourism industry in Sikkim are stated below. The picturesque Himalayan ranges along the length and breadth of Sikkim provide breathtaking view of mountain ranges. The snow-capped peaks, the gliding glaciers, the farming waterfalls, the glittering lakes and shrines, the forested ranges and the fascinating landscape in the mountainous sectors of Sikkim exert profound influence on visitor and viewers. From the climatic point of view too, Sikkim on the basis of topographic altitude, provides pleasant and healthy climate ranging from hot, warm to cool and cold. Therefore in Sikkim Himalayas one can choose one's own climate as suited to the visitors. In other words, tourists coming from any

part of the world can have the climate best suited to him. In addition to physical basis, Sikkim is endowed with a storehouse of antique arts and cultural heritage. There are renowned temples and monasteries exhibiting various images pertaining to ancient arts, crafts and religious believes. The most prominent e.g. are Rumtek Monastery Ranka Monastery, Pemayangtse Monastery, and Enchey Monastery. All these help in generating income at various levels.

5.18 IMPACT OF TOURISM

The progressive curiosity of man to view unseen places, longing for exploration and to know something about them has resulted on the mobility of people from his original birth place to unknown and unseen passage of the world. This movement has given rise to a specific category of activities called tourism. There lies a strong relationship between tourism activity and prevailing environment condition at a given place and time. Environment mostly consists of three major segments, abiotic, biological and socio-economic. In other words, environment is conceptualised under the classifications of natural, built, and cultural. This categorization closely relates to typology adopted in describing various environmental assets that attract tourists and provide a parameter for analysing tourism impacts. The natural environment includes air, water, flora, fauna, soil, natural landscape or physical shape and climate. The built environment encompasses urban fabric, buildings, monuments, infrastructure, parks, landscapes and open spaces. The cultural environment includes values, beliefs, moral, behavior, arts and history of communities. Before analysing the nature of environmental effects resulted by tourism, analyses on nature of environmental needs preliminary deliberations. The several types of environmental problems can be broadly classified into resource depletion and unabated pollution problems.

Before tracing out the environmental impact caused by tourism, it is appropriate to trace out its potentiality that can lead to the growth of tourism in Sikkim. The geographic environment is almost identical to that of Kashmir and Switzerland.

5.18.1 Impact classification

The study on impact of tourism helps measure the intensity of tourist influx vis a vis their impact on economy, socio-culture and environment. In this context, alteration and change brought about by growing tourist population in the host environment is discussed at length. Various aspect of cause and effect relationship has been dealt with meticulously. To study and analyse the impacts, the parameters identified are negative and positive impact, impact on tourist and impact on host destination.

5.19 POSITIVE ECONOMIC IMPACT OF TOURISM IN SIKKIM

In terms of economic gain, tourism has contributed non share in state's revenue both in direct and indirect form. People of the tiny state of Sikkim are attached to tourism activity. The capacity of tourism industry in generating employment and income makes tourism sector a multidimensional business hub. The receipt and payment and earning from direct and indirect sources contribute to national and per capita income of a nation. It is therefore proved that tourism plays a significant role in shaping the economic standard of a region in particular and nation as a whole. Besides, there are problem areas in tourism sectors, which often hinder its proliferation; all such aspects have been dealt with in depth. Roger H.Ballou, President, American Express, USA (Travel Services) told the delegates to the 1993 annual convention of Pacific Asia Travel Association (PATA) in Honolulu that worldwide employment in tourism services had grown to 127 million and capital investment had topped US $ 422 billion. In 1982, European Economic Community (EEC) estimated that there were 11 million jobs that were directly or indirectly related to tourism in EEC countries. Of this, 70% were involved in domestic tourism and the rest in international tourism. The British Tourist Authority estimated in 1985 that there were one and a half million people engaged in jobs relating to travel business in Great Britain. The rule of the thumb is that one job is created by one international tourist from an affluent country in India's low (Pranseth, 1998) wage economy.

5.19.1 Direct and indirect effect

Income and employment generated by tourism basically refers to the additional income and employment generation in various tourism sectors directly. Whereas indirect income and employment refers to income generated in sectors, which supply input to the tourism industry. Such input could be in the form of supply of vegetable, fuel and various services, transportation, which in turn help increase the total output.

Direct effects of tourism are relatively easy to measure. Let us assume that a US visitor to Sikkim stayed at Norkhill Hotel. After his 3 day stay, he paid to the hotel $ 500 which became the direct income of the hotel. But the $ 500 did not stay with the hotel. Of this amount, $250 was disbursed to employees as wages, $ 200 went to suppliers of food, liquor and other services, $40 went towards the payments of utilities and $ 10 were remitted to the owners of Norkhill hotel towards their services. Although direct payment was $ 500 only, $490 moved through the Indian economy to several receipts that in turn, passed certain percentage of their receipts to others who provided them goods and services.

5.19.2 Gross domestic product

Tourism has an important contribution to the Gross Domestic Product. Travel and tourism generates largest GDP. All expenditure incurred by tourists will be further incurred on building hotels, roads and other tourist services. The (Table 5.7) data speaks about source of income deriving from various action of tourism.

TABLE 5.7: INCOME GENERATION FROM VARIOUS SOURCES (2005)

Sectors	**Income** (Rs *in thousand*)
Travel	2868
Food	5941
Accommodation	6200
Marketing	1855
Recreation	1260
Others	1413

Source: Field Survey, 2005

5.19.3 Employment generation

With the increase in number of tourists, there will be an additional employment generation in the service sector. Such effect is seen in the area of direct employment. If there is an increase in the number of visitors to a destination, there is bound to be an increase in the manpower requirements of the travel industry. A 33% increase in the occupancy of tourist hotel will result in increasing the demand for more staff at the hotel counter, drivers, guides and shops etc. It is the direct employment resulting from increased flow of tourists.

Indirectly, further avenue for new employment is also created in the field of agriculture, horticulture, manufacturing units etc. The (Table 5.8) reports on employment in tourism sector is generated in hotels, restaurants, souvenir shop, front desk, guide, handicraft manufacturer, drivers, owner, travel agents, and many other related sectors.

Tourism is a tool, which helps to eradicate unemployment problem in the state. In the case of Sikkim, one of the pressing problems is mounting on menace of unemployment. The development of tourism industry is one of the most practical ways of alleviating this problem by imparting trainings to tourist guides, hotel managers, tour operators etc. Educated and enterprising manpower can be accommodated in this sector.

TABLE 5.8: EMPLOYMENT PATTERN IN SAMPLE HOTELS

OWNERSHIP	MANAGERS	EXECUTIVES	OFFECE STAFF	RECEIPTIONIST	SKILLED STAFF	UNSKILLED STAFF	TOTAL EMPLOYMENT	
							PEAK SEASON	LEAN SEASON
GOVT. OWNED	4	9	13	18	30	74	148	147
PARTNERSHIP	1	0	0	1	1	2	5	5
PROPRIETORSHIP	7	4	5	4	26	26	70	66
PRIVATE LIMITED	14	10	19	16	75	58	187	165
PUBLIC LIMITED	1	3	3	2	12	30	51	40

Source: TEC, 1998

5.19.4 The multiplier effect

The concept of multiplier effect is closely related to income multiplication by tourism activity. It explains that the flow of money generated

by tourist multiplies in various sectors within and outside the tourism sector. The various economic benefit arising out of tourism business include benefits from infrastructure investments, roads, water supply, other public amenities, hotels, restaurants, museums, clubs, sports complexes, public transport, national parks, wildlife sanctuaries, art and craft, preservation of indigenous culture etc. It is seen that tourism brings multi-faceted gains to the economic structure of a host region. (Bhatia, 1997) This concept of multiplier is widely applied in the context of Sikkim. The hoteliers, service providers, suppliers, tours operators, shopkeepers, guides, drivers are benefited in multiplication of income.

5.19.5 Tourism multplier

It basically explains the role of international tourism expenditure in bringing higher income for tourism suppliers. This income gets distributed over wide areas as wages, salaries, rent, interest, profits, and indirect income to suppliers of goods and services. This is further distributed to food and beverage services, phone and electricity companies, fuel suppliers, taxis, printers and many others. The recipients of all these incomes may spend the new income or save it for further investment. To the extent that they choose to spend on goods and services produced locally, a round of new transaction creates new induced income for secondary suppliers. They themselves have more to spend and the cycle moves on.

It can be illustrated as under. If an American tourist spends US $ 2,000 in Bombay, including the hotel bill. Of this amount $ 1,000 is the direct income to the hotel and we know how it will be spent as explained earlier in the case of Maurya Hotel, New Delhi. The remaining $ 1,000 is re-spent in the economy from indirect or induced income. Since those who receive the money, keep certain part of it for further investments, they may recalculate only$500. The next transaction may be for $ 250, and the subsequent for $ 125. The total value of the income created over the same period works out to $2,000+$ 1,000+$ 250+$ 125=4,000. Multiplier=2 Same principles are applied in case of tourist activity in Sikkim as well.

5.19.6 Foreign exchange

Tourism business helps strengthen economy by enhancing its foreign investment .The positive balance of payment helps in enhancing its foreign exchange. Foreign exchange is not the only advantage. In terms of employment, tourism has an edge over other industries. India Tobacco Company (ITC) set up a factory with 300 million rupees investment, which generated employment for only 300 people. A hotel with similar investment provided jobs to 600 people. This is applicable to most countries more so in developing countries where (Pranseth, 1998) wages are lower.

5.19.7 National and per capita income

Tourism is the biggest foreign exchange earner for the countries like Nepal, Thailand, Spain and New Zealand, and ranks third among the export earnings items of India.

An increase in expenditure by foreign tourists in a country raises the national income. On the reverse side, an increase in expenditure on tourism abroad by the nationals of a country lowers the national income. Thus the net income generated in a country by tourism will vary directly with the expenditure of visitors in the host country and inversely with expenditure abroad by their own nationals. In Indian context tourism has an advantage in bridging the gap of India's balance of payments.

According to Dr. N. K. Sengupta, a former Secretary of the Planning Commission of India, "Tourism has the capacity to generate valuable foreign exchange with almost 100% value added, thus making it the most readily available source for resolving the balance of payment crunch." Accordingly, during March-June, per capita income of service sector in Sikkim goes high, due to increase in tourist traffic.

5.19.8 Tax benefits to the state

The state Government collects huge amount of revenue from tourism sector. In every movement of tourists, income through tax in generated. In order to visit Changu and Nathula, hundred rupees from each passenger is

collected. Besides, environment tax is also levied on top of that. Entry fees are charged from visitors, camera fees are separately collected from the visitors. Therefore there are direct and indirect tax collection systems in Sikkim. The state Government is indirectly earning from the vehicles coming to Gangtok as road tax. In every purchase of commodity, government is benefited through taxing system such as imports duty, sales tax, income tax, hotel tax, transport tax, entertainment tax etc.

Revenue generation (Fig 5.5) from tourism sector has been increasing constantly. Over the years, Sikkim tourism has been able to generate (TEC, 1998) huge amount of foreign exchange and employment opportunities. Direct income of the state has gone up to Rs 40.39 lakhs in 2000 from mere 38 lakhs in the year 1997.

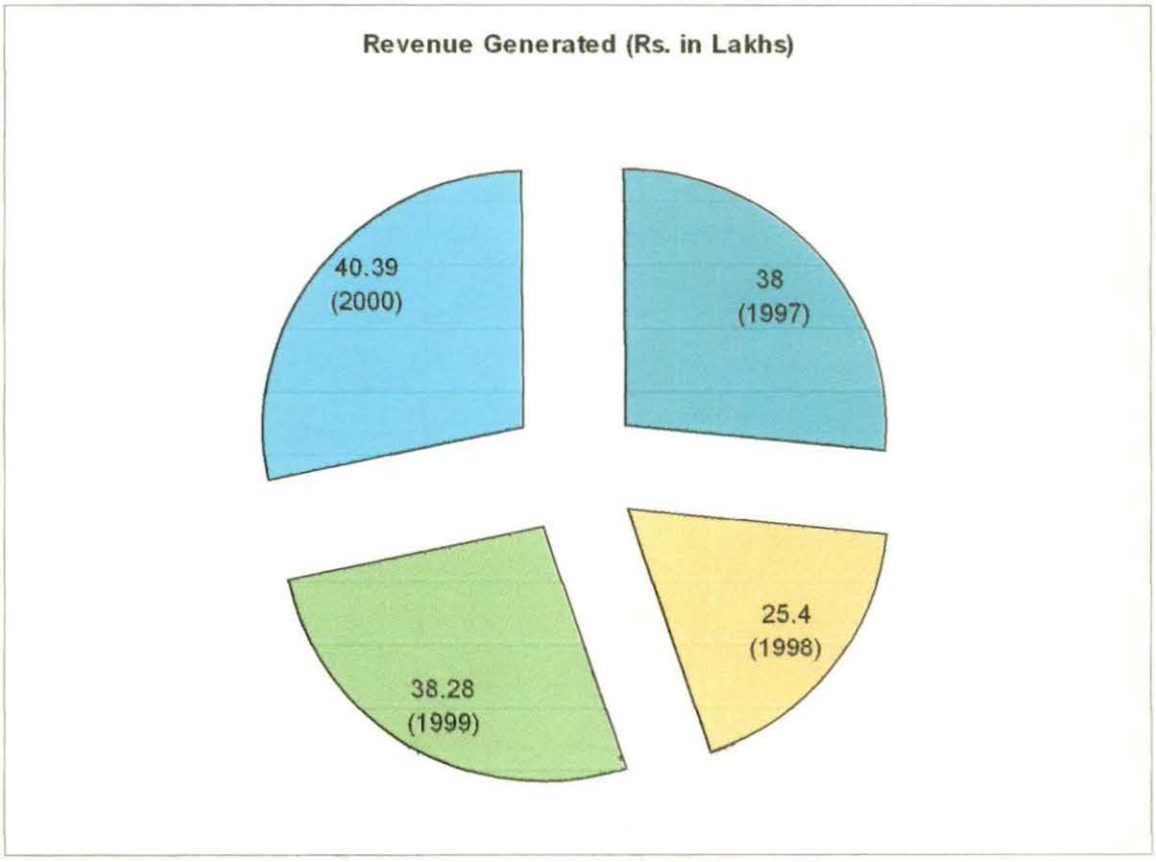


Fig 5.5 Revenue generated from Tourism (1997 –2000) TEC, 1998.

5.19.9 Projection of income and employment generation

The tourism industry is normally viewed as labour intensive. the direct employment it provides in hotel is in thousand. It is the indirect employment, which is relatively higher than direct employment. To estimate the employment generation in hotel transport and travel industries, estimates of tourist arrivals and peak season bed requirements are studied. The additional projected direct employment generated in different sectors are calculated (Table 5.9) which shows employment of 13,276 persons (Table 5.10) by the year 2011, that is exceptionally beneficial for the Sikkimese economy.

TABLE 5.9: TOURISM RECEIPTS AND DIRECT INCOME GENERATED BY TOURIST EXPENDITURE (projection, Rs. in Crores)

Year	1995	1997	2001	2006	2011
Tourism Receipts	15.95	24.31	45.39	89.71	180.12
Income	6.89	10.49	19.59	38.72	77.73

Source-TCS, 1998

TABLE 5.10: ADDITIONAL DIRECT EMPLOYMENT GENERATION (projection)

Institutes	Employed	Base year addl. Employment generated				Total
Hotel sector	Per bed norm	1997	1998-01	2002-06	2007-11	1997-11
Managers	0.05	100	70	130	260	560
Office staff	0.08	160	110	220	400	819
Skilled	0.16	310	230	440	820	1800
Unskilled	0.13	250	190	360	617	1470
Hotel sector(Total)	-	820	600	1150	2150	4720
Restaurant sector	-	750	550	1060	1980	4340
Travel agents	0.001065	136	53	88	119	396
Transportation		750	550	740	1780	3820
Total direct employment generated in all tourism sectors						13276

SOURCE-TCS, 1998

5.19.10 Distribution of wealth

The income generated by elite people penetrates down towards the downtrodden society in exchange of services provided by them. The international visitors and visitors from metropolitan cities pouring into Sikkim will surely spend handsome amount in pursuit of peace and tranquility. In this

way many locals have been employed and they are earning from various tourism related sources.

5.19.11 Regional gap reduction

With the advent of mass tourism, people are interested to see not only the natural product but also associated in the process of learning diverse social aspects of a region. In the process of learning, they travel deep into the forest and inaccessible areas in pursuit of knowledge. Similarly Khajuraho is a remote corner of Madhya Pradesh but after the recognition of Khajurao, thousands of tourists flock into the region .In Sikkim, the remote areas like Dubdi and Tumlong Monastries, Sincor bridge are often visited by tourist despite of their distant location.

5.20 NEGATIVE ECONOMIC IMPACT OF TOURISM IN SIKKIM

The negative economic impact of tourism is negligible, however there are some effects, which may bring about negative development in the state of Sikkim. In less developed countries, residents tend to observe and learn the lifestyle of the richer visitors from affluent societies and try to emulate their way of life. In economic terms, it may bring about changes in the consumption pattern of local residents resulting in higher propensity to import consumer items used by the tourists. The second change is on the price level in the host country. Tourists from rich countries may bring price pressures with them, affecting local residents. Researchers have cited such phenomena-taking place in the Caribbean, the Canary Islands (Pranseth, 1997) and the Fiji Islands. In Sikkim, rise in price is experienced during the peak season and the local people residing in Pelling,Gangtok have to pay fancy price for all the commodities. Problem and scarcity of vehicle during tourist season is unnecessarily leading to price hike. Seasonal employment has created laziness and local youths are becoming dependent on easy money. The villagers are facing problem in the field of cultivation as the workforce are migrated to tourist spots. Tourists basically of international origin also face some problems regarding fluctuating price hikes and inflation. With the

enhancement of standard of living, people belonging to poor economic background are regarded with discrimination and sense of inferiority is rooted in the minds of such affected party in Sikkimese society.

