GOVERNMENT OF SIKKIM
DEPARTMENT OF FOREST, ENVIRONMENT & WILDLIFE MANAGEMENT
RESEARCH, EDUCATION & EXTENTION CIRCLE
DEORALI, GANGTOK 737 102

L. No. 40/Y /SRO/F Dated: 22 / 11 / 2005

To,
Mr. Ashish Kothari
Kalpavriksh - Env. Action Group
Apt. 5, Shree Dutta Krupa
908 Deccan Gymkhana

SUB: Book – "Sikkim State Biodiversity Strategy and Action Plan"

Dear Ashish,

Please enclosed find herewith the copy of the book, 'Sikkim State Biodiversity Strategy and Action Plan' for your information. The same was released by Dr. Pawan Chamling Hon'ble Chief Minister of Sikkim during World Environment Day on 5th June 2005.

Thank you for your commitment and support in this effort.

Kindly acknowledge receipt.

Yours faithfully,

(Usha Lachungpa)
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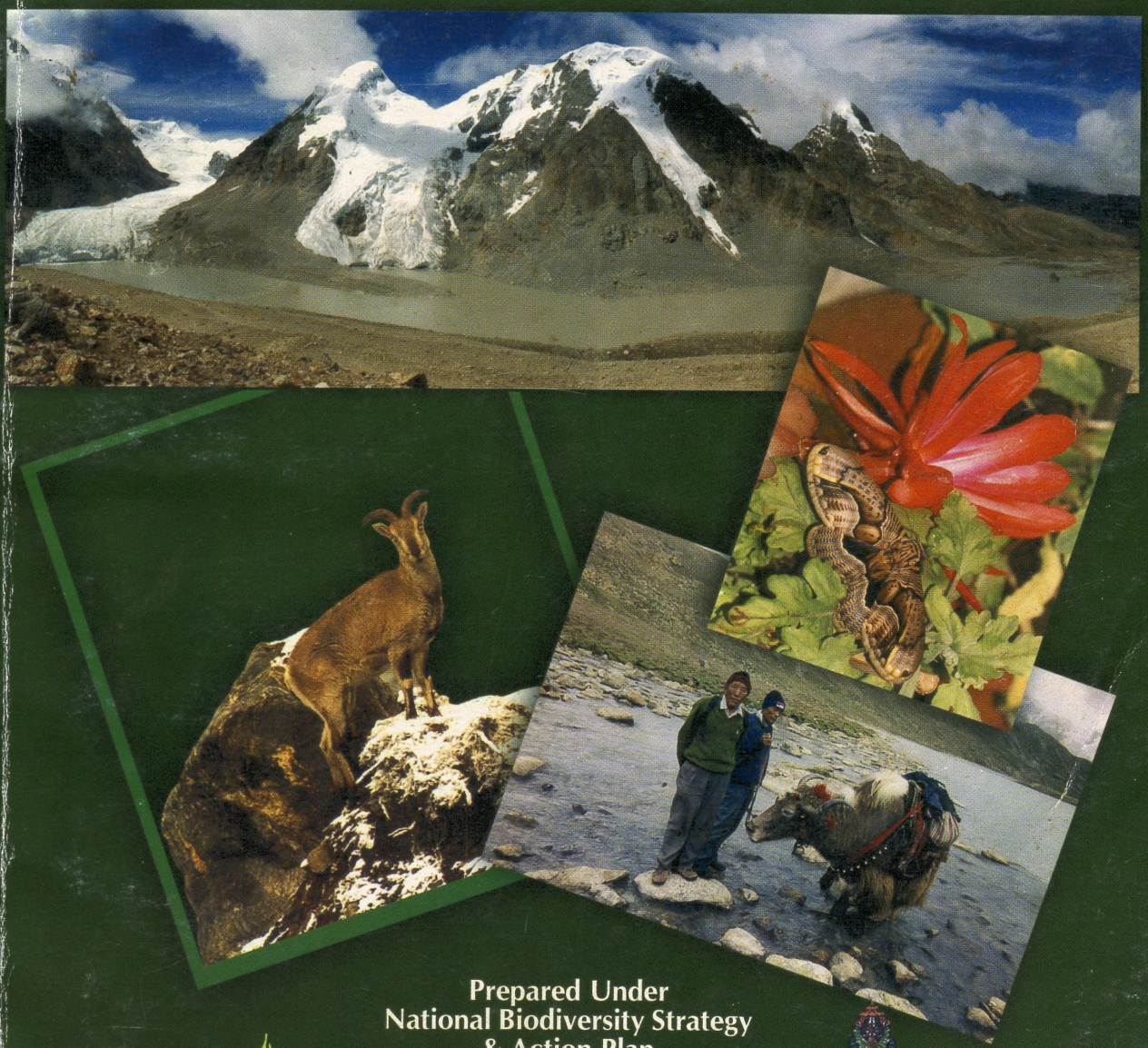
SIKKIM STATE BIODIVERSITY STRATEGY AND ACTION PLAN



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India 2002

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Ministry of Environment and Forests
Government of India

Department of Forest,
Environment and Wildlife Management
Government of Sikkim

Published by:
T. R. Sharma IFS, PCCF/CWLW-cum-Secretary, Government of Sikkim
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Cover Photographs:
FRONT: (clockwise from top)
1. Source of the river Tista (Tista Khangse and Khangchung Tso)
2. Eyed Silk Moth *Brahmea wallichi*
3. Dokpas and Yak, Lhonak Valley
4. Female Blue Sheep *Pseudois nayaur*

BACK: (clockwise from top)
1. The last Tibetan Mastiff (Do-Khyi), Livestock Guardian
2. *Ephedra gerardiana,* North Sikkim
3. Endangered Giant Beans, *Phaseolus coccineus,* Lachung

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Pipons of Lachen and Lachung villages

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ABBREVIATIONS USED

4D	Discovery, Dream, Design and Delivery Technique for Microplanning
AH&VS	Animal Husbandry and Veterinary Services Department
AIR	All India Radio
APPA	Appreciative Participatory Planning and Appraisal
AR	Assam Rifles
BRO	Border Road Organization
BRS	Barsey Rhododendron Sanctuary
BSI	Botanical Survey of India
CO	Commanding Officer
CSAP	SAP made by the community only CSAP = FSAP + MSAP
CWC	Central Water Commission
DPR	Detailed Project Report
ECOSS	Ecotourism & Conservation Society of Sikkim
EDC	Ecodevelopment Committee
FCA	Forest Conservation Act
FSAP	SAP made by the Female participants of the community only
GBPIHED	G. B. Pant Institute for Himalayan Environment and Development
GO	Government Officers
GOC	General Officer Commanding (17 Mountain Division)
GOI / GOS	Government of India / Government of Sikkim
GPU	Gram Panchayat Unit
GREF	Garrison Reserve Engineering Force
GSAP	SAP made by the government departments only
ICAR	Indian Council for Agriculture Research
IOC	Indian Oil Corporation
IPM	Integrated Pest Management
IWDP	Integrated Wasteland Development Project
JFMC	Joint Forest Management Committee
KCC	Khangchendzonga Conservation Committee
KBR	Khangchendzonga Biosphere Reserve
KNP	Khangchendzonga National Park
LAC	Local Area Committee
MASL	metres above sea level
MPCA	Medicinal Plant Conservation Area
MSAP	SAP made by the Male participants of the community only
NGO	Non Governmental Organization
OPD	Out Patients Department
PHC	Primary Health Center
PHED	Public Health and Engineering Department
PHSC	Primary Health Sub Center
PRA	Participatory Rural Appraisal
PWD	Public Works Department
RRC	Regional Research Centre
SAP	Strategy and Action Plan SAP = CSAP + GSAP
SDM	Sub Divisional Magistrate
SHRA	Sikkim Hoteliers and Restaurants Association
SGC	Sikkim Government College
SGMI	Sonam Gyatso Mountaineering Institute
SNT	Sikkim Nationalized Transport, Bus Service
STCS	State Trading Corporation of Sikkim
SWRC	Social Work Research Centre
TAAS	Travel Agents Association of Sikkim
TTI	Teachers Training Institute
WB	West Bengal
WLS	Wildlife Sanctuary
WPA	Wildlife (Protection) Act 1972

GLOSSARY OF LOCAL TERMS

Ban Manshe	Yeti
Banmara	*Eupatorium* spp., a naturalized exotic weed
Bustee	Village
Chilimey	Blood Pheasant
Danphe	Monal Pheasant
Dhoopi/Dhupi	*Cryptomeria japonica*, an exotic naturalized conifer
Dokpa	Tibetan grazier
Goth	Permanent Cattle Shed
Gothala	Goth owner
Goucharan	Government Protected Forests notified for grazing
Gumpa	Monastery
Khola	River / Stream
Malingo	*Arundinaria maling*, Dwarf bamboo, forms thickets in Temperate Forests, excellent fodder, also used for making mats etc.
Mela	(Local) Festival
Muda	Sitting stool, reinforced with bamboo and covered with animal hid
Munal	Crimson Horned Pheasant or the Satyr Tragopan
Paha	Frog
Pokhri	Pond
Shikari	Hunter
Tsachu	Hot spring
Uttis	*Alnus nepalensis* [Alder Tree] used as shade bearer extensively in agro-forestry model in Cardamom plantations. Very fast growing, provides excellent firewood for curing Cardamom also.
Pipon	Village headman of Lachen or Lachung village in North Sikkim

EXECUTIVE SUMMARY

The National Biodiversity Strategy and Action Plan (NBSAP) is a project of the Ministry of Environment & Forests, Government of India. Its execution was done by a technical and policy core group of various experts from all parts of India, headed by the reputed Indian NGO, *Kalpavriksh*. The Biotech Consortium India Ltd coordinated its administration.

The state government of Sikkim approved this project in September 2000. Since June 2001, the Department of Forest, Environment & Wildlife tried to reach out to all sections of people across the length and breadth of the State in a massive effort to formulate the Sikkim Biodiversity Strategy & Action Plan in a participatory manner. This involved the full participation of maximum number of people from all walks of life, having any sort of traditional / scientific knowledge to contribute. Some of the remotest villages were visited as also villages on the peripheries of wildlife protected areas. Besides intensive public hearings, two biodiversity festivals were held at Yuksam in the west and Tsungthang in the north. The first state level steering committee meeting of various luminaries in the field was held at Gangtok on 20th August 2001.

The initial publicity blitzkrieg followed by public hearings deep in rural areas and the first State Level Meeting of the SSC, struck a very positive and hopeful chord among the people of Sikkim. It was heartening to note that everyone was very concerned about the increasing biodiversity losses and mistakes of faulty development strategies. At the community level, there is a lot of expectation from the government for implementing various schemes, which may lead directly or indirectly to biodiversity conservation. The second state level steering committee (SSC) meeting was held on 7th December 2001 to finalize the GSAPs.

The basic strategy used for Sikkim was conducting Community SAPs (CSAPs), which included organizing public hearings in about 39 locations and two biodiversity melas at Chungthang in North Sikkim and Yuksam in West Sikkim. These 39 CSAPs were tabulated village-wise in their ecoregions, giving the problems and issues, major actors and expectations from them. These were then condensed ecoregion-wise followed by informal brain storming sessions involving all the stakeholders to synergize the CSAP and GSAP into one holistic SAP. CSAP + GSAP led to the State BSAP.

Final comments received from Ms. Seema Bhat and Mr. Ashish Kothari of Kalpavriksh on the State BSAP were incorporated in the document as were those from local informal brain storming of the executive summary. The latter, translated into the four local languages, Nepali, Limboo, Bhutia and Lepcha was released officially on the occasion of State Biodiversity Park inauguration by the Chief Minister of Sikkim at Damthang, South Sikkim on 29th April 2003.

The draft SBSAP was widely circulated (in the form of CDs) for comments. These comments have been incorporated into this document.

Chapter 1

INTRODUCTION

The National Biodiversity Strategy and Action Plan (**NBSAP**) is an ambitious project of the Ministry of Environment & Forests, Government of India, to be completed in a period of three years. Its execution was being done by a technical and policy core group of various experts from all parts of India, headed by the reputed Indian NGO, Kalpavriksh. The Biotech Consortium India Ltd coordinated its administration.

During the process in Sikkim, emphasis was given on all kinds of biodiversity (varieties of life) we have, both domesticated and wild, both plant and animal, including our microorganisms. We tried to know whether and how this has been conserved in the past, the roles of our traditional cultural practices in their conservation, gender issues, who is responsible, what mistakes we might have committed or are committing, which need to be reviewed and how to proceed so that we can still have the distinction of being so rich in biodiversity. A vision for a detailed, long-term biodiversity conservation in Sikkim, was hoped to be developed in a participatory manner involving all stake holders, which will sustain us and our generations to come.

This document has been prepared by people who have grown up in this place, with long years of experience and a vision of the future. Several such people exist, both within and outside the government, in Gangtok and in the remote *bustees*. They do not necessarily have to be experts. All contributors whether he/she be an 'Amji' from Lachung, or an Army Officer or a Politician of Sikkim or a Bureaucrat from Gangtok, were actively consulted for their expertise or suitably acknowledged for their views, however small.

It is hoped that with the public input from the remotest corners of Sikkim, actual biodiversity concerns have come to light and are addressed suitably in the **Sikkim State Biodiversity Strategy and Action Plan**, which is a public document.

THE PRESENT REPORT HAS BEEN PUT TOGETHER IN THE FOLLOWING FORMAT:

Chapter 1: Introduction: Brief background, scope and methodology

Chapter 2: Profile of the area including the protected area network

Chapter 3: Current range and status of wild and domestic diversity

Chapter 4: Statement of problems pertaining to biodiversity

Chapter 5: Major actors and their current roles relevant to biodiversity

Chapter 6: CSAPs Ecoregion-wise

Chapter 7: GSAPs

Chapter 8: State BSAP

Final comments received from Ms. Seema Bhat and Mr. Ashish Kothari of Kalpavriksh on the State BSAP were incorporated in the document. Also incorporated were those from local informal brain storming on the executive summary of the same, translated into the four local languages, Nepali, Limboo, Bhutia and Lepcha. The Chief Minister of Sikkim officially released the Executive Summary of the State BSAP in these local languages, on the occasion of State Biodiversity Park inauguration at Damthang, South Sikkim on 29th April 2003.

METHODOLOGY OR PROCESS

1. PUBLIC HEARINGS were organized in the remotest of villages with the help of a number of NGO's as facilitators. Khangchendzonga Conservation Committee (KCC), Ashoka Trust for Research in Ecology and Environment (ATREE), WWF Sikkim Unit, Society for Environmental Education and Development (SEED), Concerned Citizens of Sikkim (CCS), Green Circle (GC), Ecotourism Conservation Society of Sikkim (ECOSS), Chungthang Welfare and Sporting Association (CWSA), Sikkim Lepcha Youth Association (SLYA), FRLHT etc.

2. MODELS AND CHARTS were used explaining the problems of deforestation, garbage, soil erosion and water pollution. The models were made using local material at the village itself. There was a model of trans-Himalayan Sikkim, Khangchendzonga Biosphere Reserve, Tendong Nature Reserve, Soil runoff model, water-source pollution model, etc. The charts from Centre for Environment Education, Posters and Photographs of Wildlife etc were also explained in the local language i.e. Nepali.

3. PRA USING APPA AND 4D MODEL: Interactive, Appreciative appraisal, mapping of the current resource map of the village and the dream village ten years hence, was done using the APPA and 4D techniques.

4. BIODIVERSITY EXHIBITION: Two Biodiversity festivals were organized, one in Yuksam, West Sikkim during May 2001 and the other at Tsungthang, North Sikkim during the Pang Lhabsol festival in August 2001. These Biodiversity Festivals held at Yuksam and Tsungthang featured:

1. Display of various NTFP with their uses
2. Display of indigenous seeds of agricultural crops
3. Display of hybrid livestock poultry and exotic fodder species
4. Display of traditional cuisine
5. Display of traditional clothes and handicrafts
6. Display of indigenous handloom
7. Display of Models and Charts

5. BIODIVERSITY PROGRAMME: The programme at the Biodiversity Festival featured:

1. Religious plays on conservation, "Ney Pemathang"
2. Religious offerings of local harvest to the Khangchendzonga deity
3. Humorous Skit on the impacts of tourism and local issues
4. Presentation of CSAP by the key community members
5. Folk Dances
6. Humorous Puppet Dance
7. Musical performance using indigenous musical instruments
8. Conservation message by the local faith healer or *Jhankris* and *Bonthings*

6. Exposure and Exchange Programme: The key community members from the villages were invited to make a presentation of their CSAP, at the Biodiversity Festival. Listening to the CSAPs of the other villages, these key community members were exposed to the whole gamut of development initiatives adopted in the region by the various villages. Indian Army personnel also actively participated in the organization of this unique festival of *Pang Lhabsol* in North Sikkim.

7. Nature Games: In order to make the villagers realize practically the esoteric concepts of conservation, to liven up the proceedings, act as energizers and also as ice-breakers, nature games like "Web of Life", Commons Dilemma, "Who am I", etc. were organized.

8. Religion: The state of Sikkim is a sacred landscape and hence religious plays; discourses by Lamas and faith healers on conservation were organized in these Biodiversity Festivals. Public hearings were also held during religious festivals like Drukpa Tseshi, Guru Rimpoche's Trungkar Tshechu and Pang Lhabsol.

9. Separate Programme for Women: It was observed in the initial public hearings that even when the number of women members was substantial, they were shy and hardly made any contribution. After that, where

PHASES IN IMPLEMENTATION

A: South & West Sikkim *(all hearings in Nepali)*	B: North Sikkim *(all hearings in Bhutia, Tibetan, Nepali, English during three religious Buddhist festivals)*
1. Welcome Speech 2. Self Introduction 3. Introduction to Biodiversity 4. Introduction to NBSAP 5. PRA and Micro-planning using APPA and 4D Tools 6. Resource Mapping **LUNCH BREAK** 7. Future Resource Mapping 8. Feedback from Participants 9. Vote of Thanks	1. Prior Talk / Discussion with the Pipon, Army officials 2. Meetings (usually after puja or lunch): a. Introduction by Pipon, Tashi Tshering (Facilitator, Interpreter) in Bhutia and Tibetan or self introduction in Nepali b.Introductory talk on NBSAP process c.Local natural resources & issues d.Discussions and noting down as far as possible in formats e.Local area mapping exercise f.Winding up, (writing discussion points in Bhutia for Lachung Pipon) 3. Lecture cum discussion with jawans, officers of Assam Rifles regiment

Male SAP + Female SAP = Community SAP **Community SAP + Government SAP = SAP**

Phase	Details	Methodology
Phase I	Preparation of CSAP	1.Public Hearings in the villages, 2.Interview of key resource persons 3.Tying up with Religious Festivals, 4.Soliciting inputs through advertisements, letters, distributing CFP in local languages 5.Capacity Building of Local NGO's, Key Community Members and Forest Officers CSAP = FSAP + MSAP
Phase II	Preparation of GSAP	Questionnaire for the State and Central Government Departments, Meetings of the State and District Level Steering Committees Feedback on how the CSAP can fit into the existing schemes
Phase III	Preparation of SAP	Brainstorming between the key community members, independent experts, NGO's and government officers. CSAP + GSAP = SAP

ECOREGION WISE CSAPs

S. No	Ecoregion	Public Hearings in Villages	
		North & East Districts	South & West Districts
1	**Trans Himalayas**	Lhonak Valley (Muguthang) Nyimateng (for Lashar & Tso Lhamo)	This ecoregion is not represented in south and west districts
2	**Temperate**	Lachen, Thangu & Lachung	
3	**Sub Tropical**	Tsungthang	Damthang, Sada Phamtam, Uttarey, Dentam, Hee Patal, Bermiok Martam, Sribadam, Soreng, Sombaria, Ribdi,Borong, Ralang, Rabongla, Yangang, Pathing, Lingmo, Sokpay, Wok Omchu, Singithang, Maniram, Tangzi Bikmat, Turuk Ramabong, Lunchok, Kamarey, Assangthang, Sorok Shyampani and Sadam Suntaley
4	**Tropical**		Kitam, Salghari, Mellidara, Poklok, Kartikey, Rateypani, Rong, Mamley

Chapter 2

PROFILE OF THE AREA

Sikkim is a vertical strip of very rugged, mountainous country, having a geographical area of 7096 sq. km. The Chola ridge towards the East, the Singalila ridge towards the west and the mighty Himalayan axis at the north bound it. These ranges enclose Sikkim in a titanic horseshoe, which traps the moisture-laden winds from the Bay of Bengal, causing heavy precipitation. This land is drained by the mighty Tista, which flows north south. The most astonishing aspect of this region is the enormous altitudinal gradient ranging from 300 masl to 8585 masl. This creates a range of climatic zones, right from the tropics to the tundra. This in turn fosters a bewildering diversity of flora and fauna.

[This abrupt telescoping of the terrain from the hot steamy foothill valleys to the artic cold of the snow capped peaks, which has produced the marked altitudinal zonation in the rainfall, humidity, climate and vegetation is also responsible for the great variety and numerical abundance of the resident bird life, making Sikkim perhaps the richest area of its size anywhere in the world.] (Ali, Salim 1962)

LOCATION

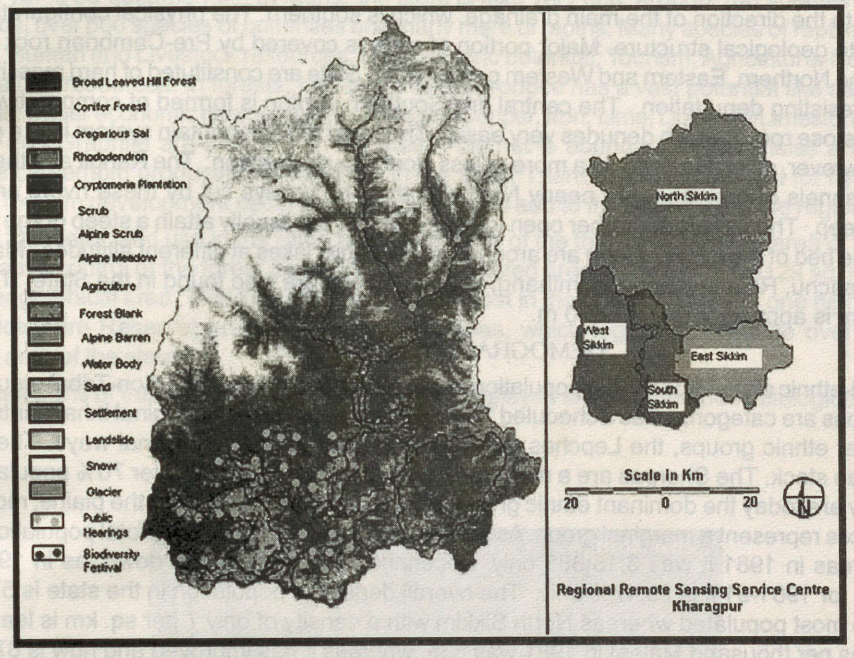
Sikkim is a very small hilly State in the Eastern Himalayas, extending approximately 114 km from North to South and 64 km from East to West, surrounded by vast stretches of Tibetan Plateau in the North, Chumbi valley of Tibet and the kingdom of Bhutan in the East, Darjeeling district of West Bengal in the south and the kingdom of Nepal in the West. The State being a part of inner ranges of mountains of Himalayas has no open valley and no plains but varied elevations ranging from 300 to 8598 metres above mean sea level consisting of lower hills, middle and higher hills, Alpine Zones and snow bound land, the highest elevation 8585 metres being the top of the Khangchendzonga massif itself.

TOTAL AREA STATEMENT

The total geographical area of the State is 7096 sq. km. but according to 1958-60 Survey Operation and the Gazetteer of Sikkim, the land area under different utilization categories is 7299 sq. km. Detailed break up is as follows:

Land use Pattern	Area In '000 ha	% of Area
Barren Land	209.01	28.28
Land put to Non- Agricultural Use	69.96	9.58
Permanent pastures and grazing land including cultivable waste	102.49	14.40
Land under miscellaneous tree crops and grasses	4.17	0.57
Forest Land	265.21	36.34
Land under operational holdings	79.06	10.83
Total	**729.90**	**100.00**

Map 2.1: Sikkim State Project Area



CLIMATE

The climate of the state has been roughly divided into the Tropical, Temperate and alpine zones. For most of the periods in a year, the climate is cold and humid as rainfall occurs in each month. The area experiences a heavy rainfall due to its proximity with the Bay of Bengal. The rainfall in North District is comparatively less than that of the other Districts. The general trend of decrease in temperature with increase in altitude holds good everywhere. Pre- monsoon rain occurs in April-May and monsoon (South-West) operates normally from the month of May and continues up to early October.

TEMPERATURE

The mean temperature in the lower altitudinal zones varies from 4.5° C to 18.5° C, whereas at higher altitudinal zones, it varies from 1.5° C to 9.5° C. Temperature varies with altitude and slope. The maximum temperature is recorded usually during July – August, and minimum during December – January. Fog is a common feature in the entire State from May to September. Biting cold is experienced at high altitude places in the winter months and snowfall is also not uncommon during this period.

RAINFALL

An examination of available rainfall data shows that the mean annual rainfall is minimum at Thangu (82 mm.) and maximum at Gangtok (3494 mm.). An isohyetal analysis of these data reveals that there are two maximum rainfall areas (i) South-East quadrant, including Mangan, Singhik, Dikchu, Gangtok, Rongli etc. (ii) South – West corner including Hilley. In between these two regions, there is a low rainfall region e.g. Namchi. Rainfall in this area is about half of that in the former areas. Northwest Sikkim gets very little rainfall (even less than 4.9 mm.) and has mainly snow-covered mountains. Rainfall is heavy and well distributed during the months from May to early October. July is the wettest month in most of the places. The intensity of rainfall during Southwest monsoon season decreases from South to North, while the distribution of winter rainfall is in the opposite order. The highest annual rainfall for the individual stations may exceed 5000 mm. and average number of rainy days (days with rain of 2.5 mm. or more) ranges from 100 at Thangu to 184 at Gangtok.

GEOMORPHOLOGY

Sikkim encompasses the lesser Himalaya, Central Himalaya and the Tethys Himalaya. It is essentially a mountainous state without flat piece of land of any extent anywhere. The mountains rise in elevation northward.

The northern portion of the state is deeply cut into steep escarpments, and except in the Lachen and Lachung valleys, is not populated. Southern Sikkim is lower, more open, and fairly well cultivated. This configuration of the state is partly due to the direction of the main drainage, which is southern. The physical configuration of Sikkim is also partly due to geological structure. Major portion of state is covered by Pre-Cambrian rock and is much younger in age. The Northern, Eastern and Western portion of the State are constituted of hard massive gneissose rocks capable of resisting denudation. The central and Southern portion is formed of comparatively soft, thin, slaty and half-schistose rocks, which denudes very easily. The trend of the mountain system is in a general east-west direction. However, chief ridges run in a more or less North South direction. The Rangit and the Tista, which form the main channels of drainage, run nearly North-South. The valleys cut by these rivers and their chief feeders are very deep. The valleys are rather open towards the top, but usually attain a steep gorge like structure as we approach the bed of the rivers. There are around 180 perennial lakes at different altitudes. Many hot water springs i.e. Phur tsachu, Ralang tsachu, Yumthang, Yumesamdong are also found in the State. The perpetual snow line in Sikkim is approximately at 5500 m.

DEMOGRAPHIC FEATURES

Sikkim is a multi-ethnic state. Broadly, the population can be divided into Tribal and Non-Tribal groups. Lepchas, Bhutias and Sherpas are categorized as Scheduled Tribes. The Lepchas are the original inhabitants of the state. Compared to other ethnic groups, the Lepchas still maintain many of their traditional ways. The Bhutias are originally of Tibetan stock. The Sherpas are a marginal ethnic group in the state. Over 70% population consists of Nepalese. They are today the dominant ethnic group in the state. The people from the plains, mostly involved in trade and services represent a marginal group. As per the 1991 census of India, the total population of the state is 4,06,457, whereas in 1981 it was 3,16,385 only. Decennial growth has come down, as in 1971-81 it was 50.77%, whereas for 1981-91 it is 28.47% only. The overall density of population in the state is 57 per sq. km. East district is the most populated whereas North Sikkim with a density of only 7 per sq. km is least populated. Sex ratio (Females per thousand Males) in 1981 was 835, whereas it has improved and now is 878. There are only eight urban towns and urban population is 9.10% of total population. Scheduled Caste and Scheduled Tribe population is 5.93% and 22.36% respectively. North district is a tribal district as it has about 55.38% tribal population. Literacy rate is 56.94% (19th position), higher than the all India average literacy rate of 52.11%.

ECONOMIC PROFILE

The economy of Sikkim is mainly based on Agriculture and Animal Husbandry. Approximately 11% of the total geographical area is under Agriculture. Agriculture is of the mixed type and still at subsistence rather than commercial level. The work force participation rate as per 1991 census is 40.44%. The female participation rate in Sikkim is also much higher than the national average. This is an important aspect of the hill economy, as productivity is low and hence all the able-bodied people are employed in Agriculture or other activities. Cultivators account for greater majority of the people in the state. Their percentage is 57.84%. Agricultural laborers as a whole constitute only 7.81% of the workers in the state. Household and other industries are negligible, but other workers (Tertiary Sector) at the State level represent a good percentage of population. The decreasing ratio of the other workers at the state level indicates low level of economic diversification. The importance of Agriculture can be judged by the high percentage of population approximately 65% engaged in it. Animal husbandry is an integral part of the household economy of the region. There are certain household industries also which substantially adds to household incomes. The past one and half decade has witnessed a tremendous upward swing in various developmental programmes giving a new thrust to the Sikkim economy. This process has increased wage employment opportunities. Though most of the inhabitants are basically agricultural, they have diversified into tertiary jobs such as Government Services.

NATURAL RESOURCES

The state is gifted with abundant natural resources. The resources can be grouped into Biotic or Abiotic, both of which can be renewable and non renewable. Biotic resources include agricultural crops, fodder and forests. The entire Himalayan region is endowed with natural flora and fauna, and is a paradise for nature lovers, conservationists, botanists, zoologists and environmentalists. There are about 4500 species of flowering plants, 362 species of ferns and its allies, 11 species of oaks, 9 species of tree ferns, 30 species of Primulas and 20 species of bamboos. Many medicinal plants are found in low and high altitude areas. Another major resource is water. The potential of microbial diversity in Sikkim has not yet been tapped except from foods such as traditional

fermented foods and beverages. Glacial micro flora and that from aquatic ecosystems, forests, soils, plants, fungi, etc are yet to be documented. In fauna, the state is also very rich, around 150 species of mammals, 550 species of birds, over 600 species of butterflies and many more of moths. Many species of reptiles and amphibians are available. Human and Livestock resources, Hydroelectric potential, Tourism, Agriculture, Horticulture etc. add to Sikkim's natural resources. In forests, non-wood forest produce has a vast potential like sand, boulders, and other materials. Under economic geology the minerals like Copper, Iron, Lime, Dolomite/Limestone, Coal, Quartzite, Talc, Silicate and Graphite are available in the state. Garnet is abundant in the gneiss and mica schists at places. Large cardamom production is very high in the state. There is a vast potential for hydroelectric power generation. Tourism development deserves consideration to add to the economy of the region.

Forestry is the major land use in the State and nearly 80% of the total geographical area of the State is under the administrative control of the forest department. The forested area of the State is 3129 sq. km., which is 44% of the total geographical area. This figure is one of the largest in the country. There is one high altitude National park (cum Biosphere Reserve) and six wildlife sanctuaries, which together constitute over 30% of the total geographical area of the state.

Covering just 0.2% of the geographical area, Sikkim Himalayas show tremendous biological diversity.

Table 2.2

Wild Biodiversity at a glance	Approx. Nos
Flowering Plants	4500
Orchids	500 +
Rhododendrons	36
Bamboos	20
Ferns and Ferns allies	362
Tree Ferns	9
Primulas	30
Oaks	11
Mammals	144
Birds	550
Butterflies	600 +
Fishes	48
Mountains & Peaks	28
Glaciers	21
Lakes and Wetlands	227
Rivers and Streams	over 104

PROTECTED AREA NETWORK

Table 2.3: Legally Gazetted Wildlife Protected Areas In Sikkim

Name of the WLPA	District	Area in sq km
National Park		
1. Khangchendzonga National Park	North & West	1784
Wildlife Sanctuaries		
1. Shingba Rhododendron Sanctuary	North	43
2. Barsey Rhododendron Sanctuary	West	104
3. Kyongnosla Alpine Sanctuary	East	31
4. Fambong Lho Wildlife Sanctuary	East	51.76
5. Maenam Wildlife Sanctuary	South	35.34
6. Pangolakha Wildlife Sanctuary	East	124

The total forest land of the state is 5765.10 sq km, i.e. 50.04%, while total area under tree cover is 3129 sq km, i.e. 44.1%. 2173 sq km or 30.62 % of the total geographical area of the state is under wildlife protection, which is perhaps the highest in the country. Khangchendzonga Biosphere Reserve was notified in February 2000. It is spread over North and West districts encompassing 1784 sq km of Khangchendzonga National Park and 835.92 sq km over four buffer zones totaling an area of 2619.92 sq km. These buffer zones are Lhonak Valley, West Chungthang-Lachen, Tholung Valley and Rangit and Tista Catchments. Pangolakha Wildlife Sanctuary was recently declared on the Bhutan – China (Tibet) – India (Sikkim and West Bengal) tri-junction. There is also another proposal for declaration of a cold desert protected area in north Sikkim.