5.21 IMPACT 0F TOURISM ON SOCIO-CULTURAL ENVIRONMENT

Impact of travel, trade and tourism, falls directly on host tourist destinations and guest tourist themselves. The degree and intensity of use of recreational resources by tourists and their interaction with the surrounding environment is directly proportional to the degree of negative impact within a given destination. In other words, the degree of negative socio-cultural impact varies from person to person, time to time and place to place.

The impact of tourism on any society and culture of a particular community is normally influenced by rate and magnitude of adaptability. Generally the tourists touring towards any particular destination bring about symbiotic and heterogeneous social attributes to the host country. Such situation may affect the local ethics, social habits, moral values and behavioural pattern of host population, which eventually lead to demographic and structural changes in a society.

This interaction with tourists and local people often lead to social tension creating disharmony and disturb the existing local cultural ethos. Intermingle between host and alien culture usually propagates and alteration of social values comes into effect. Such circumstances may create room for eroding moral and religious values.

During the process of mixing, culture of rich societies prevail over poor societies, transformation of traditional hospitality of the local resident gets exposed to commercial practices. Adoption of consumer behavior, social evils like begging, drugging, prostitution, loss of dignity and frustration may get cultivated in either of the society.

The impact study further shows trend of westernization and alteration of traditional culture, art and artifacts, aesthetic norms, and bio-piracy leading to illegal trade of antique objects of animals. Feeling of inferior cultural complex, imitation and superficiality in demonstrating own culture and tradition

are the examples found in Sikkim, bio-piracy and superficial pseudo cultural development is also taking place.

The exhibition, commercialization and selling of traditional cultural events may lead to the creation of pseudo-cultural substitution of folklore. A drastic change is seen in the life styles, attitudes and life pattern of the local people of Sikkim in general and Gangtok in particular, where sign of replacement of regional culture is noticed.

5.21.1 Negative effects

Cultural and social change takes place through a number of factors, slowly over a period of time. (Bezbaruah, 1999) Having long association with tourists and tourist destinations during the course of field study, various effects have been identified. Generalizations have been made with respect to Jina's parameters.

1 ***Demonstrative effect*** It is the outcome of close interaction between divergent group of people which is noticed in mass tourists concentration zone. It is a kind of tendency of resident people to give their impulse to follow the other culture. Such situations give birth to social hybridization. In such scenario, local resident under the influence of tourists, tend to emulate their behavior, food habit, dress and attitude. In Sikkim, the drivers, hoteliers in the trekking route of Dzongri,Pelling,Yumthang have developed similar behavioral pattern due to their close affinity with the tourists. The young boys of Gangtok have shown shift from traditional to modern and western outlook.

2 ***Homogenization*** It is the outcome of interaction between two culture having their affinity to each other. In such cases, technologically advanced group naturally gain supremacy by their virtue of adoptive nature. In case of Sikkim, western culture from outside invades the local set up due to positive response offered by host population. It is revealed that Indian and western culture comes to Sikkim and affects the local culture.

3 ***Contract effect*** Commonly it is surfaced by changing pattern of relationship among the social groups. People who are involved directly in tourism activities are absorbed so much that they many times loose ties between themselves. The cases have been observed especially in Gangtok, where manpower involved in tourism sector is loosing tie with their families and community. In Gangtok and Pelling, number of antique shops, restaurants, travel agencies and several other economic activities are established by the local manpower. The employees of tourism sector having close contact with tourists do not get much time for the people belonging to their on community. It is due to their constant interaction with tourists coming from outside.

4 ***Xenophobia*** It normally refers to the fear or disliking of strangers/foreigners by the local people and community. The residents of host region often develop fear-psychosis against the tourists and visitors. In remote areas, people shut their doors before strangers. The local residents feel sense of insecurity and debarred from freedom, hence, obnoxious treatment is noticed from some individuals. The parents of Yuksum and Dzongri trekking belt have developed obnoxious attitude towards tourists. In the far-flung remotest corner of North Sikkim, the Lepcha tribe is intermingled in their purely traditional unaltered culture. It is noticed that they have general tendency to close their doors whenever any stranger passes by their residence. The locals in Sikkim many times dislike domestic tourists.

5 ***Autochthonic*** It symbolises change of culture, where, effect originate mostly in the tourist destinations. The autochthonic culture is basically emerged out of uncontrolled exposure of local residents with the tourists. Such changes take place when foreigners are given privileges to mix up freely in the milieu of host society. During this free mixing process of autochthonic, the young generations have the tendency to adopt western way of life, manners and cultural values.

This kind of situation is noticed in some places of Lachung, Gangtok, and Pelling, where a tourist staying in same destination for a longer duration has resulted in alteration of dress pattern and food habit among local youths.

Many villagers in Yuksum and Ravangla stated that they have not seen their sons for two years, but knew that they are working in some tourism agency. These parents feel bad when their children do not attend festivals such as *Dassin,tiwar* etc.

6 ***Cultural confrontation*** It is also a type of cultural impact of tourism. In this scenario, poor sector sometimes losses its moral values in tourism development (Jina, 1994) process. With the emergence of tourism, the natural as well as socio-cultural structure of a region has been facing the challenges of several setbacks relating to cultural erosion. For example, the tourists and drivers do not treat the girls selling tea and stationary at Changu Lake region with respect. Besides, local beer sellers in (Field study, 2004-05) Ravangla and Pelling are often treated derogatorily.

Sikkim is no doubt a major tourist destination due to rapid growth of domestic and international tourism over the years. Tourists not only transfer money into this region but also inflict harmful affects towards society and culture of Sikkim. Their dress and address, food habits and merry-making manners bring some sense of vulgarity, newness and uniqueness in the region they travel.

Hence the imitation of foreign culture and lifestyle by the host people leads to cultural erosion. Moreover, interaction between tourists and inhabitants also lead to the change of autochthonic culture. The youths below 30 years of age are easily carried away by the guest culture as observed during the survey. In Pelling, one of the guardians complained about their son's behaviour. He stated that the boys including his son never return home in time, do not eat at home and do not attend rituals and ceremonies at home. The guardian complained "the local boys have lost the sign of respect to elders and family ties. During off season, they remain jobless

because they do not work in the field." Such situation may lead to loss of traditional knowledge and culture. (Field study, 2004-05)

TABLE 5.11: EXPOSURE OF TOURIST to LOCAL CULTURE (IN PERCENTAGE)

Particular	Foreign	Domestic
Local food tested	71	65
Local drink tested	66	57
Mixing with local people	68	71
Wearing local traditional dress	39	32

Source-Field survey,2005

It (Table 5.11) is obvious that the cultural attributes of Sikkim have influenced tourists, as the respondents desiring to visit the villages of Sikkim were many in numbers. Nearly 68-71 percent tourists at an average intermingled with host community. In such a scenario, there may break out atrocity, if the factor of irritation and disliking is greater than liking. (Table 5.11). In Gangtok, many sex workers are found involved in such an ugly business (Samay Dainik 5-10-2005) Therefore sex tourism may prevail if proper check is not restored in time.

5.21.2 Negative socio cultural impact of tourism

The final outcome of interplay of two forces, local and alien culture in this context, will lend up with the conclusion that strong and acceptable culture and tradition will prevail over the weaker one. Tourism being the largest industry in the world, millions of tourists across the globe is on the move. During their travel, tourist just do not move alone rather they move along with their tradition, food habit, language, custom, tradition, rituals and religion. Hence during the course of inter continental, overseas movement; cross-cultural events are hybridizing unnoticed. At this juncture, assimilation, repulsion, erosion, invasion of cultural elements comes into affect and exhibit supremacy of one culture over the other. In such fighting process, a new type of society comes into effect with neo-traditional structural society.

The negative impacts of tourism broadly fall under the broad outline of social, cultural, traditional values and morphology. The tourists bring to the host country a strange society, which affects and even transform local social habits by disturbing basic and long-established values and patterns of behavior of host population. It may even lead to structural changes in many sectors of society. During tourist season, resident population has to accept not only the effects of overcrowding but also required to live in contact with an alien. This "co-existence" of tourists and the resident population often leads to social tension and xenophobia (Jina,1994) is noticed in very popular tourist areas.

The close interaction of divergent groups of people, termed as 'demonstration effect', manifests itself by transformation of social values. Generally, it brings change in social attitudes and outlook and often leads to erosion of moral and religious values. Such scenarios are manifested through increased crime levels. The impact of rich society over poor society has been damaging repercussions on the host population by putting traditional hospitality into commercial uses. The appearance of consumer behavior; social evils like begging, drug-peddling, prostitution, loss of dignity and frustration are growing with the growth of tourism.

Since Sikkim is no exception to foreign tourist, cross-cultural dichotomies are bound to prevail. The details of examination made during the course of field study have been highlighted herewith in depth.

1. ***Erosion of culture*** Due to several factors the traditional culture of Sikkimese people is in waning stage. This problem is further aggravated by high rate of tourist influx followed by quick transformation and adaptation of local youths to western culture. It is due to exposure of local communities to the western outfit. This trend is common among the youngsters residing in urban centers. The capital town of Gangtok, Namchi, Pelling is no surprise, even the remote destination showed an alarming trend. While in Yuksom, Yumthang, youths have fully exposed themselves into western look and modern outfit. During the field survey,

none of the Lepchas were found in their traditional dresses. On the way to North Sikkim, few ladies were found in traditional dresses around Namprikdang, near Mangan. In Lachung and Lachen areas, women dressed in traditional attire normally do not come out of their houses; it means they consider their dress inferior to other dresses. Around 80% men (Table 5.13 and 5.14) wear traditional dresses occasionally during the festivals and ceremonies only. The only women above the age group of 60 years are found wearing traditional *bakkhu.* In Yuksum,Gareythang,Tashiding and Pelling area, almost 90% of the population belonging to Nepali community wear modern shirt and pant and only aged old people wear *daura,sural and chaubandi choli.* On being asked, why don't they wear traditional dress, they responded "firstly, it is not readily available in market and tailors can not stitch *daura,sural,choli* etc". Secondly, shirt, trouser are comfortable and economically viable. Thirdly, as a matter of prestige and identity as they feel that Nepali dress is cheap and worn by the people of Nepal. Fourthly, they are imitating the market fashion. It is justified that not a single person in Gangtok, Namchi and Pelling were found dressed in traditional Nepali attire. Therefore in Sikkim, Nepali culture is slowly vanishing. It is calculated that in marriage ceremonies 90% of the bridegrooms are decorated in modern suit and tie. Among the other community, few Bhutias belonging to Lama and Tibetans clan wear traditional dress. However in marriages, almost 90% of Bhutias and Lepchas were found decorated in traditional outfit. In offices and market, everyone is dressed in modern outfit. Therefore, it can be concluded that the tradition of Sikkim is preserved and uphold only by the old and poor people residing in the remote and inaccessible corner of Sikkim. The tradition and culture of Sikkimese people are limited to festivals only. On being interviewed some school goers studying at TNSS, astonishingly responded "they have not even seen and touched their traditional dress" :No NGO and social organization is working in this field for conservation of traditional wealth of Sikkim.

2. ***Erosion of language*** The lingua franca of Sikkim is Nepali and other tribal languages are virtually dead. The Govt. has duly recognised regional languages of Sikkim. Despite all attempts, only 5% of the young generation speak and write in their mother language. Some Bhutia, Lepcha and Nepali respondents replied that they are not interested in their language because it earns them inferiority complex among their friends.
3. ***Erosion of religious sanctity*** The auspicious occasions like *Tendong Lho-rum faat Pang Lhab Sol, Diwali, Dasai* are celebrated with vigor, but spiritual fragrance and significance of celebration is being diluted. All such festivals are celebrated in modern way. In *Tendong Lho Rum faat*, beautiful cultural programme is showcased to reflect the tradition of Lepcha community but no ritualistic *puja* is held as ceremonies in the villages. It is estimated that only 10 percent population are aware of their history and culture. This 10 percent people comprises of people attaining more than 60 years of age. As per the survey conducted on 17th September 2005 on the occasion of Biswakarma puja, it was noticed that, there were nearly 61 *pandals* of various size and budget. Some important *pandals* were at S.P.W.D mechanical, Metro garage, Tadong Taxi drivers, Tata Garage, Deorali taxi Stand, Panihouse, Tenzing and Tenzing Garage, Byepass garage, Arithang, Lal Bazar taxi stand, Mainline bus driver, main line taxi drivers, in Bazar, Burtuk, Chandmari workshop, SNT workshop, and Govt. Drivers Association at Tashiling Secretariat. On the day, mass local visitors were flocking to *Pandals* located at various places. Till 14.00 Hrs, pundits chanted mantras and everything went well. The Governor of Sikkim attended *puja* at Govt. driver Pandal in Secretariat complex. Large number of people irrespective of cast, creed and religion took part in Puja. However, in the evening after 18.00 Hrs, all the nearby youths gathered and started western and Hindi film songs and dance. In Tadong, Deorali and Panihouse area, some boys were found alcoholic dancing in perfect tune of modern Hindi, Nepali and English songs. The *Bhajans* including *Aarati* was not sung; rather cassette player and electronic gadgets replaced it. In 5th mile garage, youths themselves were

found fighting till late night. During *Dasai* festival 2004,it was observed that, almost 90% households in Yangang, Namchi, Pelling, Ravangla , Lingmo, Rongli, Makha areas did not perform *Puja*. The festival of *Dasai* started with alcohol and delicious non-vegetarian food items. Only on the *Dasami,* elders put *tika* over the forehead of youngsters with blessings.

4. ***Pseudo culture*** The tourism promotional festivals, fairs and commercialization for traditional cultural events may lead to the creation of pseudo-cultural folklore for the tourists with no cultural sustainability. People seem to have lost patience in ritualistic lingering. In Laxmi Puja or Diwali, except for some Marwari, Bihari and Bengali community, none of the local communities celebrate it with religious discipline.
5. ***Neo* Colonialism and invasion of local culture** Due to many reasons establishment of neo-colonialism is developing in Sikkim. It is proved that the local residents tend to speak the language of tourists, wear western outfit and eat Pizza and hamburger.
6. ***Change of foodstuff*** In Gangtok, Pelling and Namchi, none of the restaurants and hotels serves traditional, ethnic and local food. It is analysed from the survey that, despite of high demand for local food and beverages, no one has taken keen to introduce it. On the other hand, restaurant selling Pizza, hotdog, cold drinks, bakeries are rapidly mushrooming even in the remote destinations. It clearly indicates that (**Table 5.12**) the rate of extinction of local cuisine is highly accelerated.
7. **Loss of ethnic rituals** The rituals of each ethnic community is diverse; everyday is special to some of the communities with respect to their religious ceremonies and rituals. However, due to external influence, people have no time to think such values. This is attributed mainly to busy life and lack of knowledge about the richness of individual culture. At this point of time, tourism growth may further aggravate the problem.
8. ***Religious transformation*** In religious faith it is observed that many Lepcha communities have been shifting from Buddhism to Christianity. This trend is not uncommon among other religious groups as well. After Sikkim joined the mainstream, various churches were built to cater to the

need of people. One of the Lepcha respondent uttered that Buddhist rituals are very expensive and they interacted with many Christian followers and found out that Christianity is simple and economic.

9. ***Threat to custom and tradition*** People have forgotten years old tradition of performing *Puja* in the *Sansari* and *Devithan* areas. During the survey it was revealed that *devithan* was preserved near entel motors at 6th mile East Sikkim. Every year *puja* was organized and people use to participate in majority but now a days weak participation is noticed in such events. It is understood that tourism in Sikkim is making its people busy as well as lazy.

TABLE 5.12: TRADITIONAL AND ALTERNATIVE FOOD HABIT

Community	Traditional food	Replaced by	Current Practice
Lepcha	Khuri (Barley+Vegetable)	Rice, dal, and vegetables readily available in market	Occasionally consumed during festivals ceremonies and religious functions.
	Tshuknyuk (Rice + Bantarul made)		
	Saktit (Bamboo fermented,Curry)		
	Sukyor (Curry)		
	Pasyen-Khu (Tree fern mixed bread)		
	Salyang Shyer (Fermanted food)		
	Tunglukbuk Chi (Root Item)	Not in use	
	Pakzikbuk Chi(Arok)(tongba)	Wine	
	Kutshung Jom(Kluyaplo)(maize food)	Rice	
Nepali	Kinema	Tinpacked fish	
	Thotney	Not in use	
	Wacchipa	Biryani	
	Pua	Suji halwa	
	Fyaplo, dhero	Rice	
	Phuraula	Pyaji, Samosa	
	Kasar	Bunialaddo	
	Bhatmas, makai, tarul (pindalu, sakarkhanda,ghar,ban, simal, ,etc.)	Bhujia,chips, patties,pastary,dosa,	
	Limboo- thi, yanbben	Beer, whisky, pickle	
	Gundruk, soldar	Dal	
Bhutia	Khabje,jero	Packed namkeens	

Source-Field Survey, 2005

10. ***Adoption of western outfit*** The dress pattern of the local community has revealed almost 90 percent transformation from traditional (Table 5.13) to western outfit. In Sikkim, only 10 percent population wear their traditional

dress. Tourism is one of the reasons for such transformations. The locals believe that western style of dress design is impressive to tourists and present generation youths. The traditional outfits (Table 5.14) are rare and endangered which is limited to very few rural folks, belonging to poor section of society. The dresses like *Sari, daura suruwal, bakkhu* etc, are virtually replaced by suit, trouser shirt and jeans.

Among the youngsters, tight jeans, T-shirts, and transparent outfit are common in all parts of Sikkim. The loss of culture is taking place at the cost of tourists and economic gains in the name of globalisation and modernisation. Sikkimese, especially the Nepalis feel their culture inferior to western culture and they want to show off that Sikkimese are shoulder

TABLE 5.13: TRADITIONAL DRESS CODE AND ITS REPLACEMENT (MALE)

Community	Dress code for male	Replaced by
Lepcha	Sumok Thyaktuk, Papri	Hat, cap
	Tago	Shirt
	Tohmu	Trouser
	Banmok	Knife
	Tungib	Bag
	Ihyangshik /Lhom	Lather shoes
	Sali (bow)	(Not in daily use)
	Tshong (arrow)	(Not in daily use)
	Pangrek/Nyamrek	Leather belt
Nepali	Daura, Sural, Askot.	Shirt, pant, waist
	Askot	Half jacket
	Galphan	Muffler
	Lukuni,	Over/long coat.
	Khukri	Knife (not used as dress)
	Cotton Patuka	Leather belt
	Dhakatopi,Feta	Cap, hat etc.
	Limboo-hangjangwa,	Shirt , T-shirt
	Langdepma	Shocks
Bhutia	Khuchen kho, hentachi, zyaja	Shrit, pant
	Shyambu thuri	Cap, hat etc.