HISTORICAL PROFILE

In 1914 the then Maharajah of Sikkim, Sidkeong Tulku, initiated the demarcation of the forest areas of the then Kingdom of Sikkim. Forests that were vital to the life support system and required full protection were set apart as Reserve Forests. These forests were to be left in their natural state and heavy penalties were imposed for illegal activities in these areas. Other forest areas that could be worked on a small scale in order to meet the timber and fuel-wood requirements of the local populace were carved out in the vicinity of villages. Those forests that were set apart in this manner to meet the wood requirements of the local people were called Khasmal Forests and those that were set apart as grazing grounds for the village cattle were called Goucharan Forests. Forest rules and regulations were first of all instituted during this period.

Sidkeong Tulku the tenth Chogyal of Sikkim after completing his studies in Oxford University in 1908 was given charge of forests, monasteries and schools.

1. He introduced Avenue plantation of trees on either side of bridle paths of Sikkim through public participation

2. He passed regulations for conserving 50 yards on either side of rivers Rangit, Tista and their tributaries as river / khola reserves

3. He passed regulations for compulsory bench terracing of the cultivable land of the farmers. "Whoever tills the land must bench-terrace."

Thus bench terracing of both paddy and dry land was introduced in Sikkim.

- J. R. Subba, Jt. Director Horticulture, Government of Sikkim

Consequently, the system of exploitation of forests by selection felling leaving the mother stock intact was adopted. Contracts for lifting of forest produce from mature forests were given and extracted timber was exported with a view to generate revenue to meet the increasing expenditure on administration and to aid natural regeneration. This was supplemented by undertaking plantation work on a limited scale in marginal forests through the taungyadar system.

In 1975 when Sikkim got merged in the Indian Union, developmental activities accelerated. Aided by Central assistance, construction activities got a boost, and the lifestyle of the people also improved considerably. The increasing population, coupled with the timber intensive lifestyle, mounted pressure on the forest areas, and the requirement of forest produce for internal consumption also increased considerably.

Chapter 3

CURRENT RANGE AND STATUS OF BIODIVERSITY: ECOREGION-WISE

Sikkim is a land of vast variation in altitude within very short distances ranging from around 300m to 8598m. Elevation plays a prime role in fashioning the ecoregions of the state. This is evident from the presence of Sal forests in the Rangit Valley in the south to the temperate fir forests in the north, beyond which lie the trans-Himalayas and cold desert of the Tibetan plateau.

Broadly speaking there are five altitudinal zones of vegetation. They are not clear-cut at their boundaries but merge into one another, often showing considerable local encroachments and recessions above and below the line depending upon physical configuration and exposure of the terrain and the resulting ecological factors.

The Tropical ecoregion extends roughly from the foothills of the outer Himalayas to an altitude of about 1200m. It contains steep sided valleys and gorges with well-drained flanking slopes. Various species of orchids, *Rhapidophora*, wild banana, *Pandanus*, Nettles and giant bamboo are characteristic. The Rangit Valley Sal *Shorea robusta* in this region shows a unique association with the Chir Pine *Pinus roxburghii*. In patches of protected forest it is possible to see the weak Sal being slowly dominated by the Pine. These patches are however relatively poor in bird life. Lowland forests of Sikkim are home to several endangered species of birds like the Rufous-necked Hornbill *Aceros nipalensis*, Great Indian Hornbill *Buceros bicornis homrai* locally called 'Hongraio', Chestnut-breasted Partridge, Black-breasted Parrotbill, Grey-crowned Prinia and Ward's Trogon. Other lowland fauna includes the introduced Peafowl, Python, Geckos, Porcupine, Assamese Macaque and Barking Deer, a host of butterflies and other invertebrates, riverine fish, frogs and toads. Several species of migratory waterbirds use the river systems during transit. Lantana is a major weed in this region. This ecoregion has not yet been included in the protected area network of the state. Forest fires are generally reported from this zone and there is an occasional problem of illegal removal of the Sal, Teak trees. New hydroelectric projects have also been taken up in this zone. This ecozone is not yet represented in the protected area network. However, a representative area of the Kitam Reserve Forests is proposed to be notified as a bird sanctuary.

The Sub Tropical ecoregion extends up from about 1800 m to 3000m. The rainfall in this zone is the heaviest and conditions remain humid throughout the year. The crop in the upper storey consists of mainly *Castanopsis hystrix* (Katus), *Machilus* spp. (Kawla), *Rhododendron* spp. (Chimal), *Symplocos spicata* (Kholme), *Symplocos theifolia* (Kharane), *Michelia excelsa* (Rani Champ), *Quercus lamellosa* (Buk), *Quercus lineata* (Phalant), *Leucoseptrum canum* (Ghurpis), *Quercus pachyphylla* (Sungure Katus), etc. The other associates in the upper storey are: *Betula alnoides* (Saur), *Nyssa javanica* (Lekh Chilaune), *Bucklandia populnea* (Pipli), etc. In the underwood, *Engelhardtia spicata* (Mahuwa), *Eurya japonica* (Jhingni), *Rhododendron arboreum* (Guransh), *Viburnum* spp. (Asare), etc. are the main species.

In the upper reaches, the upper storey consists of *Quercus lamellosa* (Buk), *Q. lineata* (Phalant), *Machilus* spp. (Kaula). The other associates in the upper storey are: *Cinnamomum* spp. (Sissi), *Michelia excelsa* (Rani Champ), *Quercus lancaefolia* (Patle Katus), *Acer campbelli* (Kapasi), *Magnolia campbelli* (Ghoge Champ), *Q. pachyphylla* (Sungure Katus), *Castanopsis hystrix* (Katus), *Elaeocarpus lancaefolius* (Bhadrase) etc. In the middle storey, *Symplocos theifolia* (Kharane) is the main species and *Litsea* spp. (Pahenle), *Rhododendron arboreum* (Guransh), *Bucklandia populnea* (Pipli) etc are other associate species. Dense tall evergreen forests with oaks and Rhododendrons predominate. The undergrowth consists of *Arundinaria maling*, dwarf Rhododendron, ferns, epiphytic mosses and orchids. This area is also rich in birds including the Rusty-bellied and Lesser Shortwings, Kalij and Satyr Tragopan; reptiles like Japalura lizards, Cobra, Krait and Himalayan Pit Viper; Himalayan Bullfrog; butterflies and leeches. *Eupatorium* is a major weed competing out *Artemesia* and other secondary growth. Large Cardamom underplanted in forest patches and a tea estate at Temi are dominant features of the landscape as much as the naturalized exotic *Cryptomeria japonica* patches. Fambong Lho Wildlife Sanctuary in East Sikkim and Maenam Wildlife Sanctuary in South Sikkim are the two protected areas in this ecoregion.

Most of the human population of Sikkim resides in these two zones in an agricultural setting where terrace farmed rice, ginger, orange, cardamom are commercially grown while guava, banana, squash and marigold are common along with vegetables and herbs in homestead gardens. Forest produce like bamboo shoots, ferns and nettles are also collected during season. Soya bean, Millet and cruciferous vegetables are grown and processed into fermented foods like 'Kinema', a specialty of the Subba community; 'Gundruk' and drinks like 'Chang'. Exotic oyster mushroom cultivation is being popularized along with trial commercial cultivation of flowers like hybrid orchids and gladioli. Hybrid stall fed livestock is seen around villages while the local breed of 'Siri' Cow is grazed in the forests. Sericulture is practiced through schemes of the forest department while Apiculture is more of a hobby with the species *Apis cerana*. The government encourages pisciculture of Common and Grass Carp.

The Temperate ecoregion extends from 3000m to 4000m with mixed coniferous forests of Hemlock, Spruce, Pine, Fir and Junipers with shrubby undergrowth of Rhododendron and *Arundinaria*. Red Panda, Common Langur and Himalayan Black Bear, Lesser cats, Goral, Serow, Monal Pheasant, Fire-tailed Sunbird, Blue Magpie and few species of reptiles and amphibians are characteristic. Brown Trout *Salmo trutta fario* has been introduced in high altitude lake and river systems. Wild Seabuckthorn *Hippophae* sp. occurs some of which is collected for medicinal properties and as a dye. Potato and cabbage are grown as cash crops. Subsistence farming of wheat, barley and maize is carried out while beans, peas, some apple, peach and pear are grown on homesteads. Some amount of cattle rearing is practiced with stall fed hybrid milch cows and the rest grazed in forest areas. Farm trials of exotic Lilies is new here. Handloom cottage industry for making blankets, rugs and carpets uses some wool from sheep grazed at higher altitudes.

The Alpine forests and scrub extends upto 4500 m with small crooked trees and large shrubs interspersed with fir and pine. The stunted forest is mainly of rhododendron of many species. Dominant wild fauna includes Musk Deer, Himalayan Tahr, Blue Sheep, Blood Pheasant, Ibisbill and a toad. River systems harbor some of the (introduced) trout *Salmo trutta fario*. Most of the flora of this region attracts interest for medicinal purposes. Dwarf rhododendron leaves are used for burning as incense. This region has very little resident human population, mainly Bhutias and mostly pastoral, herding livestock like yak, dzo (cow-yak hybrid) and domestic cattle. Many wild edibles are collected from the forest floor like *Arisaema* sp. Tubers, 'Khendu' and mushrooms.

The Temperate and Alpine ecoregions are protected in four wildlife sanctuaries at Shingba (North), Kyongnosla (East), Pangolakha (East) and Barsey (West) and one national park namely Khangchendzonga National Park (North and West). They harbor representative biodiversity of these ecoregions.

Shingba Rhododendron Sanctuary is home to the endemic *Rhododendron niveum* which has been designated the State Tree. Kyongnosla Alpine Sanctuary has sheltered the Takin *Budorcas taxicolor*, which wandered over in 1999 through the newly declared Pangolakha Wildlife Sanctuary from Bhutan. The 104 sq km Barsey Rhododendron with its pure stands of Rhododendron is contiguous with the Singalila National Park in West Bengal.

The Trans-Himalayan ecoregion extend from 4500 m to 5500m with characteristic cold desert vegetation exclusive restricted to the north of Sikkim. This ecoregion has not yet been included in the protected area network of the state and is perhaps the most threatened as it contains mostly endangered species. Dominant among these are Kiang, Nayan, Tibetan Gazelle, Snow Leopard, Tibetan Wolf, Tibetan Snowcock, Lammergeier, Raven, Golden Eagle and Ruddy Shelduck. The region has a short four-month growing season during which grasses, sedges and medicinal herbs grow abundantly supporting a host of insect fauna as well as the wild and domestic herbivores, larks and finches. There are no permanent settlements. Human population consists of a small number of nomadic Tibetan graziers or 'Dokpas' (who herd yak, sheep and pasmina-type goats) and large number of Defence personnel as the area forms the international border with Tibet (China). Closure of the border to trans-humance over the last three decades has led to intense grazing pressure by both the domestic and wild herbivores on the land. The area also suffers from the presence of landmines causing casualties among yak, nayan, kiang and Tibetan wolf. Existence of feral dogs is a major hazard in this region. This ecoregion urgently needs to be represented in the protected area network of the state.

WILD NATURAL RESOURCES IN TRANS-HIMALAYAN SIKKIM

(TSO LHAMO PLATEAU, LHONAK VALLEY, LASHAR-YUMESAMDONG-DONGKIA LA)

Mammals

Red Fox, Tibetan Fox, Tibetan Wolf, Wild Dog, Himalayan Brown Bear, Martens, Weasels, Snow Leopard, Lynx, Kiang, Tibetan Gazelle, Nayan, Bharal or Blue Sheep, Himalayan Marmot, Woolly Hare, Mouse-Hare, Vole

Birds

Black-necked Crane, Bar-headed Goose, Ruddy Shelduck, Lesser Sand Plover, Redshank, Migratory birds, Golden Eagle, Himalayan Griffon, Lammergeier, Lesser Kestrel, Short-eared Owl, Tibetan Snowcock, Snow Partridge, Snow PigeonHoopoe, Raven, Himalayan Crows, Ground Chough, Redstarts, Grandala, Wallcreeper, Horned Lark, Wagtails, Pipits, Robin-Accentor, Snow Finches, Mountain Finches

AMPHIBIANS

Sikkim Snow Toad *Scutiger sikkimensis*

INVERTEBRATES

Many species of High-Altitude Butterflies, Moths, Beetles, Craneflies, Bees, Spiders, Velvet mites, etc. Also Snails, Amphipods, Nematodes

PLANTS

Alpine grassland and sub alpine flora including

· Medicinal plants like *Picrorhiza, Nardostachys, Gentiana, Aconitum, Podophyllum, Meconopsis, Ephedra,* etc.

· Plants with religious significance like *Juniperus, Rhododendron*

· Edible plants like Nettles, Wild Onion, Ground Orchids,

· Edible Lichens and Fungi (*Agaricus* spp.)

· Edible Algae

LANDSCAPES

Holy Lakes (Gurudongmar Tso, Tso Lhamo, Gyam Tsona and lesser lakes)

Holy Mountains (Khangchengyao, Chomoimo, etc)

Holy Passes (Chorten Nyima La, Dongkia La, etc.)

Old Stone Chortens made by Dokpas

DOMESTICATED RESOURCES

Animal:

Yak (pure Tibetan stock)
Dzo (strayed over from Tibet)
Sheep (of pure Tibetan stock)
Goat (Pashmina type, Tibetan stock)
Horse (of Tibetan and other stock)
Mule (used mostly by military personnel)
Dogs (contaminated Tibetan mastiff, Lhasa Apso breed)
Cat (domestic)

Plant:

Potato, Spinach

PRODUCTS OF HUSBANDRY

Wool (for blankets, sweaters, clothes)
Yak hair (for rope, tents),
Yak underwool (for blankets),
Milk (of yak, sheep, goat)
Butter (for lamps, salt tea)
Meat (fresh, dry and matured)
Cheese (dry, wet ('Churpi') fermented ('Phyilu'), sweetened),
Cream ('tema')
Fat ('Tsilu' stored in stomach pouch)
Skin (as floor mat), Leather (shoes)
Tail (as whisk)

The following has been written incorporating the views of the local people from the remote villages of Sikkim. They all felt that the present exercise was good and timely.

1. AGRICULTURE AND ANIMAL HUSBANDRY:

A lot of what we had such as disease free livestock and agriculture has disappeared today or is on its way out. Since most of the developmental activities are from the government's side, the locals are often not taken into confidence. Moreover new technologies, new seeds, chemicals, etc. are brought in, supplied or freely distributed. Now despite knowing that soil has weakened there is heavy dependence on these. Today even a developmental need such as roads has made people lazy. They have stopped growing their traditional crops such as 'Phapar' (Buckwheat), relying instead on cheaper foods from Siliguri, like 'atta' and 'maida' transported into their areas by roads. In fact it is cheaper to do so. Faulty educational practices have made the new generation fit neither for school, home or work in the fields. So now there are socio-economic problems manifesting. Now instead of natural dyes made from local plants, chemical dyes are in use, which is harmful to the people and the environment. New hybrid and exotic fodder species were introduced in various government programmes with not much thought to escapes into the nearby wilderness areas, many of which are protected areas. Traditional systems of rotational grazing and rotational collection of medicinal plants and herbs have almost disappeared due to new systems of governance (e.g. The time honored Pipon system of administration with a host of ecologically sound rules and regulations, practiced in Lachen and Lachung in North Sikkim has been given a backseat by the Panchayat Raj system. This Pipon system has been immortalized in the 'Surabhi' serial of Doordarshan. Most of farmers have domestic animals (Cows, Goats, Pigs etc) for milk and milk products, eggs, meat and manure.