Source-Field Survey, 2005

to shoulder with tourist and have better economic standard. They often try to prove their quick assimilation with the other party. The survey also reflected that people in this region irrespective of caste and creed, spend more on food and clothing. Almost 80% of households even in the villages are neat and

clean with toilet so one can't distinguish their economic background by their outward look and get up.

11. ***Behavioral change*** The survey reported change in the behaviour of local population. Though, Sikkimese people are known for their simplicity, complacent, honesty and respectful behaviour yet one out of ten in urban and one out of twenty in rural Sikkim speak lie and do not show regards to their elders. Such fragile social environment may further get deteriorated due to tourism growth.

TABLE 5.14: TRADITIONAL DRESS CODE AND ITS REPLACEMENT (FEMALE)

Community	Traditional dress for female	Present status
Lepcha	Taroh (head scraf)	Not in daily use
	Tshomrik (ribbon)	Not in daily use
	Nyilop-Zyer	Ear-ring modern
	Lyak (garland)	Used occasionally
	Tagoh-hanz	T-shirt, Sleeveless top
	Nyamrek	Leather belt
	Dumvan (gada)	Used occasionally
	Dumpra	Coat, Jacket
Nepali	Majetro	Shawl
	Chaubandi choli,	Blouse, t-shirt
	Gunew, faria,	Jeans,skirt, kurtapaijama, sari
	Patuki	Belt
	Limboos-Sumjangwa, sardakpa	Kurtapaijama etc.
	Hembari	Not in use
Bhutia	Khuchen kho, thuchi hanju, pangden	Kurtapaijama, pant,t-shirt,
	Kusen	Jacket, sweater, coat
	Shyapcha	Sandal, fashion shoe
	Tshering kyangap shyambu	hat,cap

Source-Field Survey, 2005

12. ***Replacement of local cuisine*** Dietary habit of local Sikkimese have drastically changed. There are no restaurants in the town where local ethnic food is served. The young age group of every household demand hot dog, pizza, sizzelers and Macdonalds foodstuffs. During the survey it was revealed that every hotel has specialized in Bengali, Punjabi and Italian food. It reveals that the locals are now adapting to foreign taste at the cost of mass erosion of local ethnic food and beverages. The children in Gangtok and Namchi were familiar with Maggi, Kurkure, Hotdog, Pizza

(Table 5.16) and some had tasted Macdonald food. On the contrary, 90% of the respondents among children found ignorant of Nakima,Khaipi,Gundruk,Sinki, and other local food items. It is proved that (Table 5.11) about 71 percent foreigners and 65 percent domestic tourists are fond of local ethnic food and culture. Hence the rate of adaptation to host culture is severe. The foreign tourists inflict their tradition easily as the locals are adaptive in nature. Such situation may invite invasion of indigenous culture.

13. ***Alcoholism*** Sikkim is synonymous to hot drinks mainly Whisky, Beer, Rum etc. During field survey, it was authenticated that more than 50 percent of the respondents consume alcohol. Around 20 percent tourists tasted it for the first time in Sikkim because it is available at cheap rate. It may be mentioned here that one out of five youths of 15-20 age groups smoke and drink freely in Society.
14. ***Illigal trade*** The illegal trade of historic objects are practiced in some parts of the State. The cases of bio-piracy have been identified in Sikkim. There lacks maintenance of existing heritage centers, Every cultural resource either stone, temple or monasteries are polluted by writing buzz vulgar words (*like I lov u etc.*) It is a clear indication of loss of aesthetic value and moral of host population.
15. ***Replacement of existing tradition-glaring examples*** The local languages have been virtually put off to practice, even the lingua franca Nepali is not correctly spoken by 90% of its population. The mother tongue is spoken only by 5 percent of its people. It is analyzed that majority in Gangtok speak English and Hindi language and speaking English is a matter of status symbol as described by one of the respondents. All the cinema halls run packed with Hindi cinema. In the household, Hindi T.V serials and programmes have been the lifeblood of Sikkimese housewives. The survey conducted in five video parlours showed that the attendance of Lamas are growing day by day. At least 5 % of video movie watchers are the lamas from nearby monasteries. Other minor situations are as under:-

a. The boys and girls move hand in hand like husband and wife. As reported by some house owners in Gangtok and Tadong College area, some boys stay with girls till midnight and living relation is prevailing in these places.

b. Confrontation and clashes between hosts and guests arises due to cultural and behavior dissimilarity. Along the taxi stand, quarreling between host and guest is a normal phenomenon. As reflected in the survey behavior of drivers and tourist players are not satisfactory in Sikkim. One of the respondents even suggested for improvement in this line.

c. The drug trafficking, thefts, robbery, criminal acts are growing fast. The young drug peddlers are many times recorded to have arrested in Rangpo checkpost .

d. The respondents of Ravangla,Yuksum,Pelling informed that, they never use to lock their door in the past, it is very recently that they keep everything under lock and key. It clearly states that the fear of theft and burglary has been introduced in Sikkim along with the introduction of tourism.

e. Along with tourist human behaviour, honesty, sincerity, loyalty also went away from Sikkim.

f. In Yuksum some women complained that during tourist season male population migrate for job and females are overburdened with household work. This may bring serious change in demography.

g. The word trust has been erased out from the dictionary of Sikkim. In the name of competition, cutthroat atrocity and ego hassle is prevailing among the minds of residents.

h. In Gangtok and Namchi, young generation is greatly influenced by western dance and music. The celebration is done by dancing and singing in western tune, be it a party, picnic, *puja* or programme. Sikkim does not have the university of its own nor it has better library and open space garden, but there are five numbers of discos for entertainment in Gangtok town. At this situation, tourism growth may deteriorate social values and integration.

i. In an article in *New York Times,* Dr. Frances Collington tried to prove a correlation between the growth of tourism and increase in divorce in Hawaii. Tourism experts did not hesitate to equate mass tourism with post-barbarian invasions. But to compare the negative and positive impacts of tourism in study area, one easily comes to the conclusion that the positive impacts of tourism on the socio-cultural life of hosts (Bhist, 1994) are greater than the negative ones.

j. Transformation and replacement of existing treasures are going on full swing. The traditional ornaments are not put to use (Table 5.15) as a result such ornaments are dying out forever from the society.

The traditional craftsmanship, customary laws, rituals, dance, music, are dying day by day. In order to please tourist, *Gundruk, Sinki, Kinema, Sisnu, Kodo, Fapar* have been replaced by hot dog, pizza, idle, dosa, samosa and locals area addicted to these foodstuff. Tradition folklore has been replaced fully and *dourasural, Bakkhu, Hanju*,etc.(Table 5.13 and 14) are replaced by skirt, suit, jeans, T-shirt etc. Discipline, docility is replaced by dacoit, drug, divorce etc and cheating, lying, disobedience replaced human and moral values. Work culture is virtually nil, educated ones do not feel themselves fit to work in the agriculture farm.

The lovely and touchy word Ama and Baba are replaced by Mum and Dad and survey report reveals that 60 percent parents feel inferior to be called as Ama Baba. The *Rodhi,* a traditional Gurung night festival is being replaced by nightclubs and discos. Further, *Basant Pancchami, Kushe Aunshi,* are substituted by Saturday hangout, Sunday special, weekend celebrations and datings. Earlier, guests were treated as God and doors of houses were always kept open but nowadays visits are limited to appointment and knocking the door is mandatory before entry. The mobile phoning system and internet has invited friends from far but avoided next door neighbour. People may physically be sitting together in a dining table but communicating with the third person over telephone. The development of tourism may further multiply the existing problems.

TABLE 5.15: TRADITIONAL ORNAMENTS OF VARIOUS ETHNIC GROUPS AND ITS PRESENT STATUS.

Community	Ornaments	Present status
Lepcha	Nyilop-zyer (ear-ring), kukyup (ring),	All items are either not put to use or used occosionally
	Lyak-mutik (Garland pearls)	
	Ley-melung (golden garland)	
	Sambrang bur (Waist garland)	
	Banchetkup (traditional sickle for lady)	
	Kahgyer (silver made wrist wear)	
	Thyangyer (silver made ankle wear)	
Nepali	Dhungri, Mudri, Bulaki, Tillari, Potay, Chaptesoon. Nau-gedi, Marari, Chura, Sirbandi, Reji etc. Kalli, For Limboos- Samyang fung,(head gear),labena langbangi,nesse, pongwari itchi (pualomala)	
Bhutia	Shey khaw, zhi phiru, muti, eeyu.	

Source-Field Survey, 2005

Bhatkhuni is replaced by birthdays, (Table 5.16) the custom of birthdays have also become the status symbol in Sikkim society. Work has been important than worship.

The ratio of oily food, fried eatables are directly proportional to killer disease like cancer etc and urbanization and pollution have invited diseases like bronchitis, malaria, fever, asthma, jaundice, diabetes, etc. Erosion of discipline and character has encouraged threat like AIDS, crime etc. The diseases and hospitals are equally coming up and Malthusian principle is fully

TABLE 5.16: ALTERATION OF TRADITIONAL CULTURE AND LIFESTYLE.

Tradition-customs	Alteration/substitution
Bhatkhni	Birthday
Moi	Lassi, cold drinks
Momo, T-momo, kudi,satu,sekwa,	Pastries, cake, pastry etc.
Furaula, sel roti, kodo-fapar roti	Chips, bhuja,kurkure,lays,maggi
Chang, vaati, chanuwa, tongba, nigar	Whiskey, beer, rum, scotch.
Gagri & dhiri	Bucket, waterfilter
Janto, dhiki, okhli-musli	Mill, machine
Tolung, harpey, theki, madani-neti	Dairy farm equipments
Dhibri-panas	Candle, electricity
Aarati and Bhajan	Pop Bhajan in Gadgets
Incense and butter Burn	O point bulb
Arrange marriage	Love marriage

Source – Field Survey, 2005

applied with the growing incidents of landslide, earthquake, and accidental deaths. The growing numbers of vehicles have increased with growing numbers of accidental deaths as well. By the process of lifting chips, stones, rods, cement etc from its natural deposit, ecological and tectonic disturbances are visualized at large.

5.21.3 Positive socio-cultural impact of tourism

1. Tourism is often called as a passport of peace. Human beings are knowledge seekers, always wanting to expand his horizon and mental faculty. Through socio-cultural, scientific, economic, religious and scientific exchange, feeling of friendliness is injected into the human minds. As a result, mutual understanding, sense of collectivism and concept of interdependency is cultivated into human mind. Similarly, coming in contact with tourist, both the host and guest population are benefited. The people of Sikkim get well acquainted with foreign alien culture and feel the sense of preserving it. Many gentlemen in Gangtok are familiar with the lifestyle and behaviour of tourist.
2. The impact is applicable to both guest and host. Depending upon the quality of human resource and mental faculty of an individual, interaction with tourist helps in boosting knowledge and human behaviour.
3. It is only through mutual understanding and respect that friendly environment can be cultivated in the minds of people living in different nations. Such an atmosphere results in better understanding which help uproot the feeling of hatred and cultivate the habit of friendliness and brotherhood. In Sikkim, it is noticed that tourists flock with those having identical language and tradition. The local guide at Dzongri and Gangtok have been able to understand the feeling of tourists, understand their language and easily get along with them. This is an example of how host people benefit from mixing with tourist.
4. Tourism brings investment. The tackling of certain social problems, opening of schools and dispensaries and revival of old customs and style along the trek route to Everest in Solu Khumbu district of Nepal is yet another example

of (Bisht, 1994) humanizing tourism and making it more acceptable and trauma-free for local people.

In Sikkim, tax benefit has been utilised for the improvement of tourist infrastructures. Recently opened artificial lake at Aritar in East Sikkim has been upgraded and improved by the funds received from visitors.

5. The change is the only permanent thing in this world. Therefore it is high time for host people to get acquainted with tourist and derive the best possible benefit from them. Tourism is wealth and strength, if handled properly it may change lives.

6. Tourism is not always proportionate to erosion and invasion of local culture. The growing tourism business in Sikkim has helped in improving the sites and introducing numbers of conservation practices. For example, in Ralong-Borung hot spring and water garden, major improvement has taken place; it is mainly due to mass tourist pouring into the region.

7. At a social level, balanced tourism favours contacts between holidaymakers and local population. As a result, encouragement of cultural exchanges and ethnic relations take place between two countries. If planned in this way, tourism undoubtedly provides positive socio-cultural advantages (Bhist 1994). The visitors always appreciate hospitable Sikkimese people. As a result, better relationship and understanding is established with tourists.

8. Excavation, renovation, conservation and preservation of art, architecture; paintings, heritage sites vis a vis maintenance of such places takes place with a view to promote and develop tourism. Similarly in Sikkim various ruins, monasteries and heritage centers like Pemayangtse, Rumtek, Tashiding monasteries Rabdantse and Yuksum are maintained by the Government. This has resulted in the preservation of traditional art and artifacts in the religious site.

9. With a view to preserve dialects and language spoken by various ethnic communities, Government has declared seven language as state language and Lepcha, Bhutia, and Limbu language have been introduced in curriculum at the undergraduate level. These are the steps taken with a vision to promote tourism by showcasing diverse languages.

10. Various tourist destinations at the far-flung remote areas have been developed and proper care has been taken to preserve the valuable items. For example Yuksum, Khecheopari, Aritar are situated in the distant place from the capital, yet proper growth of tourism has been experienced in these regions. This process will reduce regional disparity and maintain level of economic standard.

11. Tourism help realise the values of own society. Due to pouring of tourist. local people feel the importance of their existing resources. As a result, conservation practices are introduced at the local and micro level. Besides, awareness among the local people is created and sense of belongingness is cultivated in the minds of local population. For example, once, two foreign tourists visited Ranka village and asked for ethnic food and he was served with buckwheat bread, in return tourist paid Rs 500 and said, "this was the food they were dying to taste for the last twenty years". Ever since, people (Field visit, 2005) in the locality continued with the same business.

12. Tourism helps in building society by introducing planned development. Management of destination is learnt from the tourist itself. As per the requirement of tourists, amenities are provided and similar planning is carried out in a society. This helps local people in planning their surrounding. In Sikkim, many model houses have been constructed with a view to encourage village tourism.

13. Tourism may help renew vanishing architectural traditions, peculiarities, ancestral heritage and the cultural environment. Through the promotion of *thanka* painting, large numbers of youths are employed to preserve and produce it for sale in the market. Similarly lost culture, costume and rituals are regenerated for tourists.

14. With the expansion of cultural and religious tourism in the state, rebirth of local arts and crafts of traditional cultural values are revamping at large scale. The department of culture is preserving traditional houses of Sikkimese people. Further model houses have been built as a step towards preservation of its heritage. Besides, tourism promotional fairs and festivals are organized to preserve the existing resources, where local cuisine, dress etc. are

displayed which have developed sense of competition among the community towards its preservation. Such fairs are held in Gangtok, Namchi and Ravangla during the month of October, November and December.

15. At international level, intermixing with tourists help in understanding their culture, behaviour and remove misunderstanding and ill feelings against them. For example, there is a general tendency among Sikkimese to avoid and dislike plainsmen, however such feelings have been vanishing day by day. It is due to the sense of friendship through mutual relation and intermixing with the guests. In Sikkim, many people have become fluent in Bengali and English over the years. Almost all the drivers can manage to speak in Bengali language with Bengali tourists.

16. Cultural exchange by understanding foreign language and art is vigorously taking place in Sikkim.

17. Tourism acts as a tool of national integration and international understanding. Promotion of mutual understanding between the two nationals through tourism interface and interdependency is experienced by many nations including Sikkim.

18. Tourism is helping in knowing the socio-cultural aspect of other states and nations through exchange of ideas with tourists. Even the uneducated tourist guides are fluent is English in Dzongri and base camp areas.

5.22 NEGATIVE IMPACTS ON NATURAL ENVIRONMENT

In terms of environment, supremacy of negative impact prevails over positive impact. Located in the seismically fragile zone with the given landscape, Sikkim may have prospered economically but naturally she has been loosing her natural endowments. The larger areas having potentials to grow as tourist destinations are located in the high altitude areas. As a result, all the infrastructure development takes place at the cost of mountain environment. Therefore tourism activity must be dealt with meticulously in order to achieve sustainable development. An assessment of impact on environment has been carried out to reflect major predicaments in the study area. The negative impact of tourism on environment can be identified

through various parameters. The resources are the natural endowments of Sikkim, all the development activities are controlled by available natural resource. Therefore depletion of resources may result in natural disaster in the long run. An attempt has been made to discuss all the parameters in the forgoing pages.

5.22.1 Depletion of plants and animals resources

As mentioned (Table 4.1), most of the faunal diversity is marked under endangered category. The birds and mammals are mostly endangered with similar endangered species of Rhododendrons (Table 4.1). It clearly indicates that Sikkim does not have all the flora and fauna recorded by Salim Ali and Hooker. The destruction of ecology in the name of tourism development is the subject matter of present study.

The immediate loss from the effects of tourism activities on floral and faunal species include destruction of breeding habits, killing of animals for hunting, and to supply goods to the souvenir trade, alteration of natural vegetation cover through clearance of plantation to accommodate tourist amenities and clearance of jungle to meet the firewood demand. In the Kanchendzonga biosphere (Chettri, 2000) reserve, loss of natural vegetation and disturbance to living organism are multiplying.

Tourism tries to create ecological imbalance at the very first step of tourism infrastructure development. The digging of earth and extraction of building materials for the sake of building tourism infrastructure is posing irreversible devastation to the physical shape of the earth.

1.Degradation of forest.

The principal cause for degradation of forests in Sikkim has been discussed in accordance with the principles laid down by Negi. The growing numbers of tourists are constantly replacing the existing flora and fauna of Sikkim. Clearance of vegetative cover is taking place in order to create tourism playground. Beautifully juxtaposed physical wealth of Sikkim gifted with wide range of bio-diversity, continues to amaze the visitors while traveling

across the length and breadth of Sikkim. The high mountain wall in its northern parts and the Singalila and Chola ranges form almost impenetrable barriers on three sides. Sikkim an enclosed area, sloping from north to south direction is often described as an amphitheatre and stairway. Owing to steep variation in altitude it offers varied climatic conditions, making conducive for the growth of flora and fauna. Tropical, temperate to alpine vegetation is well represented and exotic rhododendrons are the glory of Sikkim

The Yumthang flower valley of North Sikkim as well as the Hilley-Versay area of West Sikkim is the loci of rhododendrons. which can be promoted to naturalists. Moreover, the alpine zone is equally amazing in its variety. These zones include the Singalila range, Khangchendzonga, Lachen, Lachung and the Chola range. The Yellow anemones of Yumthang and the blue poppy flowers of Dzongri are the wonders. Wildflowers like aconites, gentians, violets, geranium, potentials, primrose, anemone cowslip, blue aster, saxifrages and the medicinal Jatamasi are also found in different altitudes of Sikkim.

Hikers, trackers and mountaineers even can enter into reserved forest and sanctuaries. The degradation resulted from such activities are of following types viz. soil erosion caused due to trampling, deforestation due to fuel requirement, threat to wildlife and threat to culture.

There are instances of bio-piracy in Sikkim. A tourist from Russia was caught with species of butterflies. Removal of orchid and medicinal plants are noticed in Lachung, Lachen, Rabong, Yangang etc. Along the trek route of Western Sikkim tempering and plucking of flowers are seen in the tourist season.

2. Degradation by Forest Fires

In great Indian forests, each year precious forests wealth are destroyed in forest fires. Forest fires may occur due to the following causes:

i- *Intentional causes*

More than half of the occurrence of fires in India is due to intentional causes. The villagers in order to obtain a good growth of grass often

fire the forest floor. This fire destroys a large forest area. The tribals to search the wild animals burn wild grass. The local people set fire to the forest to scare away wild animals from village and fields. The miscreants for taking revenge against forest officials also use forest fire as a tool to frighten them. They set fire to forest in a bid to settle scores with the forest department. Attempts are made to destroy the evidence of illicit felling by setting fire to the forest.

ii- *Unintentional causes*

This includes, unextinguished campfires of trekker, sparks from steam engines, un-extinguished cigarette butts, biris or matchsticks, torchwood etc.

Iii- *Natural causes*

Natural causes of fires include, fires caused by lightning, friction generated by rolling stones, bamboo culms etc. and volcanic (Negi, 1991) eruptions.

iv- *Damage caused by forest fires in Sikkim Himalayas.* According to Negi, damage can be studied as damage to the crop, damage to regeneration, effect on the productivity of the forest, effect on the protective power of a forest as it maintain a delicate balance in the ecosystem by providing protective benefits such as forests bind the soil together and prevent soil from being washed or blown away by water or wind, they break the force of the falling raindrops, they maintain the balance of gases like oxygen and carbon dioxide in the atmosphere. Forests maintain nature's hydrological cycle. The forest fire damages soil and destroys organic matter and nutrients of soil. The loss of wildlife animals is tremendous in case of such incidence. Fires burn the eggs of birds, destroy the young ones and damage their habitat, which is an integral part of the forest ecosystem. Thus, the delicate balance of nature is disturbed. Aesthetic loss is counted as it destroys areas of recreational and scenic values. Tourists and picnickers avoid areas

that have been burnt by forest fires as such sites present an ugly, scary look.

v- *Degradation by loss of Forest Land*

Many a times forest lands are converted into projects sites. In Sikkim huge lands are transferred to other establishments, **(Appendix V)** such as hydropower projects at North and East Sikkim, tourist destinations at Solopok, airports at Pakyong, offices, road and bridges, hotels at Pangthang, mining etc

vi- *Degradation by illicit felling and removal of forest produce*

The illegal cutting of trees and removal of forest products, without a valid permits by the individuals.

vii- *Degradation by Lopping*

The cutting and removal of branches and leaves of trees for fuel, fodder and shelter of cattle also degrade forest.

viii- *Degradation by removal of forest floor litter*

The litter is manure but when removed form surface, it losses its nutritional values.

ix- *Degradation by domestic animals.*

The tempering by animals degrades forestland making it harder and unfit for vegetative growth.

x- *Degradation by plants*

Sometimes unwanted, ecologically harmful shrubs cover the entire area and hinder growth of other plants.

xi- *Degradation by forest diseases*

Various diseases kill plants during the time of germination.

xii- *Effect s of low temperature*

In Alpine Lachung, Lachen, Yumthang, many endangered species of plants affected by severe cold, snowmelt, frostbite, avalanche, and many plants are stunted and dead.

xiii- *Rainfall*

Excess rainfall also affects growth of plants and grass. In Pakyong, Renock and Namthang are large area under crop was destroyed by heavy rainfall and hailstorm.

5.22.2 Air pollution

The pollution of air either by concentration of suspended particle or by adding of foreign element beyond recycling and absorbing capacity may cause severe health hazards. The unmet demand has resulted in air, soil, land and water pollution. The prevailing air is comparatively clean and pure in Sikkim except for Gangtok. However pollution is caused all along the main road, public places, drains, garbage disposal pits, jhoras and market place of Singtam and Jorethang. During peak tourist season, thick smoke cover Changu, Pelling,Gangtok and Singtam. Besides industry and vehicle, dust generated by unmetalled roads is harming the atmosphere.

i-***Smoke*** The invasion of suspended particulate matters, toxic fumes and gases like carbon monoxide, sulphurdioxide, oxides of nitrogen etc have polluted the ambient air quality of SIkkim. Main source of these pollutants are petrol and diesel based automobiles, chimneys, heating system fitted in the offices (all the Banks in Gangtok are heated with chimney during winter), vehicular traffic particularly in National Highways No.31 from Ranipool to Gangtok is very high. (Field survey 2005) The congestion of traffic, caused by inbound and outbound loaded trucks, emit toxic fumes and monoxide.

During office and schools timings, problem of traffic gets aggravated especially in Holy Cross and TNA complex, where hundreds of school vehicles ply everyday. Also in early morning and evening when truck enters the main road, immeasurable amount of smoke is released to the atmosphere. The traffic jams are due to limited road width, lack of parking places, absence of proper pedestrian facilities, encroachment on road sides, mixing of local and highway traffic, lack of management, poor geometries of road intersections and alarming growth of vehicles. Number of vehicles on the

road has risen (Fig 4.2) sharply, beyond the carrying capacity of the narrow roads.

Higher emission of toxic smoke by the vehicles are mainly due to unhauled engines, overloading, long and steep climbing, congested roads, and frequent traffic jams and weak enforcement of the laws controlling air pollution. No doubt the natural vegetation of Sikkim acts as air filter/purifier but with the increasing number of vehicles day by day, air pollution is bound to increase in future. In that situation the citizen will have to suffer, if strict measures are not taken to check it.

Other minor sources of smoke are burning of fuel wood and char-coal for cooking, room heating, burning of plants leaves and solid waste in the localities. Tobacco smoking also pollutes the immediate air, which we breathe. Smoking of tobacco in the traditional bamboo popes and also in the form of cigarette, cigar and *bidi* is a common habit of the residents of Sikkim as a whole. One of the respondents complained about suffocation from odors spread in hotel due to smoke of tobacco, coal, firewood and fumes of frying and cooking.

ii-***Dust*** Air is also polluted by dust particles. The aged people of Sikkim say that dust was limited to agriculture field only but all the residents along the roadside from Tadong to Gangtok informed that they collect 100 gram of dust everyday. The wind picks up dust/soil particles from unsown agricultural fields, construction sites and stone quarries in and around Gangtok. In the past, when the strong winds blew there used to be sweet whistling sound from the surrounding pine trees, but now the strong winds carry dust everywhere causing health hazards to the people. The suspended dust particle in the air comes down with the rains thus increasing turbidity in the rainwater and acid rain.

iii-***Foul Odour*** The major air pollutants in Gangtok are foul odours. The main polluters are rotten and undicomposed solid waste, garbage, rubbish, improper urinals and open defection. The fresh and pure air of Sikkim is replaced by obnoxious gases. As per the survey mapping of bad odour; the

areas at present Lal bazar, Jhora near panihouse, Manipal drainage, back side of the STNM hospital, Vajra Jhora, and all latrines and urinals of Lal bazar, supermarket, were found stinking. In the villages, open defecation urinals, cowsheds, piggery and poultry sheds are the main polluters. (Field survey, 2005)

Along the Jhoras and depressions, static water invite mosquito breeding. Besides, unmanaged kitchen refuse like, leftover foods, skins of vegetables and fruits, egg shells, froth-foam of boiled rice, rotten food items and waste parts of fish, chicken etc. are the great polluters producing foul odour.

The residents of lower 5th mile Jhora areas are badly affected by the obnoxious smell and filth brought down by the Jhora stream. During rainy season, dirt and garbage are collected at the lower side of Gangtok causing serious damage to local environment. The waste generated from byproduct of Milk union at 5th mile outlet is as bad as Namli garbage storage area. (Field survey, 2005)

5.22.3 Noise pollution

The 'micro-mini' environment of urban ecosystem is also subject to noise pollution, a typical gift of the modern age. The noise nuisance is variously defined as 'unwanted sound' or 'vibrational energy out of control' (Smith, 1972). Noise includes any loud and undesirable sound, disturbing peace of mind. It also causes irritation, distraction, loss of concentration, annoyance and damage to hearing power. Noise has become a major health hazards in the cities. Adverse ecological, physiological (pathological) and psychological effects of noise on human beings and other life forms are quite evident nowadays. Various health problem caused by noise include increase in cholesterol level in human blood, high blood pressure, heart and liver diseases, mental abnormalities in fetus, peptic ulcer, hypertension and ultimately emotional (Verma and Agarwal, 1983) and behavioral problems in men.

In the peaceful and calm environment of Sikkim, even low irritating sound makes noise pollution. Main sources are blowing of horns along the

National Highways, repairing and testing of automobiles in the workshops at bye pass, ear bursting sound produced by bursting of silencer pipes of the vehicles along the NH 31,garage, blasting of rock, music blast and electronic gadgets. The people inhabiting along NH 31 have sleepless night till 12pm and after 4am in morning, due to heavy vehicle traffic.

5.22.4 Water pollution

The people in the hills have to bank upon surface water for daily domestic and commercial uses. Hence scarcity of treated and potable water is noticed in the places like, Darjeeling, Katmandu, Shimla etc. However Gangtok in particular is devoid of such problems. Intermittent supply of water is noticed in some dry seasons. Where as in Pelling, peak season is characterized by scarcity of drinking water. Almost every villager in the rural Sikkim reflected on drying up of water sources and water scarcity for drinking and irrigation. Due to construction of road and building in the water source areas, the sources have been drying out day by day. In South Sikkim a place called Valeydhunga, known for water sources have been drying out gradually. It is due to forest clearance and introduction of hydropower project on the other side of the valley and (Field Survey, 2005) also due to overgrazing of animals and human interference pollution level has gone up to a great extent.

i. ***Contamination of Drinking Water***

No treatment of water is carried out in rural Sikkim. As per the report of Doctors diarrhea, dysentery and water borne diseases break out often in the villages. A Doctor of Tumin East Sikkim, narrated similar case story in his village. Besides, health conscious people take antehelminthic medicine every three-four month to fight against the impact of polluted water. (Field Survey, 2005).

The contaminated water with pathogenic bacteria and viruses are glaring examples found in the rural Sikkim. The stagnant water is polluted first and mosquito breeding takes place, followed by outbreak of communicable diseases. People take bath and wash cloths and vegetables in open water, as

a result helminthic, scabies and water- borne infection have occurred in many places.

The Department of Water Security and Public Health Engineering maintain water supply in Gangtok however Rural management and development Department looks after few schemes in rural areas.

The natural water collected from springs, streams are treated at Rateychu Selep Tanki and supplied to the people of Gangtok. However in Pelling, Ravangla, Singtam, Rangpo, Yangang, water is consumed directly from the source without much treatment.

The water from the treatment plant is supplied through G.I. pipes for the distribution to consumers. During this process, water gets contaminated. Washing and bathing have also been reported near water the sources and during rains water body accumulates external foreign elements. In open reservoir, animal and human interference pollute water. Sometimes dead organisms are found along with the leaves of trees in the reservoirs. Microorganisms like protozoa, fungi, algae and bacteria etc. are found in abundant in the water storage tanks.

ii-***Scarcity of water***

Population of Gangtok is increasing rapidly which nullifies any developmental scheme including water supply. In such a critical position, plight of the citizens can be understood in which they even may not get sufficient water; a basic resources. In some of the public taps there is dearth of water and drinking water is equally wasted from the open taps.

iii-***Pollution of Water Bodies by Sewerage***

All the nallahs, streams and lakes in and around Gangtok are polluted by the urban sewage. Under gravitation the sewerage naturally drains into the Jhora and passes through 5th mile area below Gangtok and finally pollutes Rongni Chu. During rainfall, stream rises above the critical level and untrained Jhora deposits all garbage and filthy material along its bank thereby polluting vast areas along the bank of Jhora.

5.22.5 Soil/land/Earth pollution

Various types of pollutants pollute and degrade quality and fertility of soil. In most of the cases, running water carries the valuable soil/earth itself away. While at some places human activities destroy land and its aesthetic value by turning it into an 'ugly landscape'. (Husain, 1996) In Sikkim, excess cultivation, over construction, urbanization and unmanaged garbage disposal has attributed to land pollution.

i-***Soil Erosion, Floods and Water Logging***

Various factors like deforestation in the vicinity of the town, making 'seed-beds' in sowing seeds, deep tillage of the hill slopes, excessive use of land and stone quarrying are responsible for soil erosion and consequent degradation of the ecosystem potentiality. In some depression floods and water logging is visualised.

The Loss of precious resource-soil is also caused due to number of construction works in the town e.g., digging of the land for construction of buildings, houses, bridges and roads.

In the name of tourism development Gangtok and other small towns like Namchi, Ravangla,Pelling, Yuksum, Geyzing, Mangan. Lachung, Chungthang etc. have been witnessing haphazard multiplication of hotels and restaurants. The fertile lands are transformed into concrete buildings to fulfill the demand of accommodation created by tourists. In the seismic zone of Sikkim, six story buildings have been constructed without proper plans. In case of earthquake, immeasurable loss of life and property is expected. The landslide at Pakyong, Namli, Sirwani, Rangpo have eroded million tons of fertile soils. There are reports of landslides and burying of houses during rainy season. As reported by SDM Pakyong, around 100 houses were evacuated due to fear of landslide in Pakyong, during the month of July-August 2005.

ii-***Quarrying*** In order to supply stone, chip and sand to the construction site, the earth is virtually excavated. As a result, soil erosion, forest depletion, and defacing of landscape are taking place in Ranipool, Mangley, B2 and Indira Bypass area.

iii-***Chemicalization*** The biodegradable chemicals dissolve into water, soil and enter into plants, animals and man through an ecological food cycle. But chemicals like DDT do not dissolve into soil and water. instead accumulate there and that causes much harm to the life forms. Excess use of chemical is deleterious to all living beings. (Husain, 1996) Fortunately, no such problem has occurred in Sikkim as Govt. has already put a ban on use of fertilizers and chemicals.

5.22.6 Other minor causes

i-***Improper dumping of urban waste***

The problem lies with the urban centers because tourists flock to towns for accommodation and other amenities facilities. In Sikkim though Govt. has put a ban on use of plastics yet secondary source of plastics uses are going on. As a result iron, tins, plastic cover, rubber, torn cloth, tyres, packaging waste, human hair from the saloons, bottles, package case, earthen soil, broken TV, radio, medical and house waste are thrown haphazardly along the road and hill side. In Gangtok such problems are minimizing but in other upcoming towns no management of garbage disposal has been done. Therefore defacement of landscape and environment pollution is being added up.

ii- ***Unplanned housing structure, hapahazard growth of town and pollution of space***

The haphazard horizontal and vertical expansion of Gangtok, Singtam, Namchi and Pelling towns and multiplication of skyscrapers all over have gifted land pollution and environment degradation in Sikkim.

Such high buildings cast shadow on the adjacent houses particularly on those lying in the shadow side, thus depriving the inhabitants of sunlight and fresh air. As no space in between the buildings are kept, no light and sunrays pass through. As a result rooms are dark and damp with breeding of hazardous insects and pests like houseflies, mosquitoes, bed bucks, cockroaches, silver fish etc. (Husain, 1996) In the survey, some tenants complained about damp and dark room in Chandmari, Thathangchen,,

Tadong, and Sichey locality. It is also noticed that the houses are too close and there is no privacy at all. In double storied houses when the floor is made of wooden plans, slight movement of that floor produces irritating sound for the people living in the ground floor.