DIFFERENT TYPES OF DOMESTICATED ANIMALS IN:

i. Dry High Zone (Trans Himalayan): Yak, Dzo, Horse, Sheep, Goat (Pashmina)
ii. Continental Upper Zone (Temperate): Horse/Pony, Cow, Goat, Pig, Sheep
iii Sub-Tropical Zone: Goat, Cow (Siri and Hybrid), Pig, Hen
iv Tropical Zone: Goat, Cow (Hybrid), Buffalo, Pig, Hen

2. FORESTRY AND WILDLIFE:

The existing protected area network was cutting off people from the natural resources. Ban on grazing, ban on collection of medicinal plants, felling of trees etc alienated people from their own resources by their own government. However new initiatives like JFM, EDC, etc. have been evolved to reinforce this joint ownership of natural resources resulting in a win-win situation wherein both the *bonafide* needs of the community are met and the natural resources are also conserved.

3. NATURALIZED EXOTICS:

Claude White introduced many garden plants into Sikkim from many parts of the world. Most of the exotic plants today in Sikkim thus began to appear during the beginning of the last century. Today the original vegetation and wildlife has been extensively disturbed by various developmental projects. Increasingly, a number of exotic plant species have out-competed the original vegetation. While some plants were intentionally introduced for beautification or economic utility, many have been coming into the state along with increasing road transport and food imports and reached pest status. E.g., Exotic weeds like *Eupatorium* sp. seem to be seriously competing with *Artemesia* sp. and spreading into the forest as well as urban areas. In fact *Eupatorium* is locally called 'Banmara' or 'forest killer' in Nepali. Other exotic weeds now well established include *Ageratum houstonianum*, *Bidens biternata, Erigeron karvinskianus, Galinsoga parviflora, Erichthites valerianiifolia* and *Calceolaria mexicana.*

Datura suaveolens native of Mexico has increasingly occupied sides of 'jhoras' (streams) and roadsides together with the edible Squash. In 1982 *Lantana camara* a tropical American plant was recorded as 'cultivated in only one Garden at Gangtok' in a document by Hazra & Das, 1982. Today the weed is commonly seen along the National Highway 31A and along state highways. *Digitalis purpurea* introduced during the 1860s is seen as a garden escape at Lachung in north Sikkim, like *Cestrum fasciculatum* at Gangtok. Clover is another fodder farm escape seen commonly in the sub-tropical zone here.

In the middle of the last century when sheep farming was initiated as a developmental activity in Dentam area of west Sikkim, there was need for nutritious fodder. An African grass *Panisetum clandestinum* was apparently air-seeded all over Sikkim. Now it is the commonest grass in Gangtok as well as at altitudes from 1200 – 2100m, having dominated all other grass species in this zone (S. Z. Lucksom *pers. comm.).*

Similarly some animal pests have also begun to manifest their influence here. An exotic snail for example, which may have come in along with the subsidized food grains is a major pest of food crops in many parts of the state today.

4. ANTHROPOGENIC IMPACT ON RANGE OF BIODIVERSITY:

Keeping the issue of 'Global Warming' in mind, many people remarked on the apparent micro-climatic change that seems to be affecting Sikkim. Several lowland species are now commonly seen in the sub tropical belt as well as in the trans Himalayas. A few animal examples:

House Sparrows earlier found only in lowland areas like Melli in South Sikkim are today quite common in Gangtok. **House Crows** are seen to have colonized higher reaches like Lachung (which have recently opened up for tourism) where they were uncommon earlier. **American Cockroach** (*Periplanata americana*) and **House Gecko** can be found today at Gangtok. Biting swarms of **Mosquitoes** occur in trans-Himalayan Lhonak Valley at well over 5000m with military camps and pack animal presence.

5. SACRED LANDSCAPES:

Yuksam' is a meeting place of Lamas Lhatsun Chempo, Gnadak Rinzing Chempo and Kathok Sempa Chempo who came to Sikkim from three different directions with an intention of establishing Buddhism. These monks searched for a fourth person as per the vision of Saint Padma Sambhava (Guru Rim-bo-che). They found Phunstsog Namgyal, who was brought to Yuksam and coronated as the religious king of Sikkim with the title of "Chogyal" meaning "the king who rules with righteousness or Dharma Raja". The event took place in 1642 at Norbugyang. The construction of Dubdi monastery also took place around the same time. The Lamas and the local people of Sikkim and Tibetans implicitly believe that Saint Padma Sambhava, found Sikkim during his journey to Tibet and personally consecrated every sacred spot along the Rathong Chu Valley in Sikkim.

Rathong Chu is an area, which the people of Sikkim perceive as the very basis of their present culture. Padma Sambhava, who is highly revered and worshiped by the Sikkimese Buddhists is considered to have blessed Yuksam and the surrounding landscape, by having placed within it a large number of hidden treasures (ters) and it is believed that they will only be slowly revealed to enlightened (terten) Lamas and discovered at appropriate time.

Yuksam region is considered to have 109 hidden lakes. Both the visible and less obvious notional lakes identified by religious visionaries are said to be presiding deities, representing good and evil. Propitiating these deities with different ceremonies is considered to be the path for salvation. Conserving and protecting these treasures from polluting and disturbing influences is considered to be vitally important for human welfare. Any major disruption to the river system would disturb the entire system of the area.

Sikkim is the only state with an Ecclesiastical Department in the state government, which is entrusted with the responsibility of the upkeep of the monasteries and other places of worship. Almost all the gompas (monasteries) and other religious institutions are responsible for a considerable degree of (unintentional) biodiversity conservation. Natural landscapes have been consecrated as sacred forests, sacred lakes, sacred boulders, stones and sacred spaces around these monasteries. Even lakes and mountains rocks and caves, springs and rivers here are considered holy as a result of which there is natural inhibition about polluting them. However these traditional beliefs are slowly eroding under the onslaught of modern education, consumptive lifestyles and other western influences.

BASELINE INFORMATION ON BIODIVERSITY IN SIKKIM

(A) BIODIVERSITY RESOURCES:

(Local names used where possible)

PLANTS		ANIMALS	
WILD	**DOMESTICATED**	**WILD**	**DOMESTICATED**
Medicinal Plants in high to low altitudes including Insectivores (*Drosera, Utricularia)*	Crops (Grains, Pulses)E.*g.* Maize, *Jhao, Gau,* Rice, *Kodo, Kalo Dal, Batamas,* Beans *(TIBI), Ghiu-shinbi, Masoor*	Lowland E.g. Barking Deer, Peafowl, Leopard, Langur, Kalij, *Luinche, Chamera*	Cow (Gai): Indigenous: E.*g. Siri* Exotic: *Jersey* and other hybrids
Wild Vegetables, Flowers E.*g. Bethu, Khendu, Tho, Sisnu, Simrayo,* Bamboo shoots, Ferns, *Nakima*	Vegetables e.g. Potato, Cabbage, *Saag,* Radish, Peas, *Phapar, Kenyum (Latte saag), Dalda saag,* Pumpkin	Temperate E.g. Goral, Shapi, Serow (*Jharal*), Bear, Musk Deer, *Danphe, Monal*	Yak Dzo
Mushrooms e.g. *Karsha, Seysha, Yarcha Gombuk*	Exotic Vegetables e.g. Broccoli, Brussels, sprouts, Squash	Trans-HimalayanE.g. Nayan, Kiang, Snow leopard	Sheep: Highland *Bhenglu* Lowland *Bheda*
Wild Fruits eg. *Lapsi, Pomsi, Kusum, Kiwifruit,* Mango, *Hippophae,* Strawberries,	Fruits eg. Apple, Orange, *Naspati, Aarucha, Aru,* Banana, Papaya, Guava, Jackfruit	Butterflies, Moths, Beetles, Molluscs, Dragonfly, other insects on land, in water	Goats: Highland *Chengra* Lowland *Baakhra*
Wild Nuts e.*g.* 'Okhar, Katus	Nuts	Fishes (22 wild species 1 exotic)	Domestic Fish *e.g. Goldfish, Carps*
Rhododendrons, Junipers (religious dhoop)	HerbsE.*g.* 'Dhania, Pudina, Tulsi'	Frogs, Toads	Horse
Spices/Seasoning Herbs e.g. 'Elaichi, Tejpatta, Rampo, Timbur, Chimphing'	Spices / SeasoningE.g. Haldi, Adua, Lasun, Tori, Methi, Chilli,	Snakes, LizardsE.g. Python, Cobra, *Chepara* (Lizard)	Donkey, Mule
Fuel/Firewood trees	Domesticated Bacteria and other micro flora (in *Kinema, Gundruk, Sinki, Chang, Cheeses*)	Earthworms, Spiders	Buffalo
Timber Trees		Crabs	Pigs (local and exotic)
Fodder Trees Fodder Grasses	Exotic Fodder GrassesE.g. Kyu-Kyu Grass	Soil nematodes	Poultry: Indigenous: *Bustee* Exotic: Leghorns
Lichens		Micro fauna	Guinea Pigs, Rabbits e.g. Angora, Albino, Chinchilla
Mosses		Wolf, Fox, Jackal, Wild dog	DogsE.g. Feral, Tibetan mastiff, Lhasa Apso
Algae e.g. *Chusha*		Lesser Cats	Cats: Feral cats
Orchids	Hybrid Orchids	Wild birds	Pigeons: Feral Blue Rock
Naturalized exotics e.g. *Digitalis*, 'Dhupi'		Honey bees (rock bees *Apis dorsata*, 'Pudka', 'Khetauri')	Domestic Honeybees *Apis cerana indica*
Natural Dyes E.*g. Rumex* sp.	Mulberry bush	Wild Silk Moths	Domestic Silk Worm
FibresE.*g.* 'Argeli'			
WeedsE.g. *Eupatorium (Banmara)*			

[B] NATURAL & CULTURAL RESOURCES: (What We Have To Conserve)

TOPIC	EXAMPLES
Culture & Tradition	House design, Dress, Household items of NTFP, carrying babies in homespun clothes, dances
Festivals, Religious plays	*Maghe Sankranti, Chhaam, ChaiteDasain, Drukpa Tseshi, Panglhabsol, Ram Navami*
Good Forests	Protected Area Network, Trans Himalayan ecoregion
Handicrafts	Weaving carpets, *Gyavas*, Blankets, *Raadis*, Woodcrafts
Holy Lakes, Pilgrimage sites	Gurudongmar, Khecheopalri
Hot springs, Thermal water	Yumthang, Tarum, Borong, Polok, Phur Tsachu
Hydro Energy	Rivers Tista, Rangit and their tributaries
Indigenous Musical Instruments	*Madal, Lingbu* (flute), *Gyaling, Dhaengro, Damnyey*
Minerals, etc.	Copper, Iron, Lime, Dolomite, Limestone, Coal, Quartzite, Talc, Silicate, Graphite
Monasteries, Gompas, Temples, Caves, Sacred spaces	Rumtek, Pemayangtse, Thakurbari, Khendu Sangphuk
Mountain scenery	Khangchendzonga, Siniolchu, Pandim, Khangchendgyao
Pipon System of traditional village administration	Lachung, Lachen
Sacred Forests	Kabi, Forests around monasteries (Gompas) and water sources
Solar Energy	Muguthang, Chho Lhamo, Lashar, Thangu (trans-Himalayan Ecoregion)
Traditional health systems	*Amji, Bonthing, Pau, Jhankri,* Faith healers
Trekking landscapes for mountaineers, trekkers, artists, poets, etc.	Green Lake, Dzongri, Kyongnosla, Barsey
Waterfalls (Chumbo) and Cliffs	Bop, Changey, potential for micro-hydroelectric energy, rock bees, honeyguides
Wind Energy	Tso Lhamo plateau

(Local names used where possible)

Chapter 4

STATEMENT OF PROBLEMS PERTAINING TO BIODIVERSITY

ISSUES	STATEMENT OF PROBLEMS (GAPS)
Deforestation	Consumptive lifestyles of urban population and developmental activities like roads, hydroelectric power projects etc
Hunting / Poaching Bio-piracy	Lack of awareness and law enforcement Lack of awareness among villagers Lack of enforcement of existing forest and wildlife laws
Effective Policing	Forest, Police need awareness, training, equipment and manpower
Alien / Invasive / Exotic Species	Plant and Animal Species introduced either intentionally or accidentally
Popularization of hybrid varieties	Introduction and popularization of hybrid varieties by private nurseries and government departments
Wildlife Research	Lack of funds and manpower
Chemical Biocides, Fertilizers	Village heads complain about degraded soils and new diseases
Culture Erosion	Unplanned 'eco'-tourism
Change in Food Habits	Availability of subsidized food grains through PDS resulting in decrease in cultivation of indigenous varieties of food grains
Roads, Bridges, GREF	Defence activities in biodiversity rich areas Roads, Bridges; constructions in biodiversity rich areas; Landslides Lacks biodiversity conservation planning in their policies and programmes
Defence Establishment	Defence activities in biodiversity rich areas Occupied biodiversity rich forest lands with hindrances for forest managers including accessibility
Power generation & supply, Projects by NHPC, Power dept.	Micro / Macro hydroelectric projects DPR not in consonance with natural resources of the area
Fuel and food depots	Lack of state government run fuel and food stores specially in the remote areas (which are biodiversity rich)
Health / Hospitals	PHSCs under stocked with medicines, in remote areas villagers rely more on *Amjis, Jhankris* etc. Biomedical waste often goes untreated
Garbage disposal	Lack of management results in pollution
Pollution Control	State Pollution Control Board is understaffed and lacks funds
Sanitation	Need for scientific management of Sewerage and Biomedical waste
Schools	Need for training of teachers, Accommodation for teachers, Hygiene (provision of Toilets), Need to include environmental education in the school syllabus at appropriate levels
Low Cost Rural Technology	Cardamom Drier, Bio-Fertilizers / VermiculturePaddy Husker, Micro-Hydroelectric Petrix Set, Bio-Bricketing, Solar lighting
Telecommunications	Better communication facilities are needed in remote biodiversity rich areas
Tourism	Need to focus not only on tourism infrastructure development but also on capacity building of the people to improve the services sector
Transport	Truck and taxi drivers' associations need to tackle traffic, pollution/ emissions
Water Supply	Need of conservation of water sources and safe drinking water

Lack of Infrastructure or its maintenance arises from the fact that the state government has few sources of revenue due to limited industrialization and limited tax collection

Chapter 5

MAJOR ACTORS, THEIR ROLES AND INITIATIVES RELEVANT TO BIODIVERSITY

Name & Address of Organization / Individual	Role and Initiatives
1.BSI, Sikkim Himalayan Circle, Gangtok	Flora documentation & research
2.CWC, Tadong; Superintending Engineer	Water resource study, monitoring
3.Village level institutions like Panchayats, Joint Forest Management Committees, Ecodevelopment Committees, Watershed Committees, Pipons, etc	Administration and Conservation at village level
4.NGO's based in Sikkim and India	Promoting conservation and livelihoods
5.GBPIHED, Tadong, Gangtok 6.Sikkim Government College, Tadong	Research & Development
7.International Donors (AUSAID, UNDP, GEF, World Bank etc)	Funding programmes
8.Geological Survey of India, GoI, Gangtok; Director	Geological research, glacier study
9.SHRA	Hospitality Industry facilitates ecotourism
10.ICAR Research Complex	Agriculture & Animal Husbandry Research
11.IOC (Liquid Petroleum Gas or LPG Bottling Plant) Bagey Khola, Bardang; Manager	Providing alternatives to firewood
12.Khadi Commission	Apiary and allied cottage industry
13.Manipal Institute Vice Chancellor 14.Central Referral Hospital, Tadong, Gangtok	Manipal University Bio-Medical waste management
15.Traditional Health Practitioners	Repository of indigenous knowledge of biodiversity resource use
16.National Institute of Orchids, Pakyong; Director	Orchid breeding center
17.NHPC:Rangit HE projects, Legship, South Sikkim; Tista HE projects, Tista Stages 5, Singtam	Hydroelectric Power Projects in river valleys
18.Spices Board	Large Cardamom Research
19.State Pollution Control Board	Industrial Pollution control
20.TAAS	Streamlining of travel agencies
21.All 4 (four) District Collectors:	Enforcing Law and coordinating development
22.Telecommunications	Connectivity to remote biodiversity rich areas
23.Departments of Government of Sikkim Agriculture Dept., Animal Husbandry and Veterinary Services Dept., Government Institute of Cottage Industries, Horticulture, Floriculture Depts Industries (incl. MDs of Temi Tea, Labott Glass, Fruit Preservation, Distilleries & Breweries Science & Technology Dept., SIDICO / SABCO	**LIVELIHOOD GENERATION**
Dept of Food & Civil Supply, Human Resource Devp. Dept., Health Dept., Forest, Environment & Wildlife Management Dept., Police Dept.	**ESSENTIAL SERVICES**
Buildings & Housing Dept., Irrigation & Flood Control Dept., Motor Vehicles Dept., Public Health and Engineering Dept., Power Dept., Roads & Bridges Dept., Rural Development Dept., State Trading Corporation of Sikkim., State Tourism Development Corporation., Tourism Dept., Urban Devp. & Housing Dept.	**INFRASTRUCTURE DEVELOPMENT**