The traditional single storey type houses made of wood/timber, reed, bamboo; plaster, hollow bricks and tin roofs are more safe and comfortable in the earthquake prone and cold area. But the growing use of cement and concrete in construction of houses and buildings (multistoried) create just unhealthy environment to the above. As cement, steel and stone are good conductor of heat, these houses remain more cool in winter and warm in summer. Fire safety devices (Husain, 1996) in the houses and buildings are either absent or inadequate. Shortage of water is already there to put off fire if unfortunately breaks out. In such senario,it is must to equip every house and building with sufficient fire extinguishing devices to avert disaster. Similarly Gangtok is no exception to such problems. The parks, space, gardens, children parks, and road connectivity in the interior houses are not found in any of the towns in Sikkim. The capital Gangtok is often named as jungle of concrete by the travelers.

iii- ***Environmental deterioration due to fluctuation in climatic factors***

In winter the climate of Gangtok is less cloudy, rainy and cold. As a result growth of houseflies, mosquitoes, silver fish, other microorganisms and weeds are seen. Mosquito nets were not in use earlier in the past; cooler, fans were never used as the weather used to be pleasant. There was no provision to hang ceiling fan in the rooms. Nowadays slight warm and moist summer require fan to get relief from heat stroke.

iv- ***Aesthetic Pollution***

The dirty water in the streams, springs and waterfalls, contaminated water, rotten heaps of garbage on every nook and corner, open drains, filth and foul odour, bursting sound, burning eyes on (Husain, 1996) the roads, cement-concrete jungle of building, growth of weeds, insect, pests and micro-organism, dust and smoke laden impure air, over-crowded streets and

neighborhoods and over all scarcity of urban amenities have eroded the comfortability, natural beauty and charm of the beautiful Sikkim.

v-**Erosion**

Erosion of top soil due to debri slide, landslide, rock fall, earth fall etc. have washed away major chunk of fertile soil and vegetation. Summer rainfall is characterized by torrential rain and landslide. The department of Irrigation and flood control has measured places prone to slides. (Table 5.17)

Table 5.17: PLACES THREATENED BY EROSION FROM RIVERS

North	East	West	South
1. Mangan	1. Ranipool	1. Legship	1. Melli
2. Lachung	2. Singtam	2. Dentam	2. Jorethang
3. Chungthang	3. Sirwani	3. Reshi	3. Majhitar
4. Dikchu	4. Rangpo	4. Rimbi	
	5. Rorathang		
	6. Rongli		
	7. Saramsa		

Source-Irrigation and flood control Department, Govt. of Sikkim, 2001

vi-***Visual pollution***

The visual pollution is the result of improper sewage treatment, space littering, landscape defacing by excavation and unplanned constructed building. Littering is usually noticed in the tourist destination. The problem of environmental depletion arising out of bio-non-degradable packing materials, which do not have properties of decomposition, blocks the drains and open sewage. Further ugly design of houses and landscape, unarranged hanging of banners etc. is seen in Gangtok, Pelling, Changu and other towns including Singtam, Rangpo and Jorethang.

5.22.7 Solid waste

It is noticed that increase in solid waste is directly proportional to tourist population. As a result, mountain of wastes is generated from various tourist related commodities. The wastes generated in Sikkim are categorized as solid

wastes from towns, agriculture, industries, commercial hotel, restaurant and bio-medical wastes from hospitals.

According to (Katyal and Satake, 1989) following are the major sources of solid wastes generated from various sources.

i- ***Agricultural wastes***

The 70 % of Sikkim population lives in village they directly depend on agriculture. In the process of agriculture practices, waste are generated at mass scale. However property of decomposition and decaying has helped in maintaining eco stability. Main waste products are remains of animal fodder, harder cover of seeds, branches and leaves, rice straw, bark, logs, food grain waste etc. Such non-degradable substances therefore result in hazards.

ii- ***Household wastes***

The household unused substances fall under this category, such as plastic cover, polythene, paper case, tin, bones, bottles, glass etc. Except for Gangtok, no other rural houses collect garbage from their houses and wastes are thrown in the fertile field.

iii- ***Community wastes and party waste***

It includes the wastes generated by group of people living in a particular locality and includes remains of food items in picnic and parties, bottles, tins, paper packs and unused items. In the picnic spots at Saramsa and water garden at the vicinity of Gangtok, waste arising out of residual food stuff, bottles, plastics, mineral bottles are found scattered all over the garden during winter picnicking.

Iv- ***Fruit and vegetable processing wastes***

The solid wastes are generated from the following fruit and vegetable processing units namely Guava, ginger, cardamom, passion fruit, sugarcane, Mango, Citrus, apple, pineapple, banana peel and root of vegetable plant etc. Sikkim food preservation factory near Topakhani produces these types of wastes.

v- ***Animal Wastes***

The wastes generated from domestication of animals are known as animal waste. It includes remains of animal fodder, bark, bones, wooden and tin items from cattle shed, pigsty etc. In rural Sikkim such wastes are generated in each household.

vi- ***Industrial wastes***

The most hazardous wastes are generated from manufacturing industry, it includes liquid effluents, bottles of chemicals, sake and cover of raw materials, paper waste, dusts, cut items, bottle caps, broken irons, steel and nails. In Sikkim distilleries and Melli breweries such wastes are generated at large scale.

vii-***Wastes from construction projects***

As discussed in prepage, Sikkim is experiencing the peak of development. Construction of Tista stage V hydropower is going under NHPC guidelines, airport in Pakyong, stadium, roads and offices are mushrooming in every nook and corner of the state. With the decentralization of powers to Panchayati Raj Institutions block level office is under construction in all the constituencies of Sikkim. Besides, private concrete houses multistory buildings are mushrooming alarmingly. Wastes from construction project include, pebble and gravel, rubble, brick, Sand, cement, waste wood, iron, rod, cement waste, and cover paper and poly items are everywhere. It is reported that the waste generated by NHPC at Balutar is being thrown into the rivers causing river pollution.

viii- ***Aquatic wastes***

Solid wastes from aquatic ecosystems include silt, aquatic weeds, algae, lichens etc. (Negi, 1991) Other wastes are residual foods from restaurant, polythene pipes, bags, rubber sticks, spoon, plate, sweet packet cover, *chocklet cover, bhujia and namkeen* cover and plastic packs. Besides, non- degradable waste from hospitals too adds to the problem. The destination Changu and Pelling are piled up with the layers of unused articles.

In the villages, dumping of waste in the Jhora has caused massive degradation of soil and also resulted in spread of diseases. The plastic covers of eatables are thrown in the open space and accumulation of filthy, dirt and dust is threatening natural environment in the region. The local people are facing numerous problems arising out of such activity.

5.23 POSITIVE ENVIRONMENTAL IMPACT

Tourism is like a knife with a doctor, it may save or kill life from death. Therefore tourism is as delicate as glass and needs proper handling. Similarly planned tourism growth helps in boosting and improving the economic condition and landscaping of the entire region. By applying sustainable way of developmental activity and by introducing the model of carrying capacity. environment remains uninterrupted. The possible benefits are detailed as under:-

a- In the developing state like Sikkim, tourism cultivates a sense of conservation of natural resources by protecting wildlife, national parks, garbage management, creation of parks, garden with open space, reserves. Similarly Gangtok town development and beautification programme was launched and ropeways, flyovers, footpaths were constructed accordingly.

b- Many sites of historic and archaeological attractions for tourists have been renovated in Rabdentse, Tumlong, Pemaonchi and Rumtek.

c- With a view to maintain tourist destinations various ideas are mooted out towards abatement of pollution in the locality. Tourism provides an incentive to clean up environments by putting check on air, water, noise, visual pollution and reducing congestion by upgrading overall aesthetic ambience with suitable landscaping and building design. In Gangtok, with the advent of tourism, water supply, sewage and solid waste disposals, are planned and maintained as per environmental ethics.

d- Mass awareness among the local people regarding environmental awareness plans have been introduced in Sikkim. The voluntary social organisations have become active in this field.

e- In order to reduce regional disparity the receipts from international tourism has acted as impetus for the growth of backward region of Sikkim Himalayas.

f- Penetration of economic benefits to the lowest level of society in the form of foreign exchange earnings. have been noticed vividly. The rural artisans have started making gift articles for the tourist. Besides, supply of vegetable and milk etc is adding to their per capita income even in the remote corner of Sikkim. The Ranka and Rumtek village people are selling milk and vegetable at Gangtok on a daily basis.

g- Direct and indirect employment opportunities have been created due to all round development of tourism.

h- Infrastructure development also can not be overlooked as it forms a major economic base.

i- Income multiplication and multiplier effect have penetrated down below the rural grass root.

j- Tourism has also helped in raising government revenues in the form of various kinds of taxes levied on tourism activities.

k- Tourism is a tool in bringing consciousness among the local populace with regards to environmental protection measures. The villagers of Dzongu are familiar with the importance of environment

l- Introduction of environmental impact assessment and sustainable measures in various development activities have further helped in reducing environmental degeneration.

m- The promotion of rural and village tourism has enhanced the capacity of rural folk in organising themselves for better living. In Yuksum, Lachung etc some tourist visit village areas and spend money in the villages itself.

CONCLUSION

This chapter enabled researcher to identifying interesting findings mentioned below. Drying up of water sources along with dying tradition and culture. It may be mentioned that *Mahadevthan, Sansari, Deorali,and Devithan* puja Sthals are generally water source areas where common ceremonies are

performed by the community in every villages in Sikkim. To maintain and uphold the sanctity, all such sacred places are kept away from pollutants and encroachments. Plantation is carried out with strict ban on entering, encroaching and cutting grass and tress on such *Sthals*.. However due to tourism activity and other development works penetrating into grassroots, such places are destroyed and people have discontinued to perform Puja in these Sthals. As a result, conservation process also has been stopped and hence signs of water source depletion is noticed everywhere. In Yangang, Pakyong, Temi, Tintek area there were many such sacred places in the past but very few remains today. Now a days ceremonies and pujas are performed for the sake of get together, eating and celebrating. In Assam Lingzey and Namthang, Namchi, similar trend is observed. (Field Survey, 2005)

The concept of *Smriti Van* has been introduced in Sikkim, where a notified area is devoted for planting of saplings in the memory of near and dear ones. In all the villages such places are seen but recently it is observed that picnics and parties are celebrated in such areas as a result *Smriti Van* may deplete in future.

Unplanned growth of urban area is characterised by construction of roads, lodges, hotel, cafeterias and problems of open defecation, littering and garbage disposal. The problem of traffic congestion, scarcity of drinking water, latrines, open space, and lack of gardens and children parks are noticed in all the places. The looming pollution around the towns are seen, atmospheric pollutions are experienced especially in tourist peak seasons.

Conversions of agricultural land into industries and hotels have caused massive ecological depletion in Gangtok and surrounding areas. Open sewage and drainage system in Gangtok has caused various hazards. Rainwater is not properly drained, as a result danger of landslides and cracks are found at 5th mile, near college valley. Two buildings were collapsed in Gangtok, hotel Dreamland was evacuated recently to save human life. The Chandmari area falls under sinking zone and there lies every danger of natural calamities. (Field surrey, 2005)

The degree of slope is directly proportional to rate of erosion. Sikkim being a hilly tract, fragility is one of the most important characteristic features of its topography. It falls in the highly sensitive erosion prone belt of Eastern Himalayas. The steep slope and uncover vegetation cause physical damage to soil in three forms. Firstly by digging or cutting of earth during constructional activities, secondly by various tourist activities such as trekking, camping, mountaineering and thirdly by run off, landslides and avalanches. During rainy season, million tons of soils are washed away by river Tista.

Sikkim has gone all out for hydropower development along the river Tista and Rangit. Along the dam site, whole earth is being washed away by river Tista and Rangit. Further in Dikchu, Makha and Baluatar in East Sikkim total landscape has been altered by the construction of dams and power colony. The deep jungle has been transformed into a compact urban landscape like Mumbai. Every year, fertile soils are washed away by the rivers and streams draining into main river. The social environment has been prone to erosion due to many reasons and tourism is one of the reasons.

In general negative impact is greater than positive impacts in case of environment and culture, on the other hand positive impacts are found numerous while explaining economic impacts. At this stage it is pertinent on part of a researcher to identify the solution to negative impacts on the environment and culture. Hence attempt has been made in chapter six to identify and introduce principles of eco-tourism for sustainable development of tourism in Sikkim.

CHAPTER - VI

ECO-TOURISM PROSPECTS AND PRACTICES

INTRODUCTION

Tourism activity effects the surrounding environment mainly in four ways. Namely effects on architectural façade, land use change, burden on infrastructure and socio cultural alteration. The problem of land use change is more acute in mountain topography where land is less productive for agricultural purposes and thus farmers are willing to sell their land in getting an attractive price for it by the developers. Trekking routes in mountain landscape seems to be highly sensible as such activity affects the land use patterns in many days. The activities for instance are conversion of forestland into agriculture land, encroachments on public open spaces and tendency to leave land fallow for camping. Thus the above-cited factors have been affecting the built environment in various ways. (Batta, 2000) In general, agriculture productivity in Sikkim decreases with increase in the number of small and marginal farmers. In this scenario, money flow inside the destination is equalized by money flow outside. For example, Sikkim imports food grains, vegetable, eatable items, cloths from other states, as a result, earned money also returns with the tourists.

Damage to archaeological and historic sites due to overuses or misuse by tourists are commonly seen in the tourist destination and disturbances to living organisms in the mountain due to trekking, firewood collection are posing threat to existing tourist potential areas. There are instances of hunting wild animals in Tendong and Mainam reserved areas. The illegal felling of trees are still persistent in the higher altitude remote areas.

Therefore, eco-tourism is the only powerful answer to conserve and sustain tourism for future.

6.1 DEFINITION, MEANING, CONCEPT

Eco-tourism is a type of tourism where the environment, local community and visitor all derive benefit. The travel agents often use the term "eco-tourism" while marketing tourism product. Eco-tourism in other word incorporates both a strong commitment to nature and a sense of social responsibility. That responsibility extends to the sensitivity of the travellers. The term "responsible travel" another aphorism for eco-tourism, encapsulates its aims. The eco-tourism society gives a slightly fuller definition. "Eco-tourism is responsible travels to natural areas which conserves the environment and improves the welfare of locale people". (Lindberg and Hawkins, 1999). According to Ceballous Lascurain eco-tourism is " traveling to relatively undisturbed areas with the specific objective of studying, admiring and enjoying the scenery and its wild plants and animals as well as any existing cultural manifestations found in these areas"

According to WTO eco-tourism is "tourism that involves traveling to relatively undisturbed natural areas with the specified abject of studying, admiring and enjoying the scenery and its wild plants and animals, as well as any existing cultural aspects found in the areas"

Black (1996) defined eco-tourism as an experience with a focus on the natural and cultural environment, ecologically sustainable activity, an activity with a predominant educative and interpretative programme and a activity that contributes to local community groups and projects and to the conservation of the surrounding (Batta-2000) environment.

The global significance of eco-tourism was recognized by declaring year 2002 as the International Years of Eco-tourism by UN General Assembly. In simple, eco-tourism has recently come to be regarded on the panacea that enables us to aggressively seek tourism dollars with no obvious damage to (Yadav, 2002) eco-systems.

Eco-tourism in the Himalayas-Prospects and Problems Mountains are the beginning and the end of the natural scenery –John Ruskin

The Sikkim Himalayas have attracted travelers, scholars, adventurers, mountaineers, visitors, and researchers, since the dawn of human

civilizations. Holy shrines, sacred temple abode of gods, symbol of peace, tranquility, austerity and cradle of civilization and enchanting meditating caves have always been the treasure house for god and goddesses.Our sages and saints have been moving to mountains, meadows and streams and experiencing elevation of mind that close contact and communion with nature produced. They understood than man and nature were not two separate entities but an enmeshed part of the same organic entity and the same divine spirit (Jagmohan, 2002). With the evolution of pilgrim tourism, mountains became the destination for peace seeker healer and meditator. Later with the growth of adventure tourism, mountain became the playground for trekkers, and mountaineers. However, mountain preserved its sanctity, even George Bond, first person to scale Mt. Kanchenzonga held six feet below the summit as a mark of respect to honour the sanctity and sacredness of Mt. Kanchendzonga (Sikkim Express, Now, 19th Sept. 2005)

The Sikkim Himalayas supply water for electricity and domestic consumption, minerals for industries, and renewable green wealth for better health and prosperity.

The mountain world today is in perilous ecological state. The biophysical and socio-economic resource base is undergoing disastrous impoverishment due to human action. Being an environment friendly activity, eco-tourism aims at promoting environmental values and ethics in preserving nature in an uninterrupted from. It thus benefits wildlife and nature by contributing towards ecological integrity. Participation of local communities ensure economic benefits for them, which in the longer than can ensure a better status (Yadav. 2002) and an easier life

The state of Sikkim is girdled by Himalayas from almost all the directions. Mountain peak, passes, ridges, caves and its natural wealth such as rivers, snows, wildlife and vegetation forces major center of eco-tourism.

6.2 POTENTIALS OF ECO- TOURISM IN SIKKIM HIMALAYAS

The Himalayan state of Sikkim is the capital of Eco-Tourism in India. The study area provide an arena for eco-tourism activities ranging from awe-

inspiring grandeur of Mount Kanchendzonga and house of orchid and rhododendron with unspoilt harmony of nature, culture, agriculture, horticulture, sericulture and adventure. Mountaineering as an adventure sport, can be well established in Sikkim. The third highest peak and other sacred peaks, hills, caves are conserved and preserved for sustainability.

After Tenzing Sherpa assent the Everest followed by setting up of Darjeeling mountaineering association, mountaineers from the world pointed Sikkim for mountain adventure. The mountains being the abode of gods and sacred, no permission was granted to the European mountaineers to scale Mt. Kanchendzonga. It was only in 1955 and 1977 that successive scaling of the Mt. Kanchendzonga was done. Since then, other mountain peaks namely, Mt. Kobru, Mt. Talung, Mt. Pandim, Mt. Lamaongden, Mt. Masunyange got exposed for tourism activity. However, sacred peak namely Mt. Kanchendzonga (8780m) Mt. Nursing (5825m) Pandim Peak (6601m). Mt Simvo-(6809m), Goecha peak (6126m), Fosk Peak(6212m). Mt. Siniolchu(6891m) and Pauhungsi (7065m) have been kept at bay from pollution and environmental degradation. As a result, all the sacred peaks are now potentials for future mountain expedition in Sikkim.

An attempt made to scale Kanchendzonga in 1899 by Freshfield, remain futile. After successive attempt in 1929, 1930, 1931 finally 1955 and 1977 witnessed humans to standing just below six feet from the crest of Mt. Kanchendzonga. Other expedition included Mt. Kabru in 1935 by Cooke Pyramid peak in 1949 by R.Dittert, Mt. Paunhri in 1911 by Kailas, Mt. Pandim by Sonam Gyatso. However prospects of eco-tourism in the Sikkim Himalayas remain intact and sustainable tourism activity makes Sikkim an eco-tourism destination. Three peaks have been declared opened for the mountaineer with the announcement of Hon'ble Chief Minister of Sikkim (Now,dated 29-9-2005) on 19th Sept. 2005. It includes Ferries Peak in West Sikkim (5868m), Lama Wangchen Peak,.North Sikkim (5868m), Brum Khansha Peak, North Sikkiim (5635m). All the mountains and peaks in Sikkim Himalayas can be developed as eco-tourism hotspots of the Eastern Himalayas.

6.2.1 Major trekking spots in Sikkim

Trekking along the high mountain passes are adventurous, trail routes encompasses wide cross section of flora, fauna and heterogeneous cultural set up. The experience in the high altitude are thrilling and exciting. There are five (Table 6.1) major trek routes located at various places.

TABLE 6.1: TREK ROUTES IN SIKKIM

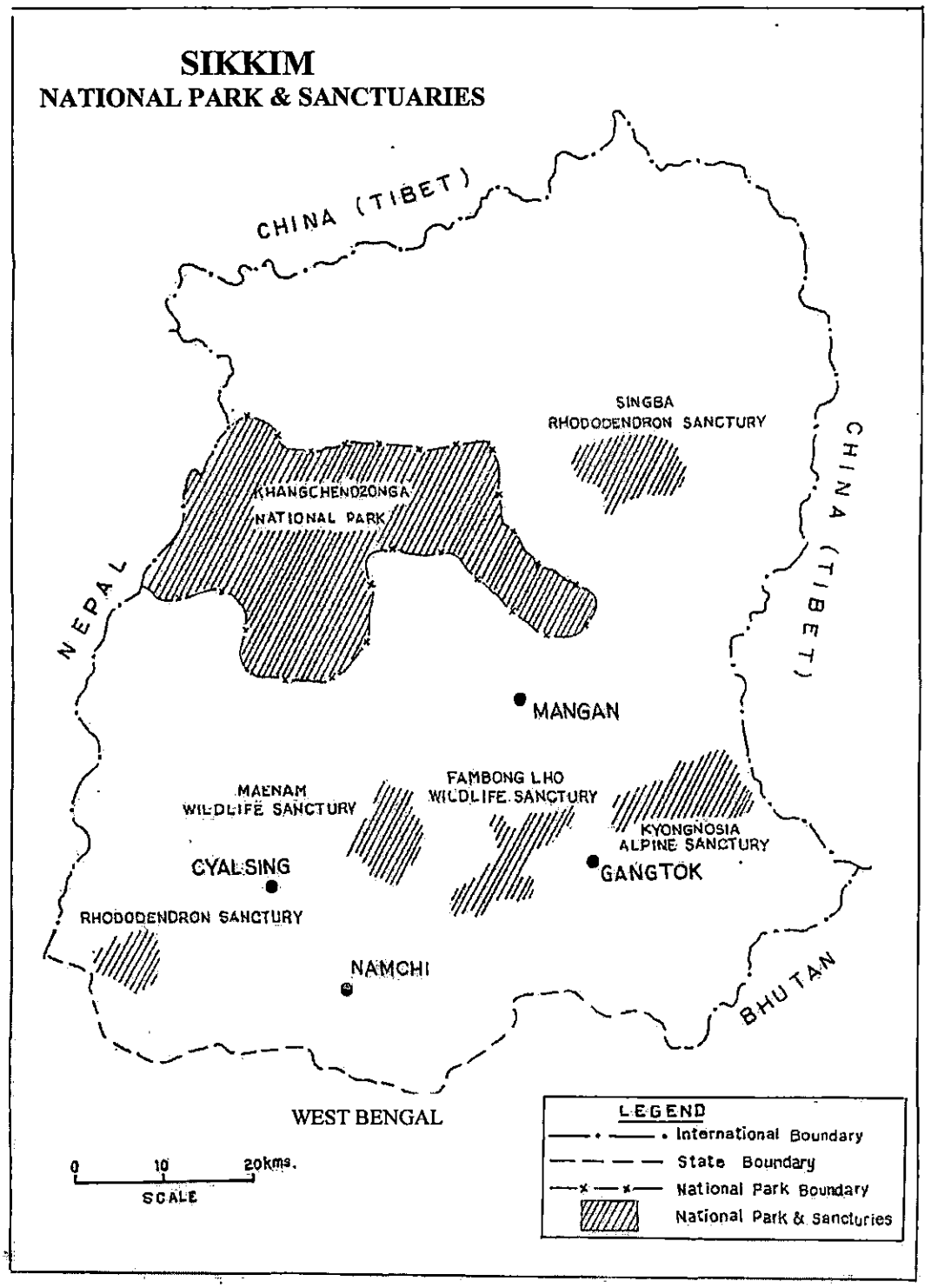
Sl. No.	Name of Trek Routes	Location	Suitable Month for Trek
1	Monastic Trek	Pemayangtse, Sangacholing, Khechopalri, Dubdi, Sinon, Tashiding, Ralong	March – May / Oct - Dec.
2	Rhododendron Trek	Naya Bazar, Hilley/Soreng Varsey, Dentam,Pemayangtse	March – May
3	Kanchendzonga Trek	Yuksom, Bakhim, Tsokha Dzongri, Thangshing/Bikbari, Zemathang/Chaurigang, Goechala, Rathong Glacier	Mid March – Mid June/Oct – Dec.
4	Coronation Trek	Rumtek, Sang, Rabongla, Tashiding, Yuksam	Oct – Dec.
5	Kasturi Orar Trek	Yuksom, Dzongri, Thangsing Kasturi Orar, Labdong, Sinon Tashiding	Mid March – Mid June/Oct – Dec.

Source: Tourism Department, Govt. of Sikkim

Besides, other trekking routs are:

- Yoksum-Zongri route
- Base Camp-Boktak-Laxmipokhari-Garakhet Trek
- Phalut-Singelila-Chiwabhanjang route.
- Hiley-Varsey-Chiwabhanjang route.
- Yoksum-Zongri route
- Base Camp-Boktak-Laxmipokhari-Garakhet Trek
- Phalut-Singelila-Chiwabhanjang route.
- Hiley-Varsey-Chiwabhanjang route.
- Damthang-Tendong Trek
- Rabongla to Maenam Bhaledunga trek.
- Tumlong Monastery trek.

Fig. 6.1 National park and wild life sanctuaries



Lachen-Green Lake Trek.

Thangu-Muguthang-Chorten-Nyimala-Green Lake Trek.

Zadong-Donkiala pass-Cholamu Trek.

Phimphu

Taramchu Hotspring.

Lhashar Valley.

TABLE 6.2: SANCTUARIES AND NATIONAL PARK

Sl. No.	Name	Location/District	Area
1	Kanchenzanga National Park	North Sikkim 110 km from Gangtok	850 km^2.
2	Fabong Lho Wildlife Sanctuary	East Sikkim 20 km. from Gangtok	5176 hec.
3	Shingba Rhododendron Sanctuary	North Sikkim 148 km. from Gangtok	32.50 hec.
4	Kyongnosla Alpine Sanctuary	East Sikkim 26 km. from Gangtok	401 hec.
5	Mainam Wildlife Sanctuary	South Sikkim 72 km. from Gangtok	3534 hec.
6	Barsey Rhododendron Sanctuary	-	-

Source-Statistical Profile 2004

6.2.2 National parks and wild life Sanctuaries

Nature has always been the source of sound health and mental peace. In the high mountain range of Sikkim there lies number of National Parks and Wildlife Sanctuaries. (Table 6.2) These places are reserved mainly for the conservation of existing plant and animal kingdom in the region. (Fig 6.1) Varieties of species have been preserved and such places are known as the house of endangered species of flora and fauna reserves. Besides, other eco-tourism potential are underlined below.

a. ***In Situ ex Situ Reserve***

With a view to develop eco-tourism, in situ and ex situ conservation practices have been planned in the ecologically fragile state of Sikkim.

b. ***Cave Eco-destination***

Caves are believed to have been the ancient houses of god and goddess in Sikkim. Each cave is associated with its own history and mythology of ancient Sikkim. The Laring Vigphu in North, Dechhenphu cave in West, Kahdosangphu in West and Pephu cave in South Sikkim are well preserved eco-tourism gift of Sikkim.

c. ***Hot Spring***

Health and medical tourism can be best developed in the hot spring areas located mainly in Yumthang, Ralong, Borong and Phurchachu region.

d. ***Lake Eco-destination***

The lakes in Sikkim have been listed under high, medium and low altitudinal lakes. Except for Changu and Rhenock artificial lake, all other beautiful natural lakes are the potentials of eco-tourism destination in Sikkim.

e. ***Pil grim-Eco-destination***

Monastic tour to Pemayangtse. Rabdentse Ruins, Norbugang, Songachelling, Phodong, Tumlong may be turned into eco-tourist paradise with its rich cultural diversity, these religious and historic forts are the potentials for eco-destination.

f. ***Mountain biking- an alternative eco-destination***

The mountain biking is a popular adventure sports in Sikkim. An alternative and unusual experience in the mountain of Sikkim with modern thrilling mountain motorbike is no less than a motor scooter and SCUBA diving in the beaches.

g. ***White Water Rafting***

The rapids of mighty river namely the Tista and Rangit await for rafting along the rivers in Sikkim. The possible spot, is being opened along the river course at Chungthang, Legship, Mangley and Melli

h. ***Bird, Butterfly and Boundary Eco-destination***

Sikkim houses large variety of birds and butterfly species ranging from tropical to alpine climatic belts. With the opening of trade route with China, the destination Nathula serves as open boundary between India and China.

i. ***Village Tourism***

In order to percolate direct benefit from tourist to local community, village tourism as an eco-tourism destination plays a crucial role. Staying with the local community surrounded by natural elements and shy natured hospitable human behaviour offers an open atmosphere for seeking peace, tranquility and pristine environment.

In developing all such eco-destination, the underlying objective of eco-tourism such as eco-friendly development without destruction, knowledge based socio-cultural exploration and upliftment of backward community and stake holder is feasible in the State of Sikkim.

6.3 ECO TOURISM PRACTICES

As discussed, eco tourism encompasses wide range of natural, traditional, and indigenous tourism products, which help in propagating harmless tourism by benefiting local villagers and stakeholders. A showcase of such ecotourism activity was jointly ventured by Khangchendzonga Conservation Committee, (KCC), Travel Agents Association of Sikkim (TAAS), the Green Circle, G.B.Pant Institute of Himalayan Environment and the ECCOS. During the project period, various trainings were imparted to stake holders and other key players. The activity of NGO, Tourism development association, institutions are engaging themselves for the cause of flourishing eco-tourism in the state. The Government prepares the list of DO's and DONT's and attempts are made to inculcate the principle of eco-tourism in the minds of drivers, travel agents, hoteliers etc.

6.3 .1 Problems

Being a mountainous state, Sikkim's prospects for eco-tourism development must be initiated in accordance with the underlying principle of eco-tourism and sustainable tourism development. The slight deviation and compromise in principles of eco-tourism will result in abrupt natural catastrophic and hazard leading to long-term impact on delicately balanced

eco-system. The constraint and feature of eco-tourism destination are discussed below.

- Most of the trekking eco-destination have been under constant ecological disturbances due to already developed trekking routes and its guidelines.
- The wildlife, national parks, bird sanctuary, bio-diversity parks are in the initial stage of conservation and no immediate response from tourist is expected.
- Village tourism may help percolate direct economic benefit to the villager, but it needs meticulous attention to check socio-cultural pollution of the host society.
- Mountain biking, skiing, ice-skating may encourage adventure tourism, however, there lies every possibility of alpine pollution.
- It takes time in inculcating the principle of eco-tourism among the local people, tourists, stakeholder and players.
- Sikkim gets domestic, low to medium budget tourists. Hence, eco-destination may cost them high. It may therefore discourage domestic tourists.
- Trekkings are always associated with rampant tempering and cutting of wood for firewood by poachers.

  Despite of all such problems tourism if managed well may boost Sikkim's economy in close harmony with man and nature.

6.4 ECO-TOURISM AS A TOOL OF SUSTAINABLE DEVELOPMENT

Survey reports over crowding of vehicle at Changu, Baba Mandir and Pelling with the problem of parking, waste management and pollution.
In such places, sustainability is the powerful answer to all environmental degradation in the destinations.

Sustainable development may be regarded as a philosophy, a plan or strategy or a product. It is defined by the Brundtland Commission as 'development that meets the needs of the present without compromising the

ability of future generations to meet their own needs' (World Commission on Environment and Development 1987).

According to Wood (1993), sustainable development has received widespread support because it appeared that sustainable development was an idea whose time had come, reflecting a convergence of scientific knowledge, economics, socio-political activity and environmental realities that would guide human development into the twenty-first century These have been articulated by any number of national and international ag ncies and organizations, and typically embrace components of:

- Conservation and enhancement of ecological processed.
- Protection of biological diversity
- Equity within and between generations.
- Integration of environmental, social and economic considerations. (Wahab ,Pigram ,1997)

In Sikkim Himalayas, immediate application of sustainable development principles acts as a tool for environmental conservation and minimizes destruction. In the steep relief, the level and rate of development must be balanced with the rate of ecological destination. The process of sustainability involves application of concept of carrying capacity and destination management followed by the process of impact assessment and management plants.

6.5 CARRYING CAPACITY

According to WTO carrying capacity is "the level of visitor which an area can accommodate with high levels of satisfaction of visitors and few impacts on resources". According of Mc Intyre, carrying Capacity is "the maximum use of any site without causing negative effects on the resources, reducing visitors satisfaction, or existing adverse impact upon the society, economy and culture of the area". In general it is the process by which maximum number of people visit the destination causing minimum number of harm and defacement. The development of tourism products within the limit of its load bearing capacity is also referred as sustainable way of development.

The application of carrying capacity leads to sustainable development of tourism as it restricts to the unbearable and unwanted growth of a destination. For example in Changu and Pelling limited number of vehicles set by prescribed norms only will be permitted to enter the destination. Further, construction of hotels will also be restricted to estimated numbers specified by the law of Carrying Capacity. As a result, minimum environment degraded is caused in the host region.

The first step involved the process of achieving carrying capacity is Environment Impact Assessment (EIA). According to Goverdhan (1993) "EIA is basically concerned with identification and assessing the environmental consequences of development projects, plants, programmes and policies and attempt to ensure that the best alternative for development is selected" (Batta, 2000)

It is an assessment of prevailing environmental condition, its cost and benefit, impact and management plan of a proposed project area. Identification and evaluation of element of environment is carried out by making mandatory to prepare EIA before the project is initiated.

In tourism development plans, such as construction of airports etc EIA must be prepared and environmental clearance must be obtained from the Ministry of Environment, Govt. of India. Similarly, in Sikkim EIA is prepared for Hydro-power Projects and proposed airport. As a result, minimum environment is degraded.

CONCLUSION

In the hilly area like Sikkim, development of tourism industry is closely associated with environmental degradation and it is seen that large number tourists infrastructure are knocking Governments door for clearance of projects. It is a fact that major industries from Mumbai and Delhi were shifted from its core location. There have been instances where people are putting injunctions in the recently opened up industries. Due to pollution, erosion and constructional activities, large ranges of microorganisms are killed mercilessly. Besides, there is use of bio non-degradable waste generation

and problem of waste disposal, a problem which remained. unsolved for centuries.

It is proved that rate of urbanization is rapid and growth of towns is taking place haphazardly. This unplanned vertical and horizontal growth of urban structure has resulted massive environmental problems like drainage, congestion, traffic and solid waste. All this in turn may result in health hazards and serious outbreak of influenza and diseases. The hotel complexes in Sikkim generate massive amount of garbage and there is no recycling process involved so far.

The concentration of population has led to various problems in the town and cities in Sikkim such as garbage disposal, lack of drinking water, lack of space, expansive transport and communication, pollution (noise, land, water, air and vehicular) improper sewage treatment, poor drainage system, lack of electricity, law and order and irregular electricity.

Gangtok town has been suffering from traffic congestion, drainage, sewage treatment and solid waste management. As a result waste generation is high and environmental degradation is resulting in the form of sudden outbreak of waterborne diseases and stress and respiratory diseases.

Due to alarming increase of human activities towards utilization of natural resources, the per capita consumption of natural resources has increased by manifold. The rate of increase in population is faster than rate of increase in forest area. It is estimated that nearly 89 percent of population inhabit rural area and they bank heavily upon natural resources. The livelihood of rural poor are earned from existing natural resources. The pressure on agriculture land is excessive, shortage of food grain is seen everywhere. People primarily depend on agriculture and forest for their livelihood and growth of infrastructure to accommodate tourists may harm surrounding environment on the whole. On the other hand, tourism growth is greater than its carrying capacity. An attempt therefore has been initiated in the next chapter to elucidate recommendations for the planners and decision makers as a guideline and eye opener for the redressal of various environmental predicaments.

CHAPTER - VII

SUMMARY AND CONCLUSION

Sikkim, a tiny mountainous state lies in the biodiversity hotspot of Eastern Himalayas. Since 1975 rapid developmental activities started and face of the mountain gradually changed to give the present landscape. The lifeline of state is its strong natural resources. The economy of Sikkim revolves around the productivity derived from agriculture sector. Industry whether small or large scale is virtually insignificant due to non-availability of suitable land, cheap labour and market. The traditional way of human interaction with the environment is clearly noticed in the context of Sikkim. More than 70% population still directly bank upon forest and natural vegetation for their livelihood.