ONGOING BIODIVERSITY RELATED INITIATIVES:

STATE GOVERNMENT: POLICY AND PROGRAMMES

The state has adopted and implemented policy for the management of natural resources based on the principle of conservation and sustainability. Keeping this objective and vision for future in the mind, state government has already taken up the following initiatives / steps in this direction to overcome the challenges in sustainable development:

1. State government has passed and announced a comprehensive State Policy on Forests, Environment & Land Use, 2000. As per the provision of this policy the budget in the field of Forest, Environment and Wildlife will be enhanced to 5% of the annual outlay.
2. Compulsory environmental education for school children including forest, wildlife, cultural heritage etc. Extension and training programs for the same.
3. Environmental Impact Assessment, Management Plan and Catchment Area Treatment Plan for all the Hydro Electric Projects and in other Development projects if required. The Environment Impact Assessment and the Environment Management Plan for the Tista Stage V (HEP), 510 MW project has been done by the state government.
4. Abandoned and closed the construction of Rathongchu Hydro Electric Project and Firing Range "G" to save the environment, bio-diversity and rich heritage of the state.
5. To preserve the fragile ecology and heritage, the state government has banned the scaling of important peaks, including Khangchendzonga for mountaineering expeditions. For preservation and protection of unique terrestrial and aquatic ecosystems of the wetlands in the state, the state government has not permitted, and will not permit in future, any commercial activities in all the natural lakes / wetlands of Sikkim.
6. Eco-governance has been strengthened, by launching the "CM online" Website for bringing about accessibility, accountability and transparency in government functioning. All government / cabinet decisions and notifications are readily accessible on the Internet. In addition, Community Information Centers have been setup (40 nos.) all over the state.
7. By Legislation banned the use of Non-biodegradable materials like plastic, polybags etc. very successfully.
8. Integrated approach & efforts by all the Inter- linked sectors for sustainable development and pollution free Sikkim.
9. Government has directed through a notification to all the government departments and institutions to keep their compounds green and pollution free.
10. Banned green felling in forests, no clear felling, only dead, dying and diseased trees are allowed to be removed for the bona fide use of the people in the state.
11. Banned grazing in reserved forests areas, plantation areas and water sources. Fodder collection is allowed on sustainable basis.
12. Declared year 1995-96 as "*Harit Kranti*" year and period 2000-2010 as '*Harit Kranti Dashak*" for Forestry with free distribution of seedlings; massive afforestation program and protection of natural resources through people's participation at all levels.
13. Minimum diversion of Forests land for non-forestry purposes (only approx. 700 ha in last 20 years) and compensatory afforestation (approx. 1700 ha.) completed.
14. Notification on Joint Forests Management and its implementation under all the schemes/Program in all the four districts. Constitution of 145 JFMC, covering an area of about 3000 ha. Notified and implemented the Sikkim Ecodevelopment Notification 2002 for collaborative wildlife management in and around protected areas.
15. Integrated Afforestation and Integrated Watershed Development Program and more emphasis on Fuel wood and Fodder plantation to reduce biotic stress on natural forests. Constitution of about 25 watershed committees, under the IWDP scheme being implemented through the Zilla Panchayat.
16. Launched "*Smriti Van*" program in all the districts to bring people close to the Forests & Environment by bringing it to each panchayat/block/village level in a phased manner.
17. Constituted a state award "*Rajya Van Samrakshan Evam Parayavaran Puraskar*"
18. Perspective planning (State Forestry Action program and State Forestry Research plan) and proper enforcement of Acts / laws and regulations (Amendment in Sikkim Forest Act).
19. A Network of National Parks, Sanctuaries and Biosphere Reserve for conservation of bio-diversity. The Khangchendzonga Biosphere Reserve has been notified, bringing the total protected area cover to 38% of the geographical area, which is the highest for the country. Another wilderness area Pangolakha has also been brought under the protected area network.

20. The Biodiversity Strategy and Action Plan is under formulation and will be provided adequate legal backing by enacting the "Sikkim Biological Diversity Act".

21. Lopping of Dhupi Tree (*Cryptomeria japonica)* is banned for various purposes in the state.

22. Protection, conservation and development of Medicinal plants, Herbs and other Non -Timber Forest Produce, bamboos, herbal gardens etc.

23. For Forests protection, prevention and control of Forests fire, Wireless communication network installed and Arms would be provided.

24. State Act "Sikkim Forests, Water Courses And Road Reserve (Preservation And Protection) Act 1988 has been amended with most stringent provisions for offences, most of them made non-bailable.

25. Soil conservation and reclamation of land slide areas has been accorded top priority, as in the past few years the state has experienced heavy socio-economic losses due to landslides, floods and slips, blockages and drought.

26. Tourism Development on the committed principle of Eco-tourism and Nature tourism. A "Tourism Master Plan" has been developed in consultation with experts, and is under the process of implementation.

27. Formulation of Urban forestry / Eco-cities / Eco-village project for management and development of urban environment is in pipeline.

28. Encouragement and establishment of Eco- friendly industries only in the state.

29. Special emphasis on public relations, publicity, extension and awareness as well grievances relating to environment and establishment of a network of dedicated NGO are to facilitate the various development works.

30. The Sikkim Human Development Report is also completed and will be adopted as the basic document for the sustainable development of the state.

31. Minimum and controlled use of chemicals, insecticides, pesticides etc. and encouragement of bio-pesticides and bio-manure using vermiculture and composting for agriculture, horticulture and floriculture.

32. In order to provide ample employment opportunity in rural areas, state government is providing 70% of the total state plan outlay in rural areas. Capacity building, legal support, more autonomy and financial support are strengthening the Panchayati Raj System.

33. For the environment safeguard of urban areas and to reverse the trend of deteriorating urban environment, the state government has taken appropriate step for Safe Drinking Water Supply, Improved Sewerage System and Efficient Solid Waste Disposal System.

34. Sikkim Vision 2000 has been prepared on the principle of sustainable development.

35. In the Sikkim Democratic Front Party's decadal conference held at Namchi during 1st to 4th March 2002 the resolutions for protection and conservation of natural resources, protection of environment and protection and conservation of biodiversity was given top priority and were passed with thumping majority. Protection of glaciers, wetlands, butterflies, medicinal plants, birds, animals, orchids, rhododendron etc was given special priority. For Environmental protection the conservation of forests, wildlife, water resources, culture and tradition were given top priority. For biodiversity research, extension, policy formulation, patenting etc were discussed.

36. For reducing the dependence of villagers on firewood collected from forests, the LPG connection programme was launched for below poverty line and economically weaker section of society on 15th August 2002.

37. For overall conservation and development of medicinal plants a State Medicinal Plants Board was established in June 2002.

38. Community participation for conservation was institutionalized through the creation of Forest Development Agency. Administrative powers and devolution of financial powers has been done for the JFMC / EDC

39. For better protection of Forest, Environment and Wildlife infrastructure like check posts, arms and ammunition; wireless communication was created and strengthened.

40. Eviction of a number of illegal encroachers from forests and protected areas done.

41. Manifesto for Panchayat Elections October 2002

Para 36 *Preserving our environment is a major responsibility. All Panchayats will work diligently towards this end. They will ensure that their gram panchayat is pollution free.*

Para 37 *Panchayat will open registers to register every species in their area – as to the kind and the usage especially of the medicinal variety. This way they will also undertake to protect the biodiversity – our flora and fauna as well our traditional knowledge base. All this will be done on a war footing.*

Para 39 *Panchayats will indeed also need to protect*

and preserve our chautaras, pauwas, deoralis, gufa (caves) and other holy and socially valuable places. These are part of tradition and serve the people very effectively even today and so they will be needed to be protected and their efficacy enhanced.

Para 40 *Panchayats will carry out tree planting in Smriti Vans – there is going to be one in every gram. They will make environmental plans and plans for plant protection for species that grow specifically in their geographical location. Plantation of Argeli and Bamboos species will also be taken up in full.*

Para 46 *They will also look after the Khasmal and Goucharan land and take necessary action to protect it.*

42. The state shall not promote use of agrochemicals (fertilizers and pesticides), organic farming to be promoted.

In the above programmes for Sustainable Development, it has to be kept in mind that in Sikkim there is very little or nil scope for further increasing the area under arable Agriculture to augment the food production. The main problem therefore is how to provide food and other resources to the growing population and at the same time ensure that the benefits of the development reach even the poorest of the poor.

Thus, the state is taking all necessary steps to protect, conserve and develop the natural resources on sustainable basis. In this effort, sufficient financial and technical assistance is needed from the Government of India in the form of Centrally Sponsored Scheme and External aided projects. The state cannot exploit the natural resources with revenue as a target, as the state falls in the ecologically sensitive zone and in a fragile ecosystem.

LOCAL NGOS: POLICY AND PROGRAMMES:

A. **KHANGCHENDZONGA CONSERVATION COMMITTEE (KCC):**

1. **Conservation Education:** Awareness campaign among the rural masses through workshops, fairs, street plays and model demonstrations; involving students actively in conservation activities; Conducting seminars and quizzes in schools and also training school teachers on how to impart conservation education to school children.
2. **Training:** Different skill development training at a very basic level for porters, vegetable farmers, cooks, pack animal operators and local guides.
3. **Micro planning:** In order to ensure a more holistic approach to development, we carry out micro planning exercise jointly with the various government departments, specially the Forest Department. This grass root level planning through the technique of Participatory Rural Appraisal ensures that both conservation and development go hand in hand.
4. **Advocacy with Government agencies:** Advocating and lobbying with the government agencies for appropriate policies in tourism sector for sustainable development, which would benefit the community to conserve the natural resources.
5. **Monitoring:** Monitoring the use of natural resources in and around the Khangchendzonga Biosphere Reserve. Monitoring the tourism enterprises that are operating trek in the area to control illegal extraction of herbs, incense and other medicinal plants as well as proper disposal and management of waste. Strengthen the monitoring of wildlife and poaching with the help of porters, cook, tourists and guides.

B. **ECOTOURISM AND CONSERVATION SOCIETY OF SIKKIM (ECOSS):**

1. Training and Capacity building of NGOs and stakeholders involved in Ecotourism and Conservation
2. Combined conservation activities in collaboration with SIF (Singapore International Foundation)
3. Gangtok School Sanitation and Environmental Program in collaboration with HDFS
4. Village Tourism activities in Khedi in collaboration with KEEP
5. Training Capacity Building and Participatory Planning with Forest Department - FDA project
6. Research and Extension in the Field of Ecotourism
7. Village Tourism and Community Development activities in collaboration with FRHLT (INGO)
8. EDP Training on Ecotourism Enterprises with collaborating Institutions
9. Entrepreneurship Training for unemployed Youths - CMSES Program
10. Ecotourism initiatives in West Sikkim in collaboration with The Mountain Institute

C. **SIKKIM PARYAVARAN SANRAKSHAN SANGH (SPSS):**

1. Promoting alternate livelihoods: Different skill development trainings at a very basic level for vegetable farmers, use of biogas, energy efficient chulahs, bamboo propagation, NTFP promotion, etc.

2. Advocacy with government agencies: advocating and lobbying with government for appropriate policy for conservation and sustainable utilization of natural resources
3. Rehabilitating Tendong: afforestation activities, water source conservation, reducing forest and wildlife offences
4. Conservation Education: generating awareness among villagers through workshops, fairs and other programmes involving students actively in conservation activities
5. Grassroot Institution building: formation and capacity building of *Pani Panchayats* around Tendong Nature Reserve
6. Appropriate technology intervention: introducing ecofriendly interventions to reduce the dependence on natural resources, e.g. GI wire mesh in lieu of branches and poles for cultivation of Squash (vegetable)

D. **GREEN CIRCLE:**

(a) To develop ecological ethics – a change in the attitude of Man, towards Man, his Heritage and culture, Society and Nature in realization of man as part of Nature and not alien to it.

(b) To create a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.

(c) To help individuals, groups, institution etc. especially the youth to:
   (i) Acquire an awareness of and sensitivity to the total environment and its allied problems.
   (ii) Acquire skills for identifying and solving environmental problems.
   (iii) Work towards resolution of environmental problems.

(d) To actively participate in preventing and solving environmental problems.

(e) To serve as a platform for any individual(s), NGOs, institutions and Governments at various levels and interacting with them to focus on current and potential environmental situations.

(f) To utilize a board array of educational approaches to teaching and learning about and from the environment with due stress on practical activities and first hand experience.

(g) To take necessary action(s) against environmental exploitation and act as an environmental watchdog.

To do all things and to perform all such acts as may be necessary or appropriate for the achievement of any or all of the above aims and objectives without the interest of any political or religious group.

Chapter 6

COMMUNITY STRATEGY AND ACTION PLAN (CSAP)

Serial	Ecoregion	No of Public Hearings	Sample CSAP
A	Trans-Himalayas	2	Chho Lhamo – Lashar (North)
B	Temperate	3	Lachen (North), Yuksam (West)
C	Subtropical	27	Hee Patal (West)
D	Tropical	8	Kitam (South)

A. TRANS-HIMALAYAN ECOREGION

PROBLEMS AND ISSUES	POSSIBLE SOLUTIONS
Grazing restrictions for free ranging livestock like Yak, Sheep, Goats on international border	Army to not restrict traditional rotational grazing practices
Army occupation of land for grazing and housing	Indian army to provide alternative housing and take cognisance of traditional grazing areas
Landmine casualties	Proper fencing of land mined areas, Compensation by Indian Army
Over harvesting of medicinal plants by outside agencies	Strict vigilance by Forest staff in uniform assisted by military Awareness among the local people of loss of biodiversity
Feral Dogs menace	Culling operations by military and civilians
Dependence on military resources	Easier access to basic amenities by State Govt.; Military to check pilferage of date expired tinned foodstuffs and other amenities
Poaching of wildlife including plants, timber, etc. by non-native people	Compulsory Awareness courses on natural history of Sikkim to military, BRO and their laborers; Stricter vigilance by field staff of Forest Department, which should make sure that staff, has incentive, plus all the basic field equipment, training w.r.t. rules, regulations, procedures and good transport for high altitude Active assistance of IB & Sikkim Police especially in difficult areas and at Check posts
External control / restrictions over sale of own resources out of trans-Himalayan Sikkim	Since grazing is on Forest Land, Forest Dept. should have some say in sale of by-products
Lack of value addition to products	Provide trainings & skill development for Wool Industry (sheep wool; yak hair, underwool)Milk Processing Centre (viable only in summer) Cheese Plant (viable only in summer) Solar Energy Appliances, Wind Energy Appliances, Leather processing, Handicraft & Handloom, Herbal Gardens & products including

BIODIVERSITY STRATEGY AND ACTION PLAN FOR CHHO LHAMO & LASHAR VALLEY, NORTH SIKKIM

ACTIVITIES	WHY	WHO	WHERE	HOW	INDICATOR
Yak improvement (Those from Ha Valley, Bhutan, will not be able to survive the sub-zero plateau winters)	Existing yak inbreeding, smaller in size, less milk, meat. Department's present crosses not as good as earlier Tibet crosses	Indo-Swiss Project of Sikkim (ISPS), Animal Husbandry Department in consultation with the elder Dokpas	Muguthang, Chho Lhamo and Lashar	In full consultation with experienced Dokpa elders	Healthier yak, more meat, milk
Sheep breed improvement(exotics will not be able to survive the sub-zero plateau winters)	Inbreeding problem, breed only once unlike exotics	Dokpas to be consulted and taken into confidence by ISPS, AH&VS Dept.	Muguthang, Chho Lhamo and Lashar	Good care of existing animals, which are of hardy Tibetan stock. In case of exotics, the Govt. should take full responsibility of care, feed, medicine, esp. during winters	Wool improvement, industry, better meat, milk
Wool Cottage Industry at **Thangu**	Wool harvest from Sheep & Yak can be processed there itself instead of sending out raw material	Dokpas with Lachenpas and assistance by GICI	Thangu, North Sikkim	Exchange & Exposure programmes for tribals, initially from Govt. which should buy wool directly from Dokpas	Employment opportunities for the youth
Milk Collection Centre and **Cheese Plant at Thangu** (only in summer)	Better processing and marketing of milk and milk products	AH&VS Dept., Indo-Swiss Project, Power Dept, Dokpas of trans-Himalayan Sikkim	Thangu, North Sikkim Milk collection from Dongkung, Chho Lhamo Lashar maybe even Muguthang	300 lt. Capacity Centre to be made by ISPS assistance; milk collection by public	Distribution to Army; Cheese Plant; Locally trained youth, economic benefits