The Sikkim Himalayas form a contiguous part of prominent mountainous region threatened with severity of ecological disaster. The high hills are gradually nurtured destroyed for human need. The negative effects of development are threatening terrestrial and aquatic life. The catastrophes such as landslides, hailstorm, erosion, are common across the length and breadth of the state. Sikkim is a consumer state and population is growing at faster rate. As a result solid waste management, basic amenities remain as an unmet challenge before the planner. The emphasis on development planning under- went a major shift between the year 1975-2004.In the seventies the stress was mainly on industrialization to achieve rapid economic growth. Recent development efforts in Sikkim have been designed for improving living conditions and infrastructure development. Very small habitable space in Sikkim is left open and untouched by human activities. However, there is regional disparity and inequality in economic growth pattern. The development is lopsided, such problems are common everywhere due to feasibility predicament.

Agricultural land is limited to narrow; rugged mountain and alpine climate discourage cultivation. The compact form of settlement is seen in the lower belt especially in the towns and agricultural fertile areas. However, harsh climatic areas are devoid of human population. The length of road is extended; as a result, growth and development of administration and urban centers are taking place in the villages. The block development offices are being constructed in almost all the 32 constituencies in Sikkim. Around these administrative centers, other amenities facilities have been coming up rapidly. Over and above there exist a symbiotic relationship between nature and men. Man being the most intelligent animal and technologically most advanced, tries to make use of the environmental resources for his personal gain. In doing so, man affects and modifies the environment and thus environmental conditions are changed by human activities. When the environmental changes brought in by man exceeds the critical limit then the environmental degradation starts.

The pioneer study on environmental degradation and impact of tourism in Sikkim depicted significant findings and generated enthusiasm and scope for further work in the same line. The brief highlights of major findings, discussed in the foregoing chapters are being briefly summarized herewith.

In chapter one aspect of history and geography has been dealt with, where short history of Sikkim and its physical features including flora, fauna, natural wealth are given due importance. The relief, drainage, mountains, vegetation, soil, glaciers, cave, lakes, and biodiversity etc. have been given equal weightage in describing physical feature of Sikkim Himalayas. This chapter makes reader familiar with natural wealth of Sikkim.

In chapter two population characteristics and socio-economic features ranging from migration, growth, distribution of population, literacy, educational standard, religion, ethnic composition, workforce, per-capita income, domestic products, food habit, health scenario, land use, agriculture, horticulture animal husbandry, livestock etc. have been discussed in detail. Attempt has been made to relate and correlate each parameter with states of environmental condition in Sikkim. It is revealed from the study that there is a constant

increase in population followed by education, agriculture and health infrastructure. In each parameter, infrastructure-building activities are taking place. Such developmental activities have encouraged people to migrate from primary to secondary and tertiary sectors. As a result, occupation structure has changed in the locality. The infrastructure development has also led to cutting of earth, removal of vegetation and invited natural calamities like land slide, erosion in the Sikkim Himalayas.

Environment is the only thing Sikkim can loose either in the name of tourism or infrastructure development. Two things are certain in Sikkim firstly tourism growth and secondly growth of urban centers and human population. At this juncture stress on environment due to pressure on ecosystem and ecological imbalance is bound to take place. Though Sikkim has nearly 46 percent of area under forest, virgin landscape, un scaled mountains, perpetual glaciers, abundant flower and plants, untouched, unpolluted and crystal clear water bodies; transparent atmosphere to delight soul, body, mind and human heart, yet there lies unlimited material need and greed to be obtained from resources. Easy earning at the cost of ecosystem and tendency to grab natural wealth for personal satisfaction found prevailing in the study area. This cruel action of human mind against nature needs to be replaced by kind heart to save the environment from further bleeding.

Chapter three is devoted for highlighting the major tourist destinations in Sikkim. where all the places of tourist destinations are discussed at length. From the write up, it is revealed that most of the tourist destinations are located in higher altitudes. The destinations Gurudongmar, Dzongri, Nathula, Thangu, Changu, Memenchu, Yumthang lie above 2438.28m from the mean sea level. At this Alpine climate, precious medicinal plants and high value flora and fauna co-exist. Trekking to Green Lake, Dzongri and other peaks in Sikkim also take place at high alpine regions. Besides Mt. Sinolchu, Kabru, Johsang, Tent peak, Singalilia range, Chola range lie above 2743.06m from the MSL. The Maenam and Tendong peak. Rhododendron of Barsey, Sinchor of Uttaray and wild life and National Parks lie in the elevated regions of Sikkim Himalayas. All these hotspots have been the playground for various tourist

activities. Therefore there exist every reason to be alert on environment front and embark on construction strategies to save world's few left over biodiversity resource of Sikkim Himalayas.

Chapter four throws lights on various active agents contributing to environmental degradation. The major actors in degradations are discussed in detail. Deforestation due to diversion of forestland for construction of infrastructure like road, power plant and buildings, followed by high dependency ratio on forest for fodder and fuel is prominent. Further, plucking of flowers and plants from the trek route with some instances of bio-piracy have been recorded. In the process of hydropower development, dams, bridge, roads and horizontal concrete colonies have replaced large agriculture and forestlands. In the dam site, blasting explosions have led to crack and joint development and water sources have been drying up day by day. The Government of Sikkim has declared the areas along the roadside extending from Rangpo to Ranipool as Industrial area. Hence various industries such a CIPLA INDIA LTD, PIPES, POLYMER, INK etc have been setup. These industries are not only polluting the surrounding environment but also generating unmanageable non-degradable solid waste. As a result entire area in the vicinity have remained unfit for agriculture etc. Further population and rate of urbanization has been growing up rapidly. The growth of tourism along the roads and villages has resulted in landuse change duly affecting the agriculture and cropping system. Mining activities in the selected areas have further led to land degradation thereby misbalancing the existing ecosystem. Though steps have been taken by the state Government to combat environmental pollution yet growing numbers of vehicles have resulted in air, noise, and land pollution.

In chapter five various impact of tourism has been discussed. Wherein it is revealed that economic benefit in the form of increase in per-capita income and employment generation is discussed in respect of multiplier effect. The direct and indirect benefit from tourism services helps penetrate income towards grass root level. Secondly socio-cultural impact showed negative aspects, wherein cross culturisation sometimes tend to invade local

culture, cuisine and costume. It is witnessed that in the wake of tourism influx there is a constant erosion of tradition, dress pattern and food habit. In toto, negative impacts on host society in greater than positive impacts. Thirdly tourism development is seen parallel to destruction. Wherever there is tourist activity some kind of environmental pollution is noticed. However with the strong political will the concept of sustainable development by introducing environmental impact assessment. carrying capacity and destination management have been introduced in the sphere of developmental activities. Hence, the hilly state may achieve eco-tourism growth in future. In this chapter findings of field survey have also been incorporated to analyse the level trend and magnitude of impact of tourism on environment, economy society and culture. The behavioral attitudes of visitors have been highlighted to understand their level of environment consciousness.

In chapter six, mention has been made on prospects of eco-tourism in Sikkim. It is perceived that Sikkim has every potentiality to grow as eco-tourism capital of India. If the concept of sustainability, carrying capacity and Environmental Impact Assessment is practiced in toto tourism can sustain in the long run. The eco-tourism destinations have also been identified and described at length.

Finally in chapter seventh, brief description of overall findings have been underlined by highlighting the measures taken by the Government towards balancing dichotomy of tourism and environment. The writing of the thesis has been put to an end by pointing out some suggestions and recommendation in the conclusion.

RECOMMENDATIONS

The Western developed world has enough of material wealth but scarcity of spiritual wealth. Spiritually the west is depriving the most. In the wake of globalization and consumerism the custom, tradition, folklore, supernatural power, rituals festivals, meditation, enlightenment etc. have been vanished form the western land. Where as Sikkim reserves virgin nature and unspoit beauty any grandeur of mountain ranges, folklore, custom and rituals.

It is this aspect which entices foreign tourists to pour into small but beautiful Sikkim. This place is often compared with Swiss of the East. Many tourists do not imagine Sikkim to be so beautiful and they get wholly absorbed with local tradition and manifest by wearing local dress, eating traditional food and enjoying the multi-community and cross cultural syncretism.

Further steps must be ensured by the government, local bodies, NGOs developers. operators. suppliers. visitors, local communities and all players to strike a balance between tourism growth and socio-cultural, economic and environmental degradation. The recommendation is discussed in the following paragraphs in different headings.

A. SOCIO-CULTURE

1. Cultural heritage center displaying community wise dress, pattern, rituals, religion, tradition folklore, dance, music, language, food habits, script, with a tourist village would be essential to set up. Excursion to these centers may help students and youths to get along with their cultural ethos.
2. Fair and festivals displaying rich cultural diversity must be organized annually so as to familiarize ethnic culture locally.
3. Encouragement and incentives to rural folk of remote areas towards preservation of their cultural and natural heritage. Training may be organized for such people in the state museum, art galleries and community centers.
4. Light and sound shows at night at Gangtok, Namchi, Rabdantse, and Yuksam may further enhance symbolic tourist activities.
5. Establishment of artifact, museum, art gallery and interpretation centers.
6. Awareness camps and incentives for youths to promote and preserve their culture and tradition and display such antique items frequently.

7. Restoration of historic and religious institutions, architectural façade and save them from pollution, decay and destruction.
8. Monastic tourist circuit may be planned out to cater the needs of religious tourists.
9. Gorkha, Bhutan war, Hooker trial and silk route may be explored as trek and trial route, as it is historically significant.
10. Traditional styled wooden building needs to be preserved and constructed with a view to maintain aesthetic beauty.
11. Local craft, sculpture, painting, play, music, dance should be encouraged and exhibited.
12. Tourism promotional fairs must be organized to put offbeat tourism.

B. ENVIRONMENT

1. Resource mapping and carrying capacity of all the tourist destinations must be done before the development project is initiated.
2. Enforcement of eco-tourism principles must be made mandatory to all the players in tourism industry.
3. Feasibility report, environmental impact assessment and environment management plans must be drawn in advance.
4. The infrastructure development such as road, hotels, *yatri niwas*, and wayside amenities should be constructed in harmony with nature.
5. Awareness to stake holders and local community in various field of environment and socio-cultural impact should be extended.
6. In order to combat vehicular pollution a "Yatayat Nagar" would be ideal to be established 5-10 km away from the main town. Shopping centers should be free from traffic congestion, however light vehicles may be permitted.

Besides, planting of flowers and trees may be encouraged further to achieve green roads.

7. Movement of stray dog and animals should be prohibited in residential and town areas.
8. Trekkers and mountaineers should be informed to follow the prescribed code and everyone should be legally binded .
9. Permits to trekkers should be awarded on the basis of carrying capacities of the trekking area and strict vigilance and monitoring should be done to avoid congestion in geologically weak plates.
10 The growth of super structure and building construction must be checked and permission may be granted as per the geological/geographical/environmental report. Sikkim falls under seismically active Himalayan zone, hence wooden structure should replace the concrete structure.
11. Development of off season crops, floriculture, sericulture, medicinal plants, should be encouraged and support price may be granted to the farmer/growers.
12 Special care must be paid to protect threatened and endangered species of flora and fauna.
13. Need of reduction in the use of ecologically unfriendly substances such as CFC, asbestos, pesticides, toxic, infections, explosive and flammable items.
13. Workshop and training should be imparted to mountaineers/ trekkers with guidelines, code and ethics to be followed during the course of trek/tour.
14. Solid waste, garbage disposal and amenities should be provided in the entire tourist destinations.
15. Tourist taxi drivers spend maximum time with the tourists, they are sometimes called the *ambassadors on wheel* but they often mislead tourists. Therefore, lessons on value driving, moral and ethics must be taught to them.

16. Skiing, hang gliding, horse riding, yak riding, water sports, camping must be introduced.
17. Harnessing water, wind and solar energy and replacement of firewood by LPG, kerosene should be encouraged further.
18. Dry lakes should be artificially devoted for boating and adventure sports and ecology around the lakes may be preserved.
19. Water sports, adventure sports skiing, hang gliding, yak driving, horse riding and golf course should be promoted.
20. Environment auditing concept should be introduced in every matter related to environment.
21. Compulsory environmental education including forest, wildlife, cultural, heritage etc. at school level should be started with proper curriculum.
22. The state should be regarded "environmentally/ecologically fragile protected zone" in Sikkim.
23. Environmental impact assessment, management plan and catchments area treatment plan for all the development projects may be made mandatory. The environment impact assessment and the environment management plan should be carried out extensively.
24. The legislative ban on the use of non-biodegradable materials like plastic, polybags etc. have not been enforced in toto. Measures should be initiated in implementing such praiseworthy rules.
25. The offices and institutions should be aesthetically and environmentally sound, it may be achieved by greening the available space.
26. Minimum diversion of forests land for non-forestry purposes and compensatory afforestation schemes should be the priority of forest managers.

27. Initiation of afforestation may help reduce biotic stress on natural forests. Enforcement of laws and regulations for integrated development is essential.
28. Protection, conservation and development of medicinal plants, herbs and other non-timber forest produce, bamboos, herbal gardens etc. may be initiated at grassroots level.
29. The herbal gardens, smriti vans created at 166-gram Panchayat units need further improvement and encouragement.
30. Special emphasis on public relations, publicity, extension and awareness as well grievances relating to environment needs to be made access to public in general and NGOs in particular.
31. The attempts of state Government to eliminate use of agro-chemicals and make Sikkim an "Organic State" need further acceleration.
32. Department of ecclesiastical and culture and heritage should be partners in promoting and preserving cultural heritage, temples, monasteries and other religious centers of socio-cultural importance.

C. OTHER RECOMMENDATION

- Health Resort in the hot spring areas at Ralong, Borong and Yumthang along with massage, herbal treatment and traditional disease healer, local ethnic food would help be beneficial in many ways.
- Establishment of 5 star hotels, spa and resort for high spending tourists may enhance economy of this region.
- Need is felt in setting up of banquet hall and conference halls for educational, conference, and industrial tourists. Highly reputed Institutions may hold training, seminars and out door training.

- Provision of radio transmitting station, weather forecasting and natural calamities readressal forum for quick delivery mechanism help minimize eco disaster.
- Introduction of yoga, meditation, spiritual activities with herbal knowledge and first aid with the help of a trained teacher. Practical session on use of herbal medicine may help preserve existing herbal wealth.
- Fair and festival displaying variety of socio cultural component must be held annually, as it helps in realizing the importance of inter cultural richness.
- Tourism promotional fairs must be introduced to cater the need of deluxe tourists for economic gains.
- All the developmental activities should be carried out only after examining thorough report of social, environmental and physical carrying capacity of project site.
- Awareness programme on socio-cultural values, fairs and festivals, tradition and culture, flora and fauna ,and sustainable eco-tourism must be inculcated into the minds of local people, visitors and players.
- Human resource development must not be undermined, all the existing manpower should be given refresher course towards enlightening themselves in sensitive tourism business.
- Tourist stroll late night, there are discos beating and bread eating till midnight. Hence, proper protection measures should be ensured.
- Organize workshop, seminars, symposiums, Congress and trainings of national and international standard.
- Research and development must be encouraged so that impact analyses and achievement assessment go hand in hand.

- Local small-scale industry like food processing, honey, craft making, woodcarving, and herbal treatment should be encouraged.
- In tourist activity, reward and punishment with award should be declared for motivation and bringing about sense of betterment and fair play through competition.
- Alternate highway a project in the pipeline must be realized as soon as possible so as to minimize traffic congestion and the present 31 NH should only be used as one-way traffic.
- Airport, a project in pipeline should be completed in time in order to achieve and attract quality tourists.
- Off-season tourism should be promoted by introducing festivals, sports and exhibition events.
- Sikkim or Gangtok should have a brand name like Jaipur is known as pink city.
- Ethnic cuisine should be made available in the restaurants.
- Hygiene and cleanliness in hotels and restaurants should be regularly monitored to ensure environmental safety.
- Price hike during peak season should be controlled administratively, in order to protect the interest of local population.
- Ropeway, chair lift should replace road connectivity in ecologically fragile areas.
- Golf course, cave tourism, bird watching help generate off-season tourists.
- Botanical gardens, zoological parks with herbarium set up may attract educationist, students and researchers. So in technical and agriculture, floriculture, horticulture institutions, laboratory should be instituted for research

work with the provision of all varieties of flora fauna and endangered species.

- Museum, art gallery, painting and natural history museum is a must for cultural tourists.
- Mountain safari in wildlife sanctuaries with guidelines and code should be initiated and implemented as soon as possible.
- Permit system should be made access through single window, as it helps in discouraging hawker and brokers.
- Behaviour of divers in motor syndicate and guidelines for hoteliers should be tourist oriented.
- The influx of foreign tourists especially harbingers of fresh culture 'Hippies' may alter cross-cultural fabric of local community. So impact awareness camps should be held regularly.
- Establishment of an international tourism research institute and opening of chapter of IITTM is a must.
- Passing of bed remarks by using filthy words and derogatory remarks to low budget tourist should be checked and defaulters should be dealt with seriously. It helps in correcting individual behaviour and responsibility.
- Pollution abetment strategies should be applied with strict reinforcement of laws governing environment protection.
- Application of reuse, recycle and refuge of solid waste and waste utilization programme is need of the hour.
- Taxing and pricing for producing hardest substances.
- Grass root political involvement of Panchayats needs further strengthen in the field.
- Long term planning with blue print of development may help in achieving sustainable development.

- Involvement of NGOs. clubs and local stakeholders in the process of development.
- Bioremediation and biotechnological method of conservation may be adopted.
- Conservation of nature by controlling soil erosion, landslide, watershed etc. is an urgent task before the Government.
- Diversion of tourist from concentration in Gangtok to other peripheral area for regional growth is the solution to minimize environment problems and maximize economic benefit.