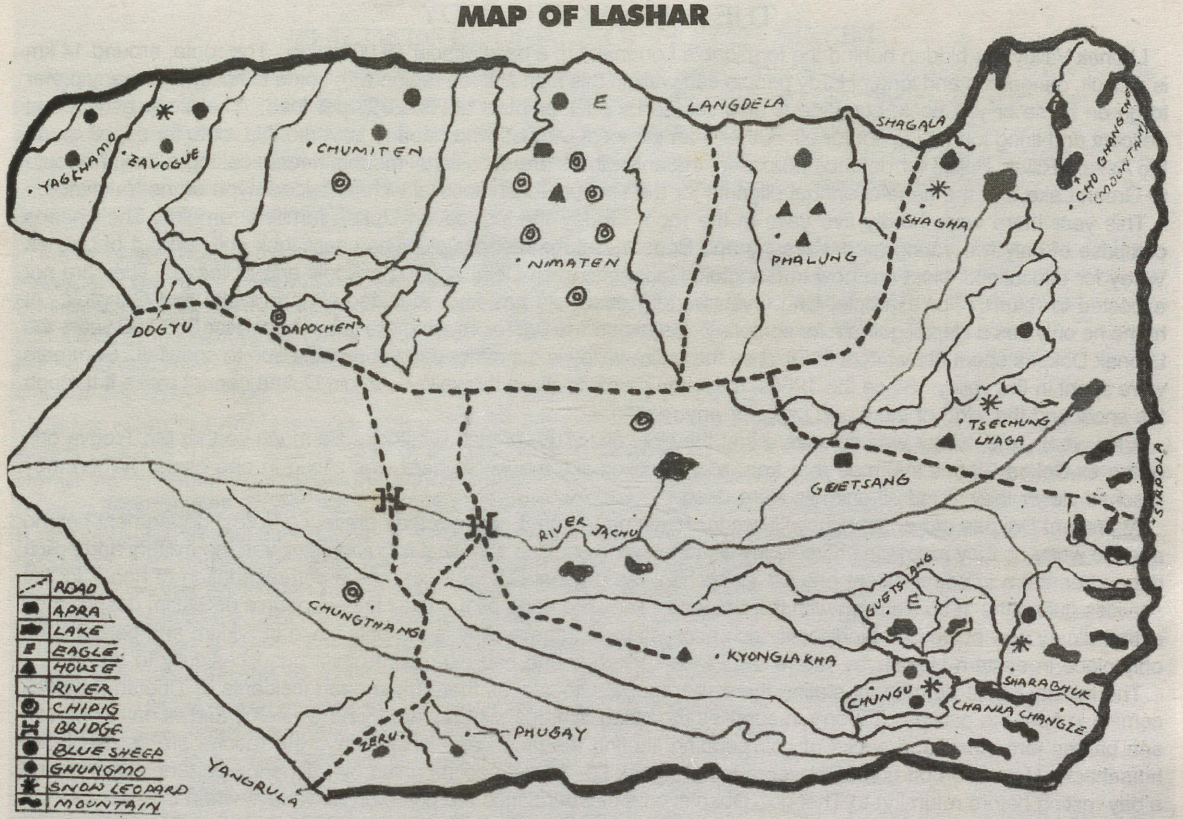
- continued overleaf

- continuation

BIODIVERSITY STRATEGY AND ACTION PLAN FOR CHHO LHAMO & LASHAR VALLEY, NORTH SIKKIM

ACTIVITIES	WHY	WHO	WHERE	HOW	INDICATOR
Power Project a. Chaten Phase-II (3 MW) b. Tarum Chu (10 MW)	For Milk Centre, Cheese Plant, Wool industry, Household use	Power Department	Chaten Chu Tarum Chu	After due formalities, surveys, permissions	Uninterrupted Electric supply for Homes and Factories
Cooking Gas conne ctions	To ease cooking pressures of wet dung fuel during summer	Can buy privately or subsidised by Forest Department	Thangu, Dongkung, Chho Lhamo, Lashar	Gas connections, cylinders to be provided through Ecodevelopment Programme	Preservation of fuel wood in lower areas, dung can dry over winter
Check over Poaching	Lots of snaring of Blue Sheep, Snowcock when *goths* migrate from Lashar	Forest Dept. WL Circle	Lashar and areas surrounding Thangu like Mebazong, Yakaamo	Vigilance by Forest officials, regular patrolling, awareness programmes	Wildlife has always coexisted with man
Upgradation of Medical facilities: Doctor at Lachen Compounder at Thangu	So far, only limited army facilities but none for women and children	Health Department	LachenThangu	Construction of 50 bedded hospital at Lachen; PHC at Thangu with eco-friendly waste disposal facility	Better health of Women and Children
Shallow portable Borewells to be provided	Water problems during winter due to freezing	RDD and Army	Lashar, Dongkung, Yum Tso	Advice and assistance by RDD and Army	Water available during winter from below four feet underground
Wildlife Consrvtn. Area to be declared on the Cold Desert	Most Sch I species of wildlife occur in this endangered habitat	Forest Department, Indian Army and relevant agencies	Lhonak Valley to Yumesamdong, including the Chho Lhamo Plateau	Using data collected during Alpine Grassland Ecology Project of the Forest Dept.	Protection of the endangered species and fewer wildlife casualties
Grazing restrictions along IB in North Sikkim to be lifted	Local livestock dying due to lack of fodder in restricted area, while grazing unchecked from animals across IB	Forest Dept, Indian Army, Pipons of Lachen, Lachung as well as Dokpa Pipon, Home Dept.	IB in North Sikkim	Army to take cognizance of traditional rotational grazing of livestock like Yak, highland sheep, goat on the Forest Land	Fewer casualties of already endangered livestock

MAP OF LASHAR





Last Of The 'Dokhyi' Or 'Phyu-Khi' Or Tibetan Mastiff Sheep-Dog

Over a gradual period of two decades or so, Sikkim has lost the Tibetan Mastiff, a magnificent pure breed of dog belonging to the nomadic 'Dokpas' or Tibetan graziers in trans-Himalayan Sikkim. Lonely army personnel diluted the breed with mongrels brought up as pet pups from lower altitudes to the cold desert. On finishing their stint in this difficult region, usually over a year or two, they left leaving the dogs behind. These fed off the kitchen and mess wastes and multiplied over the years. They have now taken to roaming in packs on the plateau in Chho Lhamo, Lhonak and Lashar, hanging around army camps and the village of Thangu, preying upon wildlife and have even been seen swimming in the glacial lakes after Ruddy Shelduck chicks. Of late they have taken to preying upon domestic livestock of the Dokpas.

The pure breed of Tibetan mastiff had been reduced to one very old male at Thangu Monastery, which was subsequently presumably eaten by the non-native residents of the area. All other dogs are now completely mongrelized. In order to save or revive the breed it is possible to purchase pedigree stock perhaps from remote areas in Bhutan or Nepal or even Tibet. The Dokpas are confident of training this master herder in the lost art of herding yak, sheep and goats on the Tibetan plateau accompanied by a slingshot bearing Dokpa.

National Biodiversity Strategy and Action Plan © NBSAP- Sikkim State

THE LHONAK TRAGEDY

Lhonak Valley lies hidden behind the formidable Lungnak La, a pass almost 18,000' high. The route, around 14 km is difficult, dangerous and long. Hardy people can walk in this high altitude region with some difficulty, but many prefer to go on horse or yak back. Luggage is also carried by pack animals at Rs. 200/- per load. The steep ascent and descent and tiring journey is not for all. Other than the local Dokpas who need to traverse this route for supplies and the Assam Rifles, Police for defence purposes, the only others are occasional mountaineers seeking a downhill route to Green Lake and the handful annual pilgrims for the Drukpa Tseshi festival with its added hype of the Yak-Race.

This year there were hardly five yaks in the race. Today the last seven Dokpa families remain. Their heads comprise of only two young men, Karsang and Sonam. All the rest are old. They sent their children out of Lhonak Valley for education. Most are now in Gangtok, Rabangla, even Delhi in good schools and colleges. They are not expected to return. For example, Cho Gyenchen 54 years old has four educated sons in Delhi and Gangtok. At home he only has a Nepali gothala for company. He expects to live for seven more years. For over 200-300 years the Lhonak Dokpas spent the winters in Tibet as the entire valley is cut off for several months due to snowfall. Summers were spent in the valley. Since the 1960s, they stay permanently in the valley. An old Dokpa cannot make it through the snow and the wind of the steep pass for any reason.

A few years ago, winter was so severe that they lost over 70% of their livestock. So much so that Mr. Tsogya one of the ex-Dokpa Pipons informed that from afar it looked like the whole herd was sitting in one place. When they reached closer they found all animals were dead.

At present Dokpas are unpaid chowkidars for forest department. Due to their presence Forest department has no need to worry as they roam the entire valley with their yaks and can see what is going on. Even the military and police depend on them to some extent and Mr. Langchen, the present Dokpa Pipon has a commendation of honor for his services during the 1965 skirmish with the Chinese. They are perhaps the least known people of Sikkim despite their extraordinary way of life in a biodiversity rich ecosystem. Lhonak valley is the only place in Sikkim and perhaps the only place in eastern Himalayas where the Black-necked Crane has attempted albeit unsuccessfully to breed.

The military has a permanent station there with many outposts, as there have been incidents of Tibetan refugees coming in from the passes. To ferry in supplies they tried airdrops, which were found wasteful, and till date, one can see broken jerry cans and sacks of coir padding littering the landscape. Nowadays the rations are carried in on horseback. Upto 200 odd horses traverse the Lungnak La (Pass) accompanied by Lachenpa porters. They spend a day resting before returning to Thangu. Dokpas said that burglaries are common nowadays when they migrate out of Muguthang. The burgled items include not just clothes and money, but even drinks, solar panels, fuel (kerosene) as well as 'gobar'! Besides now the military has changed local names of places, which have special significance to them.

e.g.

Tha Chongyeu is now Naku Camp
Binduk is now Lal Pani
Pang Khyen is now Bendu
Thukchu is now Zanak-I
Zanak is now Zanak-II
Pang Beething (Horse-like knee) is now Panbbi
Chorten Nyima La is now Chotnimala

These names are now on maps and there is every danger that local names will be lost forever, wiping out all signs of their existence.

Dokpas have strict grazing rules among themselves with fines when rules are flouted. However the Lachenpa horses graze in large numbers and deplete their yak fodder. Already the Dokpas have lost their entire sheep population over the last two decades which they attribute to the introduction of long-tailed goats by the AH&VS department. (AH&VS feels otherwise. Due to the large wetlands and presence of snails, liver fluke infestation apparently is rampant in Lhonak. This coupled with difficult access to the area; medication cannot be done in time.) Towards the end many sold off what little they had and migrated to Rabangla and elsewhere.

Now they wish the government bought off all their yak, retaining them as chowkidars. It could cost perhaps Rs. 50-60 lakhs. In case some of their children return, they could be useful as Teachers (traveling nomadically; then they would not need government school facilities which did not work so far in any case), Guides for tourists and Chowkidars of government infrastructures. They could also work as Wildlife Watchers, give yak riding lessons, revive some dying handicrafts liked yak decorations, saddle carpets, etc if there was enough initiative on everyone's part. Otherwise they are still the most marginalized community, having neither voting rights nor other benefits despite being on this side of the Indian border.

THE DYING DOKPAS OF NORTH SIKKIM

Sikkim juts out just a little bit onto the Tibetan plateau to the north. The high dry grasslands of this unique region of North Sikkim have been traditionally used by generations of nomadic Tibetans to graze their yak, sheep and pashmina-type goats. These gentle people called the 'Dokpas' (graziers), are perhaps the only human race able to survive and subsist at the highest altitudes in the world; tolerating the severest climatic conditions and one of the harshest lifestyles known to mankind. Devout Buddhists, they are also one of the rare communities which earlier practiced ecofriendly sky burials.

Today in North Sikkim, the apparently barren treeless cold desert of Chho Lhamo, Lhonak Valley and Lashar Valley is home to 23 Dokpa families. They are responsible for almost 90% of the yak population of the state. Earlier, with no border issues involved, around 12 Dokpa families freely roamed the Chho Lhamo plateau right into Tibet, while almost as many used the Lhonak valley and adjoining areas north via passes like Chorten Nyima La and Naku La. Their ancient lifestyle is virtually unchanged over the centuries and especially in Sikkim since the Chogyal's time.

Earlier when the borders were open, the Sikkim Dokpas grazed their livestock during winters, right upto Khambazong in Tibet. The Tibet Dokpas on their part came in during summer with their livestock right upto Dongkung, Lungma, Khering and Lhechen areas on our side. The Lachenpas of Lachen Valley further below (around 3000m) went up into Tibet on yak and horse, to trade. Oil, food rations, sugar, fir planks and cloth from Kalimpong were the main items. They brought back wool (large bales of which were taken directly to Kalimpong), 'Tchampa', salt, carpets, blankets, cloth and sheep mutton and fat. The Lachungpas of Lachung Valley (2900m) went via Dongkia La to Chho Lhamo and upto Gyantse, Zigatse, Tsekya in Tibet to trade in similar fashion. There also used to be a sort of three-four days 'Haat' (bazaar) on the Chho Lhamo plateau. The population was small and business good. (At present meat, cheese, butter, fat ('Tsilu') of yak and sheep as well as other related products from this region of Sikkim are rare, coveted delicacies, difficult to get even a taste of.)

Once the borders closed and the Indian army occupied the area, this idyllic, timeless lifestyle changed completely with no more border crossings for grazing or trade or marriage. The Sikkim Dokpas were restricted to a tiny patch of the vast Tibetan Plateau, the 'Roof of the World', in the Chho Lhamo region, Lhonak and Lashar. They were now at the mercy and vagaries of nature, supplementing their pastoral livelihood with odd jobs with the Indian army and husbanding some livestock belonging to the Lachenpas, besides their own. Earlier trans-border migrations ensured mixing of people resulting in intermarriages in a larger region, as also good crossbreeding of the domestic livestock comprising yak, sheep, goats and horses and no dearth of fodder.

Today, the situation is grim. Only seven families remain in Lhonak Valley, the famed international flyway for migratory birds and breeding ground of the endangered Black-necked Crane. The entire sheep population of the valley has been wiped out over the last two decades. Many have sold out their livestock and migrated to Ravongla and elsewhere. On the Chho Lhamo plateau 16 odd families hang on to a tenuous life, now mostly related to each other. There are a sizeable number of unmarried males who can find no partners to endure this difficult life where family members have to get up as early as 1 o'clock in the morning to process the dairy products, then milk the yak and sheep, cook and eat, go herding the animals over several kilometres to return in the evenings back to camp, all at an altitude of over 5000m above mean sea level. At these altitudes, normal humans like us are plagued with high altitude sickness coupled with difficulty in walking in this rarified atmosphere. Yaks have begun to show the defects of inbreeding. Gone forever are the proud Tibetan mastiffs, mixed with lowland mongrels. Progressive Dokpas who sent off their children to schools in Gangtok, Ravongla and elsewhere do not expect them to return to a nomadic shepherd life. The elders know and acknowledge that they are the last in their line. Though they themselves have not changed, still living nomadic lives in yak-hair tents and stone shelters, wearing traditional costumes and speaking their own language, almost everything else around them has.

Today their cold desert land with its fabulous medicinal plants and endangered wildlife is criss-crossed with roads, populated with non-native people, occupied for defence priorities, riddled with landmines and grazed to the ground. It is time we were aware that the day is not far when the Dokpas all die out quietly and the only yak we see would be moth-eaten skins on the ground or a pair of horns adorning a doorway. During the first meeting of the National Biodiversity Strategy & Action Plan (NBSAP) in Gangtok in August 2001, two Dokpas from Lhonak addressed the gathering asking if the government could take responsibility for all their yak, retaining them as chowkidars. At least they could be with their animals till the end.

B. TEMPERATE ECOREGION

BIODIVERSITY STRATEGY AND ACTION PLAN FOR LACHEN, NORTH SIKKIM

ACTIVITIES	WHY	WHO	WHERE	HOW	INDICATOR
Procurement of good breeding **Yak** from Ha Valley, Bhutan	Existing yak inbreeding, smaller in size, less milk meat. Department's present crosses not as good as earlier Tibet crosses	Animal Husbandry Dept in consultation with the local elders	Muguthang, Chho Lhamo, and Lashar	In full consultation with experienced Lachenpa and Dokpa elders	Healthier yak, more meat, milk
Sheep breed improvement	Inbreeding problem, breed only once unlike exotics	Public. The stud to be provided by AH&VS Dept.	Muguthang, Chho Lhamo and Lashar	AH&VS Dept. to provide animal from Australia/NZ	Wool improvement industry, better meat, milk
Angora Rabbit Farm at Zema	Better altitude, weather, than Rabum, more area, open, employment opportunity	AH&VS Dept.	Zema	Start Farm using public of Lachen, Sell wool to public	Employment to local Lachenpas Sale items for Tourists
Breeder **Donkey** / Ass from HP/J&K or suitable place	For Mules (Khacher) for Army, Tourists	AH&VS Dept.	Lachen, Lachung	Procurement from HP/J&K or as suitable	Employment; More Army, Tourist use even in case of bad roads
Exotic **Bull**	Breeding purpose; for improvement of existing breed	AH&VS Dept.	Lachen, Chaten, Thangu	AH&VS Dept. to provide stud from Australia / NZ	More milk, meat
Milk Collection Centre at Rabum	Better marketing of milk and milk products	AH&VS Dept.Indo-Swiss Project, Power Dept., Public of Lachen & neighboring villages	Rabum, North Sikkim	300 lt. Capacity Centre to be made by AH&VS Dept., milk collection by public; advice from Mangan (Unique), Training from Indo-Swiss Project	Milk collection from Chungthang, Lachung; distribu--tion to Army; Cheese Plant; locally trained youth
Plantation of thin-shelled **Walnut**	More profitable than local thick-shelled variety	Horticulture Dept	Lachen, Lapdong, Selep, Tha-Kajong, Latong, Gyanga	Seed to be provided by department; plantation by public	Good supply, income; Dye from Bark

ACTIVITIES	WHY	WHO	WHERE	HOW	INDICATOR
Power Projects Chaten Phase II (3 MW)Tarum Chu (10 MW)	For Milk Centre, Cheese Plant, Wool industry, Household consumption	Power Department	Chaten ChuTarum Chu	After due formalities, surveys, permissions	Uninterrupted Electric supply for Homes and Factories
New Plantations of **Potato** and **Apple**	Existing stock disea--sed	Agriculture & Horticulture Deptts.	Lachen, Thangu	Dept to procure from Thimpu, Paro in Bhutan	Quality improvement, disease resistance; more supply to Army
Timber. Fuelwood Plantation	For timber, fuelwood for local consumption	Local Public in consultation with Forest Department	Yangten, Tsamkang, Zema, Phemakaru, Thumbuk, Samachung, Tsochen	By local public plant trees like Dungshing, Paamo, Baajyoe, Rhododendrons	Better constructed houses, better tourist facilities
Cooking **Gas** connections	To preserve WL in KNP and trees like Tipsi, Amla (food of Red Panda)	Forest Department (Khangchendzonga National Park)	Thangu, Lachen, Chaten, Rabum	Through Ecodevelopment Programme, gas connections, cylinders to be provided	Preservation of Wildlife, Trees, etc. in KNP
Maintenance of **Hot-Spring**	For use of locals, other visitors from Namchi, etc.	Tourism Dept.	Tarum Tsachu	Repair Bungalow in traditional style, Repair Bathing Tank damaged by avalanche (proposal already sent) **Solar lighting**	Hot spring will be conserved
Upgradation of **Medical** facilities: Doctor at Lachen Compounder at Thangu	So far, only limited army facilities but none for women and children	Health Department	LachenThangu	Construction of 50 bedded hospital at Lachen PHC at Thangu with ecofriendly waste disposal facility	Better health of women & children

- continued overleaf

ACTIVITIES	WHY	WHO	WHERE	HOW	INDICATOR
Trekking Trail	For promotion of tourism	Tourism Department in consultation with Forest department	Burum to Yumthang	Making bridle path / trekking trail	Ecofriendly trail facility for tourists, local income generated
Construction of **Ropeway**	To settle communication problem	Welfare Department, Tourism Department	Welfare Department		Conservation of existing flora
Construction of **Helipad** and **Tourist Hut**	To settle communication problem, promote tourism	Tourism Department, PWD	Yakthang		
School with Staff **Quarters**, eco-friendly **Toilets**; Interested Teachers	Existing facilities lacking or inadequate; Teachers with dedication required	Education Dept. PWD Dedicated Teachers	Chaten Lachen (quarters, toilets) Thangu	Provide existing school with Staff Quarters, Toilets; New school at Chaten, Thangu Dedicated Teachers	All round development of younger generation, with qualified interested teaching faculty
Improvement of **Crematorium** at Thangu	No existing facilities, Firewood from surrounding area depleting resources	Forest Department	Thangu	Large-scale Plantation of Juniper; construction of Hawa-Ghar, Shed for Lamas	Activities controlled and contained within specified area, control over wild collection of Juniper
Check Posts Staff Quarters at Lachen	None so far	Police Department	Lachen	By the Police Dept.	Better Policing of transit of people and products
Village beautification	Lack of awareness, bad name to Lachen	People of Chaten, Lachen, Thangu	Chaten, Lachen, Thangu	Voluntarily, as decided in meeting by Pipons Pollution control	Revival of traditional and cultural values;
Creation of **Amji Training Centre**	None so far; limited allopathic facility from Army	Ecclesiastical and Health Departments	Lachen/Thangu	Involving existing lama (Chewang Lama) from Thangu, with apprentices from the area	Revival of traditional health systems; Herbal Gardens, Farms; Medicinal plant area conservation
Training / Skill Dev. Programmes	For Tourism, Handicrafts, Poly-House Vegetables, Mushroom, Medicinal Plants, Bio-Manure, Bio-Pesticides, etc.	Land-Use Division of Department of Forest Environment & Wildlife Mgmt.	Lachen, Chaten, Thangu	With expertise from various sectors, including NGOs	Less dependence on Forest resources
Protection in Landslide Prone area at Gerathang	Frequent Landslides	Department of Forest Environment & Wildlife Mgmt.	Gerathang, North Sikkim	By Plantation of indigenous fast-growing species	Successful stabilization of Gerathang; possible creation of Children's' Park

CONFLICTING ADDITIONAL DEMANDS BY THE LACHEN COMMUNITY

1. TARUM:	i) 6 km Foot-Path from Tarum Bridge to Hot-Spring and Plantation along the way
2. LATONG:	i) 3 km Foot-Path from Latong to Goda Nhenchung and Plantation along the way ii) 5 km Foot-Path from Latong to Gokoling and Plantation along the way iii) Proper Water Supply at / for Latong iv) One Motorable Bridge over Tista River at Latong with Protective Walls on both sides of River
3. PHALUNG:	i) Construction of Motorable Road from Thangu to Phalung via Byamzey and Dambochee ii) Plantation of Grass (fodder species for yak and sheep) iii) Plantation of Medicinal Herbs iv) Proper Water Supply
4. YATHANG:	i) Water Supply ii) 2 km Foot-Path iii) Protective Wall on both sides of Tista River iv) New Bye-Pass through Yathang Village v) Plantation above road to Thangu
5. DONGKUNG & CHHO-LHAMO:	i) Plantation of Fodder Grass ii) Water Supply at Dongkung and Tso-Lhamo iii) Construction of Log Bridges at Dongkung, Lhaychen, Chora, Tso-Lhamo
6. MUGUTHANG:	i) Plantation of Fodder Grass in Naku Valley and Changtsang Valley ii) Proper Water Supply above Muguthang in Naku Valley iii) Construction of five Log Bridges in Lhonak Valley

COMMUNITY STRATEGY AND ACTION PLAN FOR YUKSAM (KNP), WEST SIKKIM

RESOURCES (DISCOVERY)

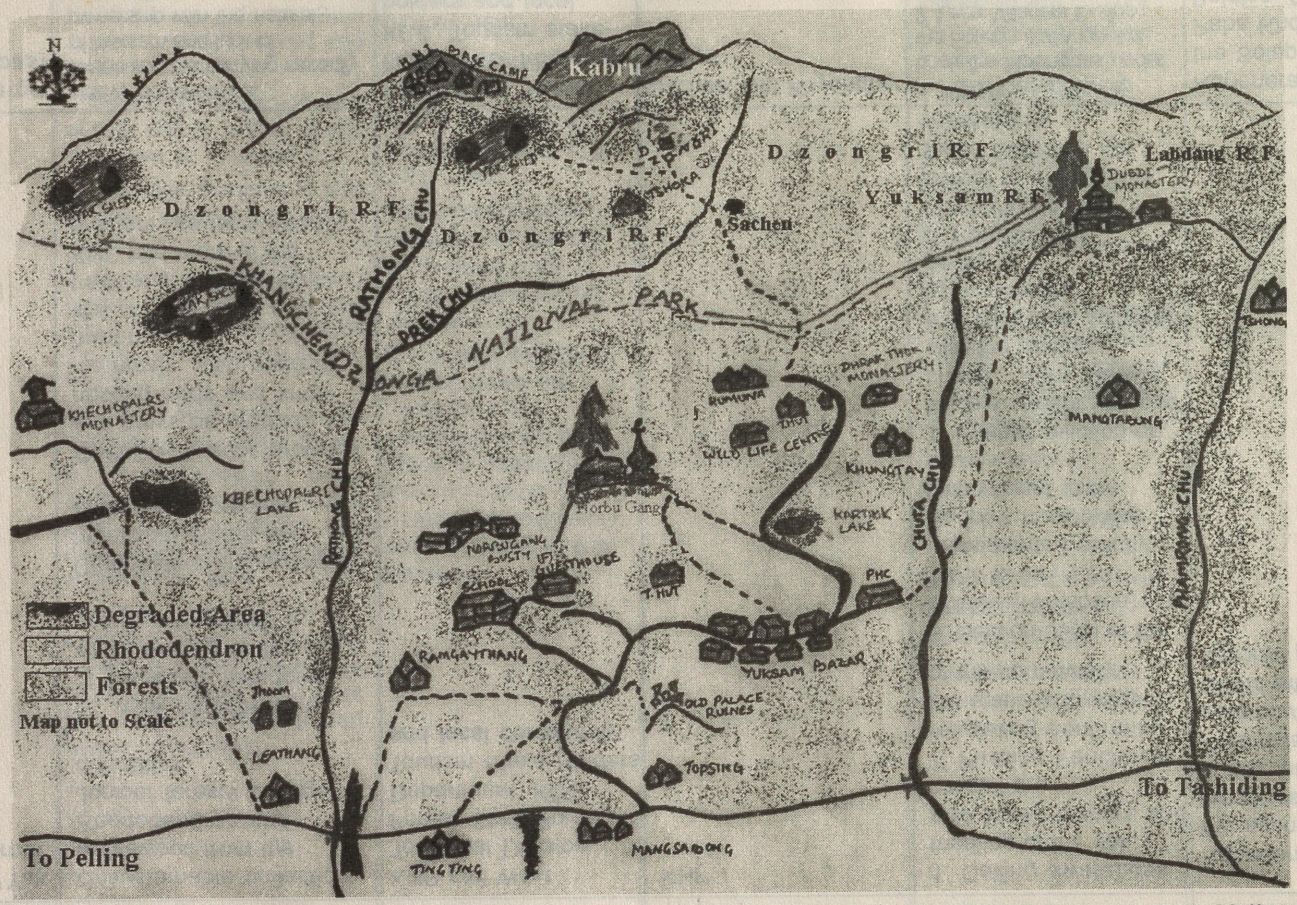
1 Yuksam is the first capital of Sikkim
2 Dubdi is the oldest monastery of Sikkim
3 Location of Yuksam near to *himal*
4 Cooperation among the villagers
5 Clean drinking water
6 Rich in forests and wild Life
7 Cultural diversity
8 Good agriculture and agro forestry of large cardamom
9 Famous tourist spot of Sikkim
10 Good infrastructure facilities and communication facility
11 KNP
12 Sacred landscape, and the area blessed by Guru Padma Sambhava
13 Ethnic look of the village
14 Rich in NTFP
15 Norbu Gang *Chorten* and its area
16 The holy Kathok lake
17 K.C.C. and its contribution in bio-diversity conservation
18 Rich in Wild Orchids
19 Beautiful landscape of the area

FUTURE DEVELOPMENT (DREAM)

1. Phased eviction of Yak and sheep *Goth* from KNP
2. Eviction of Foreign Nationals (*Holungpas*) from Yuksam
3. Closing down of HMI Training Camp on Rathong Glacier
4. Tshoka Village Relocation
5. Maximum benefits from Tourism should go to local community
6. Survival percentage of Forest Plantations to be improved
7. Garbage Management within KNP
8. Firewood stock for cremation at Dubdi
9. Reduce *Jhoom* Cultivation
10. Integrated Town Planning
11. Stop Bamboo Extraction from Reserve Forests by outsiders (*Holungpas*)
12. Participatory Monitoring of natural resources along the trekking trail
13. Reduction in the Stray Dogs in the Bazaar
14. Increased availability of Kerosene for supply to tourists

YUKSAM RESOURCE MAP

12TH APRIL, 2001



National Biodiversity Strategy and Action Plan

© NBSAP-Rathong Chu Valley

STRATEGY AND ACTION PLAN FOR YUKSAM

Activities	Why	Who	Where	How	Indicator
Phased eviction of Yak and sheep *Goths* from KNP	Unsustainable collection of firewood from the Rhododendron and Juniper forests in huge quantities. To allow regeneration of the alpine meadows, which are currently heavily overgrazed Clandestine smuggling of medicinal plants and other forest produce *Goth* Dog is very ferocious and preys on ground nesting birds and small mammals, also used for hunting Yak grazing is not a traditional activity within KNP and most of the graziers are from Nepal	KNP and West Territorial Division Forest Staff, Police Department, KCC, Tourism Stake Holders and local community	KNP	1. Calling awareness meeting of the yak and sheep owners and caretakers 2. Passing Panchayat resolution confirming the stand and support of the community 3. Section 35(6) of the Wildlife (Protection) Act 1972 to be implemented strictly. Support from Police Department to be taken 4. Phased eviction of the permanent yak and sheep *Goths* starting with the foreign nationals first, followed by the wealthy persons. 5. Participatory monitoring of the border to ensure that these *Goths* do not reestablish	Regeneration of the alpine meadows.Reduction in the spread of *Potentilla peduncularis*No *Goths* within the national park
Eviction of Foreign Nationals (*Holungpas*) from Yuksam	Heavy dependence, exceeding the carrying capacity of Yuksam and lack of ownership with the natural resources Competition with local community in ecotourism related employment opportunities. Source of anti social activities, crime and slum like development	Police Dept, Forest Dept (West Territorial) KCC, Tourism stake-holders and local community	Gechen and Khyongtey village	1. Police Department to book the Holungpas under the Foreign Nationals Act 2. Local Villagers to stop renting out their houses to them 3. West Territorial Division, Forest Department to seize the Dzos and horses belonging to the *Holungpas* when grazing in reserve forests.	Regeneration of the Selep, Nalung, Paha Khola, Bakting, Gyamtong forest areasBenefit from ecotourism reaching to the local community

	development			reserve forests.	
Closing of HMI Training Camp on Rathong Glacier	The trainees along with the support staff, number over 200 in one group. There are a total of ten groups in a year, spending three weeks each at the HMI Training Camp on Rathong Glacier.Irreversible Habitat destruction of Blue Sheep, Snow Leopard and Pheasants due to 1.Indiscriminate exploitation of high altitude herbs, shrubs and trees as firewood 2. Garbage dumping in this fragile ecosystem since 1960's 3. Consequently the Rathong glacier has started receding and cracks have appeared on the glacier as far up as Doodh Pokhri 4.Loud noise and merry making around camp fires 5. Accompanying Dzos numbering about 100 in one group cause trampling, trail degradation and over grazing in this fragile area 6. Over grazing of the medicinal plants in the alpine meadows in their vegetative phase, prevents them from flowering and fruiting and hence propagating.	A meeting in this regard was held in August 2000 at HMI Darjeeling. GBPIHED, ATREE, KCC participated in this meeting with the director HMI. In this meeting HMI agreed: Not to use firewood throughout their stay within KNP. Expressed inability in reduction of number of trainees since trainee quotas were already fixed. Expressed inability in closing down the camp for a few yearsInfact HMI has plans of expanding and increasing the number of courses even involving foreign trainees	KNP	A Code of Conduct to be prepared by the Forest Dept and the same enforced after due consultation with the President HMI, DarjeelingThis code of conduct should include the following safeguards: 1. No use of firewood within KNP 2. All the garbage dumped by HMI over the last 30 years to be brought back within a few years 3. Drastic reduction in the number of courses and trainees. Total number of Trainees and staff should not exceed 500 in an year 4. Environmental orientation for the trainees mandatory at Yuksam 5. Payment of entry fees mandatory for all the trainees and staff 6.No new construction or repair without informing the Forest Dept.	Reduction in the number of courses and trainees Code of Conduct strictly enforced - continued overleaf