CONCLUSION

The recent growth of tourism in Sikkim is controlled by two main factors firstly Sikkim offers peaceful atmosphere free from militancy, insurgency, strikes and political turmoil. Secondly diversion of tourist traffic from Kashmir and Katmandu, owing to risk of life and prevailing instability and insurgencies. The importance of Eastern Himalayas have held fascination for mankind ever since exotic nature stood up as an element of human interest. If Swiss became playground of Europe, Darjeeling since 1835 served as sanatorium for hot and fever stricken British from Kolkata, the then British Capital, Sikkim Himalayas will surely be the Alps of the East. After the advent of mass and social tourism, some tourist slipped off their way to explore virgin Himalayan kingdom of Sikkim. The Mt. Kanchendzonga the guardian deity of Sikkim was first ever ascended in the year 1955 and 1977 respectively. However the climbers had to remain 2 m below the summit as a mark of respect and to uphold the sacredness and Sanctity. It was after Sikkim's merger with Indian Union in 1975, massive infrastructure beefed up and paved the way for tourism development. As a result sudden unplanned and haphazard booming of concerts and population took place. The construction of schools, hospital, roads, offices encouraged rural-urban migration and large number of people were employed in Gangtok and other districts of Sikkim. The influential

Sikkimese people became access to Delhi, Kolkata, Mumbai and other metropolis and imitated similar building design, which they copied and pasted in the ecologically fragile state of Sikkim. During this period steep slope and seismically sensitive earth strata experienced the birth pain of six to seven story concrete dwelling houses. Those tall buildings became the business hub and center of attraction and status symbol for the elite and privilege section of society. With the growth of egoistic population, competition of concretization inflicted adversely into the minds of affluent people in the nook and corner of the state. Thus tradition of materialistic fulfillment became the heritage and legacy in Sikkim. Through passage of time landscape of Gangtok, Pelling, Namchi witnessed *matchbox civilization*, with the erection of multistory buildings. The compact and congested buildings leave no space for air circulation, park, gardens, grounds etc. The Department of Urban Development and the then Gangtok Municipal Corporation remained like a dead man and mother nature was murdered, defaced and raped mercilessly. The process of erection of buildings further multiplied with multiplying number of tourists and like a cancer it proliferated towards the remote villages as well.

With the available housing loan schemes floated by various banks the process of concretization and cementisation because an unending process. The ultimate result ended up with the fact that the influential people of society so-called owners and landlords amassed massive wealth from their tenants. Even today Sikkimese mindset has remained static; people are displaying their material wealth by erecting sky crappers and putting their lives in danger of natural calamities.

Irrespective of rock strength, contour, landslide, fragile and sensitive ecosystem, road connectivity touched the highest upto Gurudongmar (5790.91m), Nathula (4266.99m) Dzongu, Yumthang, Karzee etc. with blacktop at the cost of greeneries. Forest bungalows, rest house, and offices have been constructed in the alpine mountainous topography mainly in Gnathang, Ravangla, Thangu, Muguthang, Lachen, Yumthang etc. In the water sources, bamboo nallas are replaced by concrete tanks and steel pipes. Besides, the man and animal paths (village cart road) in the countryside are

replaced by concrete flooring and natural lakes are encircled by cemented footpath. In this way, the process of concretization and cementisation affected major portion of lithosphere in Sikkim. This has not only disturbed and degraded ecology but also jeopardized the life of flora, fauna and human beings. As a result water sources are drying up, deforestation, land, soil, water, soil and noise pollution are looming in the atmosphere. Landslide, soil erosion and rural transformation are prevalent everywhere. Vehicular growth further aggravated the problem and hydropower projects are inviting another sudden catastrophic. Besides industry, mining activity and impact of westernization, modernization, and globalisation have eroded natural and cultural wealth of Sikkim. The government has been successful in organizing festivals and opening cultural centers for various communities in Sikkim. Traditional *melas* and exhibitions are organized to awake and aware the local community.

While pondering into the steps taken by Government towards achieving sustainable balance growth, it can be said that: though its lately realised for restoration of environmental impact yet its not too late to initiate rapid recovery process. Through democratic decentralization, gram panchayats have been empowered to create and maintain smritivan, social forestry and herbal garden in each gram panchayat units. Accordingly water source development and green roads plans are carried out by the panchayats in the villages.

Furthermore students, teacher, police, individuals, community, clubs, NGOs have been involved for the cause of better environment. Massive awareness campaigns are carried out at the grass route and there exist a great political will to save environment. Therefore if proper check and balance is guaranted Sikkim will remain environmentally healthy for future.

GLOSSARY

Bakkhu,Daura suruwal,*chaubandi choli* - Traditional dress of Sikkimese Nepali people.

Bhatkhauni - An auspicious day when a child is first ever feeded with hard food with vigor as per rituals.

Biri - like cigarette, locally made tobacco.

Dhan naach - Traditional dance of Limboo community in Sikkim.

DOMG -Dept. of mines and Geology.

Gumpa -Buddhist monastery

Jhankri,Bijuwa,Dhami - Like a priest who is believed to be the healer of illness.

Jharphuk -Process by which disease and illness is cured by the Jhankri.

Kharane,kattus,malato,okhar - Name of tree species.

Kulpitri -Rituals observed in the name of person after death.

Kuse aunse,Basant panchami - Hindu festivals.

Matchbox civilization - pseudo civilization where vertical tall buildings constructed without architectural design and art (used by author himself).

Panglab sol,Lhorum fat, Dasai, Dewal i- Religious festivals of Sikkimese people.

Rodhi -Celeberation amongst Gurung community of Sikkim.

Sansari, Devithan, Mahadevthan, Deorali - Religious places of nature worshipper.

Sinki,sukako masu,kinema - fermanted food.

SPCB -State Pollution Control Board.

Yatri niwas - A small house as halt for tourists.

Pandal -Place where idol of god and goddess are kept for puja

Tika -Colourful, rice mixed ingredients put over forehead during Dasai festival in Sikkim.

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APPENDICES

APPENDIX I. RIVERS IN SIKKIM

1	Teesta River	37	Riyong Khola	73	Sema Chu
2	Rangeet River	38	Bhari Khola	74	Sevo Chu
3	Takcham Chu	39	Meyong Khola	75	Zema Chu
4	Ramphu Chu	40	Prekchu	76	Chholam Chu
5	Aho Khola	41	Raman Khola	77	Lhonak Chu
6	Andheri Khola	42	Song Khola	78	Naku Chu
7	Lachen Chu	43	Pabong Khola	79	Lhora Chu
8	Lachung Chu	44	Yalichu	80	Lungura Chu
9	Rathang Chu	45	Reshi Chu	81	Goma Chu
10	Dikling Khola	46	Kanaki	82	Thomp
11	Rongli Khola	47	Hee Khola	83	Poke Chu
12	Dichu	48	Dentam Khola	84	Burung Chu
13	Pachey Khola	49	Sangya Khola	85	Gyamthang Chu
14	Rongni Chu	50	Manpur Khola	86	Kalep Chu
15	Roro Chu	51	Rolu Khola	87	Lasha Chu
16	Lungze Chu	52	Rab Khola	88	Tholang Chu
17	Biju Chu	53	Seti Khola	89	Ringphi Chu
18	Rate Chu	54	Rabong Khola	90	Umram Chu
19	Bakcha Chu	55	Kaliz Khola	91	Rubel Chu
20	Resh Chu	56	Rakel Chu	92	Phensang Chu
21	Dick Chu	57	Talung Chu	93	Ratey Chu
22	Reshi Chu	58	Ringi Chu	94	Rangrang Chu
23	Chakung Chu	59	Rahi Chu	95	Rangchang Chu
24	Ongchu	60	Rongnek Chu	96	Q Khola
25	Rum Chu	61	Rong Chu	97	Martam Khola
26	Monmu Chu	62	Gangtok Chu	98	Neem Khola
27	Rang Phap Chu	63	Khedum Chu	99	Chokchurang Chu
28	Ramphu Chu	64	Byangya Chu	100	Yangsha Chu
29	Rangyong Chu	65	Bitchu Chu	101	Chil Khola
30	Kayam Chu	66	Chyakum Chu	102	Bareli Khola
31	Relli Chu	67	Yumthang Chu	103	Khani Khola(Melli)
32	Rothak Chu	68	Damang Chu		Any other river that may
33	Reshi Chu	69	Berung Chu		be included by the Govt.

Source-Statistical profile, 2004-05

APPENDIX II HIGH ALTITUDE LAKES OF SIKKIM (DISTRICTWISE)

Lakes in East district	Importance
Batang Chho	Water source for wildlife and habitat of avifauna
Lam Pokhari	Migratory birds and wildlife
Doka Chho	Wildlife habitat
Jyelap Chho	Rich with ground flora
No name	Wildlife habitat
Chho Nempo	Wildlife and avifauna
Tso Nam	Peculiar plant diversity
Jelep Tso	Wildlife and habitat of water fowls
Serathang lake	Domestic use
Men moi Tso	Tourism, Fishery, source of water supply for the down stream village and religious.
Cham Tso	Religious
Namang Lake	Water source for wildlife
Bhewsa Tso	Wildlife and rich vegetation
Anda Lake	Domestic use
No Name	Wildlife habitat
Chhangu Lake	Tourism and alpine flower
No Name	Wildlife habitat
Naku Chok Tso	Wildlife and religious
Harh Pokhari	Wildlife habitat
Mayur Pokhari	Wildlife and migratory birds
Nimyetso	Water source for wildlife
Gyantsona	Wildlife and rich vegetation
Chhokhya Tso	Rich vegetation diversity
No name	Wildlife habitat
Jor Pokhari	Wildlife and avifauna
Uor Pokhari	Wildlife habitat
No name	Wildlife and medicinal plant
Pangla Tso	High diversity of vegetation
Laba Chho	Wildlife habitat
Bidang Chho	Wildlife and medicinal plant
Chho Sum	Wildlife habitat
Chumalari Lake	Religious and natural beauty
Tso Ngophekuk	Wildlife habitat
Thosa Lake	Wildlife and avifauna
No name	Water source for wildlife
Lakes in West district	
No name	Wildlife habitat
Tam Pokhari	Wildlife habitat

Lacchimi Pokhari	Religious and natural flower
Tsokha	Wildlife and vegetation
Khangla Chho	Medicinal plant and panoramic beauty
Lam Pokhari	Wildlife and Primula flower
Dhaph YamTso	Wildlife habitat and migratory birds
Samiti Lake	Religious and natural flower
Dang Lake	Wildlife habitat
Kabrlam Tso	Wildlife habitat
Khangla Khang Tso	Wildlife habitat and migratory birds
Sungmoteng Tso	Wildlife habitat
Lakes in North district	
Tso Kimze Tsal	Wildlife habitat
No name	Wildlife habitat
Makang Tso	Wildlife habitat and serene view
Rahi Tso	Wildlife habitat
No name	Wildlife habitat
Pamelha Tso	Religious
No name	Wildlife habitat
Singo Chho	Wildlife habitat
Jaha Jheel	Rich vegetation
No name	Wildlife habitat
Tebleh Tso	Wildlife and migratory birds
Gochung Lake	Wildlife habitat and religious
No name	Wildlife habitat
Rabomthang Tso	Wildlife habitat and medicinal plant
No name	Alpine beauty
Lamgepui Tso	Wildlife habitat
No name	Avifaunal diversity
Muleting Tso	Religious and medicinal plant
Mule Tuk Tso	Wildlife habitat
Green Lake	Tourism and alpine flower
Neml Peam Tso	Religious and natural beauty
No name	Wildlife habitat
Phuring Chho	Religious
No name	Wildlife habitat
Phethung Lake	Wildlife habitat
Goma Sechen	Wildlife and alpine vegetation
Lhonak Chho	Religious and wildlife
Tso Chik	Source of water for wildlife
No name	Wildlife habitat
Khoraphu Tso	Primula Flower and natural beauty

Ghora Tso	Wildlife and diversity of vegetation
Chhora Chhobuk	Wildlife and religious
Tso Chhobek	Wildlife habitat
Kale Pokhari	Religious
Dud Pokhari	Religious
Bhut Pokhari	Religious
No name	Wildlife habitat
Thang Chho	Wildlife habitat
No name	Glacial beauty
Choman Khang Tso	Wildlife habitat
Banshila Jheel	Religious
Nake Tso	Wildlife and religious
No name	Wildlife habitat
Potela Jheel	Wildlife habitat and religious
No name	Wildlife habitat and alpine vegetation
Theuchung Tso	Religious and migratory birds
No name	Wildlife habitat
Gey Chho	Religious
Goma Chho	Wildlife and religious
Burum Tso	Wildlife habitat
No name	Wildlife and glacial beauty
Toklungkhang Tso	Wildlife habitat
No name	Wildlife habitat
Chhopo Tso	Wildlife and religious
Chhobakha Chho	Wildlife habitat
No name	Wildlife habitat
Ubasamdong Jheel	Wildlife habitat and religious
No name	Wildlife and alpine rich vegetation
Gorala Jheel	Wildlife habitat
Khang Kyong	Wildlife habitat
Khangse Tso	Wildlife habitat
No name	Wildlife habitat
Lhamo Jheel	Wildlife and religious
No name	Wildlife habitat
Pampila Jheel	Wildlife habitat and religious
No name	Alpine flower
Khang chung Chho	Wildlife habitat
No name	Wildlife habitat
Great Lake	Alpine scenario
No name	Wildlife habitat
Sonlaphya Tso	Religious

Sanglaphi Chho	Religious
Jhetta Jheel	Wildlife habitat
No name	Wildlife habitat
Chholhamo	Wildlife habitat, origin of river Teesta and religious
Jheutha Jheel	Wildlife habitat
No name	Alpine vegetation
Sebu Chho	Glacial and Primula
No name	Wildlife habitat
Mashya Tso	Religious
Thum Tso	Religious
Gurudongmar Tso	Tourism, religious and source of water
Cheora Tso	Wildlife habitat
No name	Wildlife habitat
Leten Tso	Wildlife and alpine vegetation
Simala Jheel	Alpine vegetation and wildlife
Khon Cheugya Tso	Wildlife habitat and migratory birds
Gyapji Chho	Source of water for wildlife
Sugu Chho	Wildlife habitat and religious
Gogong Tso	Religious and wildlife
La Jheel	Wildlife habitat
Lha Tso	Wildlife habitat
chho Yummo	Wildlife habitat
Mukti Boul Jheel	Religious
Lungma Chho	Wildlife and religious
Gayuma Chhona	Wildlife and religious
Chhuilung Tso	Wildlife and religious
Bam Chho	Wildlife and religious
No name	Wildlife and religious
Goma Tso	Wildlife and alpine vegetation
No name	Wildlife habitat
Ghora Tso	Religious
No name	Wildlife habitat
Charap Chho	Religious
No name	Wildlife and medicinal plant
Thomphyam Tso	Wildlife habitat
Chomayulmo	Wildlife and religious
Khang Tso	-
No name	Wildlife habitat
Chhomdo Tso	Religious
No name	Wildlife habitat
Satbaini Jheel	Religious

No name	Wildlife habitat
Phiroja Lake	Religious
No name	Wildlife habitat
Sima Chhokha	Wildlife habitat and religious
No name	Wildlife habitat
Chhumzomui	Religious
Chhokha	-
Lachung Tshosa	Religious lake
No name	Wildlife habitat
Mashya Tso	Wildlife habitat
Chhombo Tso	Wildlife habitat

Source-Roy and Thapa, (1998)

APPENDIX III: MID ALTITUDE LAKES IN SIKKIM(DISTRICTWISE)

Lakes in East district	**Importance**
No name	Wildlife & medicinal plant
Gompa pokhari	Mythological importance
No name	Wildlife, religious
Sethey pokhari	Wildlife
Balautey lake	Wildlife & avifauna
Aritar lake	Fish culture
Syabiyuka tso	Wildlife & natural flower
Lakes in West district	
Bhoreng pokhari	Medicinal plants
Trimurthy pokhari	Religious
Tikjuk lake	Domestic use
Khechepalri lake	Wish fulfilling lake
Kathok lake	Religious & fish culture
Lopting lake	Domestic use
Relli chho	Water source
Lakes in North district	
Kal pokhari	Domestic use
Ruketh ugo tso	Wildlife & avifauna
Naku tso	Wildlife & religious
Phodong lake	Wildlife & diversity
No name	Wildlife & vegetation

Source-Roy and Thapa, (1998)

APPENDIX IV: RESTRICTED, PROTECTED, MEDICINAL TREES/PLANTS OF SIKKIM

Restricted trees	Protected trees (Local Name)	List of high altitude alpine tibetan medicinal plants
Dar	Malagiri	Cupressus Torulosa
Khamari	Yew Tree	Suphora Florescens
Tooni	Chemal (All Kinds)	Rhododendron
Panisaj	Gurans (All Kinds)	Cephalanthum
Sisum	Chewri	Savina Recurra
Junifer	Tamala (Cinnamon Zvlanicum)	Pterocarus Hookeri
Mel	Kimbu	Petrocarpus Hookeri
Bhauni	Sinkauli	Rhododendron
Kath	Amala	Campanulatum
Rani Chap	Harra	Aristolochia Saccata
Jat Katus	Barra	Melothria Glauca
(Musurev)	Bar (Ficus Bengalensis)	Muconopsis Sp
	Pipal (Ficus Religious)	Gentiana Tibetica
	Labar (Ficus Elastica)	Lancea Tibetica
	Siltimbur And Any Other Species, Which May Be Included From Time To Time.	Gentiana Dahurica
		Rhodiola Saera

Source-Statistical Profile, 2004-05

APPENDIX V: DISTRICTWISE APPROVED FOREST LAND DIVERSION UNDER FOREST TILL 2003 IN SIKKIM

ITEMS	DISTRICTS/DIVISIONS(area in hactare)				
	EAST	WEST	NORTH	SOUTH	GRAND TOTAL
Total Geographical Area	95400	116600	422600	75000	709600
Total Forest Area	61952	86473	410817	41341	600582
Nos. Of Approved Cases	36	14	28	35	113
Total Forest Land Diverted	196.95	44.95	348.37	244.98.	835.24
Total Compensatory Afforestation Stipulated On	323.056	218.94	1041.28	383.61	1967.00
(a) Forest Land	0.89	7.78	7.28	2.7	18.65
(b) Non-Forest Land	323.95	226.72	1048.56	386.31	1985.65
Total Compensatory Afforestation Completed On	562.00	263.00	749.064	422.50	1996.564
(a) Forest Land	.89	5.014	2.262	2.50	10.67
(b) Non-Forest Land	563.00	268.00	751.00	425.00	2007.00

Source-Statistical Profile, 2004-05