Tshoka Village ***(3,000 masl)*** **Relocation**	1. Heavy dependence on forest resources within KNP at Tshoka and Sachen (total 7 households) by these refugees from Tibet who were settled here by the then *Chogyal* in 1969 by allotting them total 13 acres of land	Forest Dept., District Administration	Relocation from Tshoka to Yuksam	1. The new generation is averse to staying in this hostile and remote place. The Tshoka villagers are themselves eager to shift out to a more hospitable place. Animal Husbandry of Yak and Dzo and Ecotourism are the livelihoods practiced by them. All of them have already purchased land and constructed houses at Yuksam and Gangtok. 2. Compensation package needs to be agreed upon and funded through MoEF schemes	Tshoka villagers relocated at Yuksam. Forests recovering at Chokha and Sachen
Maximum benefits from Tourism should go to local community	1. Lion's share of tourism income gobbled up by outsiders, community gets only leftovers 2. Incentive for conservation through income generation 3. Income generation for larger section of society	Tourism Dept. Forest Dept. TAAS Non TAAS KCC Panchayat, MLA	Relocation from Tshoka to Yuksam	1. Tourism Dept should issue Trekking Permit for international tourists from Yuksam. Hence international tourists can directly come to Yuksam, instead of coming via Gangtok. This will result in local community of Yuksam can opening their own travel agencies and derive direct and maximum benefits. International tourists were also happier with this arrangement. 2. Promotion of home stays, wherein the tourists can stay with the local community instead of in hotels and lodges. Hence even those who cannot afford to build hotels can also benefit. On the other hand the tourists can also get a first hand experience of the local culture, cuisine and customs.	Travel agencies opened in Yuksam List of home stays found with all travel agents Travel agents buying vegetables from the local community Local Trained guides and cooks being employed EDC functional

				3. Backward and forward linkages like vegetable production, poultry, piggery, camping equipment hiring, souvenir shop etc need to be setup to stop leakage of tourism income to outside agencies. 4. Skill development of local youth as guides, cooks, lodge operators etc. So that demand of ESP's can be met locally. 5. Legal empowerment of local community to ensure that all the tours and travels are routed through the local community	
Survival of Forest Plantations to be improved	1. JFMC / EDC not fully functional, hence no sense of ownership 2. Planting Stock in nursery not sufficient. Also Plantation carried out rather late in the months of July - August instead of May - June Plantations usually not carried out technically 3. Grazing in plantation areas in winter			1. Forest plantations and protection to be carried out jointly with JFMC / EDC. *Smriti Ban* concept to be popularized and implemented 2. Forest Nurseries to be modernized 3. Timely approval and sanction of plantation schemes from Planning and Finance Depts.4. Grazing to be banned, since the Dzo's belong to outsiders (*Holungpas*)	Modern Forest Nurseries Plantations in May No Dzos in forests
Garbage Management within KNP	1. Garbage dumps specially non-biodegradable around Camping sites and trekking trail 2. Water source polluted by garbage mismanagement 3. Garbage Pollutes the natural and cultural sanctity of the area	EDC, TAAS, HMI, Tourism Dept, Forest Dept., KCC etc	Camp sites, HMI Base Camp, Trekking Trail	1. Code of conduct to be given legal backing and non-biodegradable garbage to be brought back. 2. Wildlife Checkpost at Yuksam and EDC should ensure the strict implementation of the same. - continued overleaf	Tourists getting garbage back Trekking trail clean

				3. Garbage bins to be setup along the trail for biodegradable waste. 4. Garbage dumped over the last thirty years to be brought back, segregated and disposed off in an environmentally clean way. 5. Performing rituals and prayers for cleansing the sacred landscape with the help of the local *Lama*.	
Dubdi Crematorium	Traditionally chestnut trees are cut down for burning dead bodies near Dubdi Gumpa. Hence the forest cover is decreasing	Lama, Panchayat and KCC to convince the community Forest Dept to provide the firewood free of royalty from Dubdi and adjoining forests free of royalty		1. Firewood from fallen trees to be collected and stocked at Dubdi. 2. Around seven *pils* of firewood to be stocked and used during cremation. 3. Afterwards the user should replenish the stock from fallen trees.	Firewood stock at Dubdi Standing trees not cut down for cremation
Reduce *Jhoom* cultivation	*1. Jhoom* cultivation specially on steep hill sides causes landslides, and hardly any regeneration 2. Also Jhooming carried out illegally in protected forests 3. Wild animals coming to feed on the crops are hunted	Panchayats, NGO's, Forest Dept etc.	Leythang, Khyongtey	Awareness for the villagers	No fresh Jhoom patches to be seen
Integrated Town Planning	Haphazard development Non traditional, multi - storied construction. Sanitation, parking, recreation facilities lacking	UDHD, Panchayat, Planning Dept. Panchayat, Police and KCC	Yuksam	Blue print for integrated town development of Yuksam Implementation of the UDHD notification restricting the no of stories of all buildings to three. All buildings should have traditional touch	Blueprint of development available with Panchayat and KCC

				have traditional touch	
Participatory Monitoring of Natural Resources along the trekking trail	Checking illegal collection and transit of natural resources Provide early information of illegal activities to concerned department	TAAS, Tourists, Forest Dept, EDC, Tourists, NGO's etc Wildlife check post and KCC jointly		By providing training on natural resources monitoring and Code of Conduct to the ESP's. By getting feedback from the visitors to KNP	Feedback forms filled and returned at the Wildlife checkpost and KCC- VIC
Bamboo Extraction from R.F. by outsiders	Preservation of local resources for local community	Territorial staff of Forest Dept.	Yuksam R.F.	Permit for extraction should be given only after checking the domicile certificate	
Reduction in Stray Dogs in the *Bazaar*	Stray dogs accompany the visitors and ESP's to KNP and disturb wild animals specially ground nesting birds and small mammals Stray dogs roam in packs at night and often attack visitors and steal young ones of livestock	Local resource persons, veterinary dept, Police Dept etc	Yuksam Bazaar	Panchayat resolution needs to be passed and then necessary action initiated by the local community	Less number of stray dogs in the Bazaar
Increased availability of Kerosene for supply to tourists	Availability of kerosene ensures that firewood is not used within KNP	Food and Civil Supplies Dept, Multipurpose Cooperative Store Yuksam Bazaar, Panchayat and KCC	Yuksam Bazaar	The Kerosene stock for Yuksam has to be increased from 10 barrels to atleast 20 barrels. This has to be supplied by the Food and Civil Supplies Dept. from their godown at Jorethang, South Sikkim.	Kerosene available at regular rates in Yuksam bazaar in tourist season

A Pictorial Study of Rathong Chu Valley: NBSAP Substate Site

- by Peter S. Lepcha -

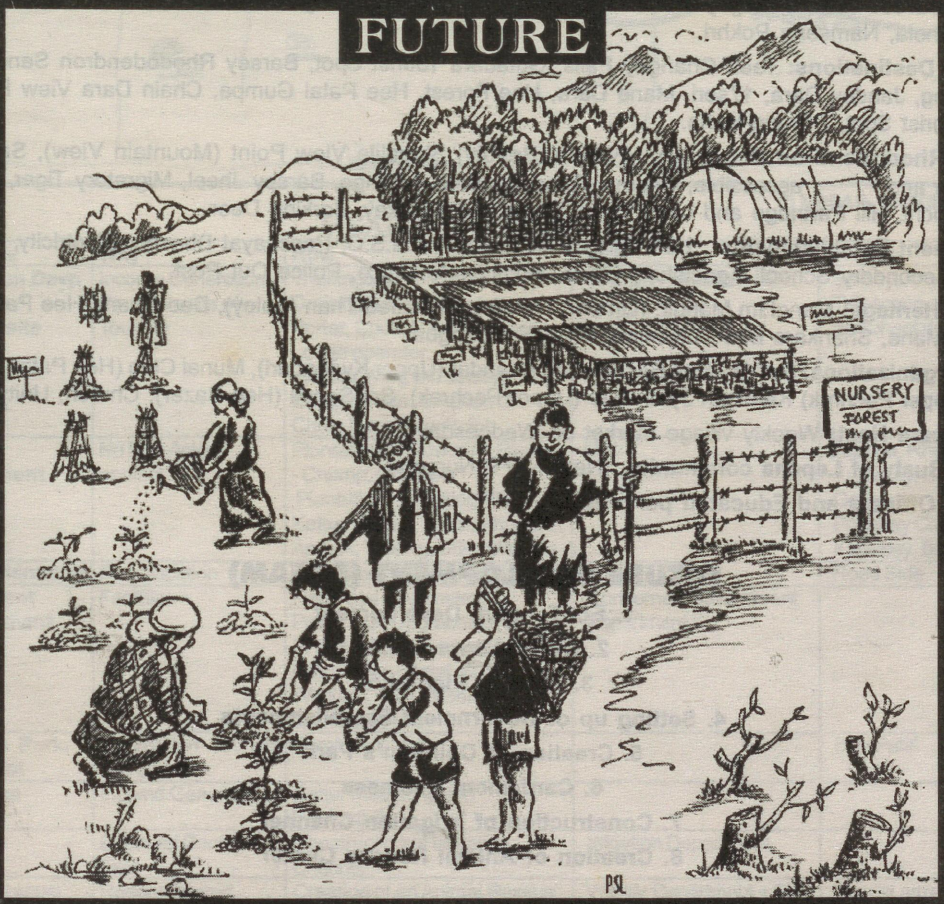
PAST



PRESENT



FUTURE



C. SUBTROPICAL ECOREGION

Biodiversity Strategy And Action Plan For Hee Patal, West Sikkim

PUBLIC HEARING

Location:	Hee Forest Rest House		
Total Number of Participants:	75		
Sex Ratio:	20 % women	80% men	17% GO
Duration:	3.00 hours	Start: 11:30	End: 14:30
Panchayat Wards:	Hee Patal, Pechrek		
Date:	20th July 2001		

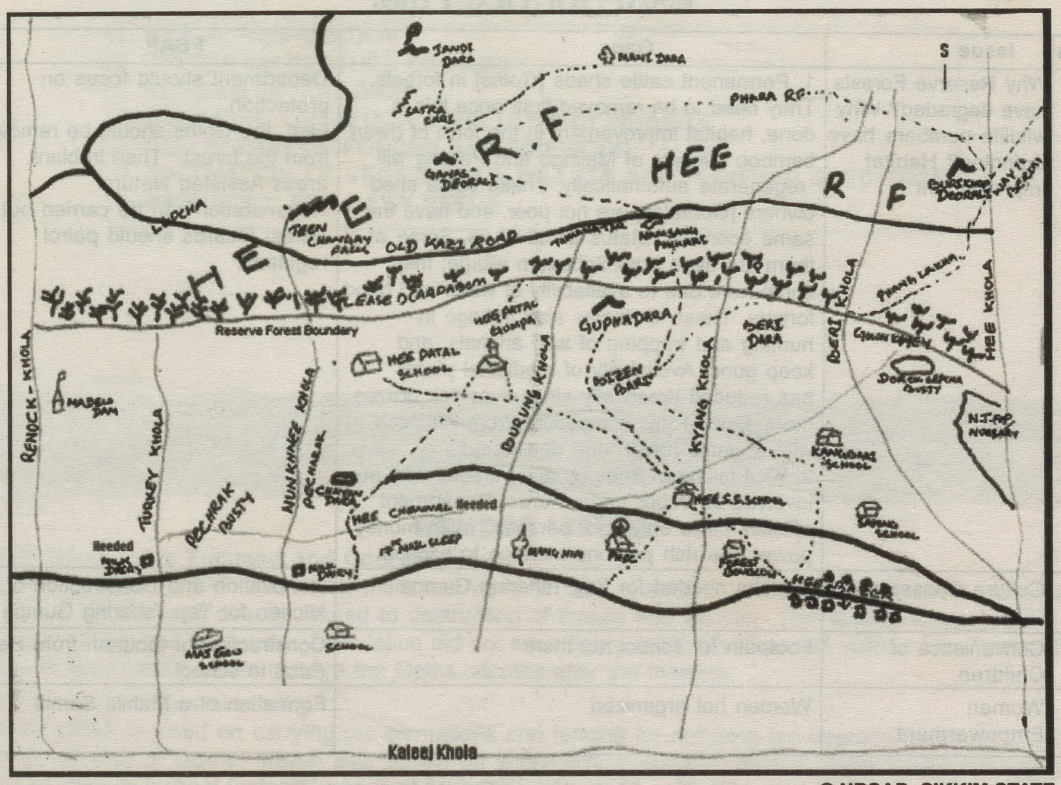
NATURAL RESOURCES (DISCOVERY)

1. **Horticulture:** Hybrid Cardamom - Shremna Variety, apple, Paddy and fodder plants
2. **Cardamom Cultivation in Reserve Forests:** Portion of Hee Patal Reserve Forest leased out to community for income generation long back
3. **NTFP :** Orchids (Dendrobium), Medicinal plants etc
4. **Water Source:** Teen Changey Falls, Gufadara, Hee Khola, Burung Khola, Rhenock Pokhri, Beri Khola, Kyang Khola, Namseng Pokhri
5. **Tourism Destinations:** Teen Changey Falls, Gufadara Tourist Spot, Barsey Rhododendron Sanctuary, Tal, Bhanjyang, Jandey Dara, 17seri, Mane Dara, Hee Forest, Hee Patal Gumpa, Chain Dara View Point, Gufa Dara Tourist Spot, Phyang-lakha.
6. **Barsey Rhododendron Sanctuary:** (Natural Beauty) Singalila View Point (Mountain View), Sanctuary is very near and accessible, Champ, Rhododendron, Malingo, Barsey Jheel, Migratory Tiger, Wild Boar, Ban Manchi, Hill Partridge and other Birds, Butterflies, Monkey, Barking Deer.
7. **Government Establishments:** Hee Forest Rest House, P.H.S.C, Panchayat Bhavan, Electricity, Telephone, Senior Secondary School, Agriculture Office, Horticulture Office, Police Out Post.
8. **Cultural Heritage:** Manghim Mandir, (Limboo Temple), Mahadeo-Than (Aaley), Deo-Dham, Hee Patal Gumpa, Deorali Mane, Shankare Beer, Chancre, Bijou, Phedangba
9. **Social Organizations:** SWYA - Hee Bazar, Yang Bhandar (Upper Kyangbari), Munal Club (Hee Patal), Sanakhari SEC (Upper Pechrek) Kanchan Jyoti Club (Upper Pechrek), Sai Samiti (Hee Bazar), Church, Unity in village.
10. **Budhabare Haat:** Weekly village market on Wednesday
11. **Dorok Busty of Lepcha community** (Near NTFP Nursery)
12. **Senior Officers and Educated persons**

FUTURE DEVELOPMENT (DREAM)

1. EcoTourism Development
2. Habitat Improvement
3. Avenue Plantation
4. Setting up of Government Establishments
5. Creation of Children's Park
6. Cardamom Business
7. Construction of Irrigation Channel
8. Creation of Animal Rescue Center

HEE PATAL RESOURCE MAP **20TH JULY, 2001**



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MSAP FOR HEE-PATAL

Activities	Why	How	Who	Where
EcoTourism Devp Trek Route Camping site	Income Generation Convenience of Tourists	Trainings for Skill Development: Language, Porter, Cook, Naturalist Guide, Lodge operator. Wildlife Wing will declare Camping Site, Creation of Chain Dara View Point	Tourism + Wildlife + EDC	Barsey, Phyang-lakha, Telescope at Gufa Dara and Jheel development
Habitat Improvement	No Man Animal conflict	Plantation of Flowering Plants - Champ, Guransh Plantation of Fruiting Plants - Kattus, Okher, Labsi, Phunche, Ambak, Tarsing, Uttis, Malingo	EDC	Lapcha, Rhenock Pokhri, Kumaray, Beri Dara, Goucharan, Mukhia Chok, Phakhey Chok, Dara Chok Kapasey, Boru
Avenue Plantation	Beautification	Plantation of Rhododendron	EDC	Road Side
Government Establishment	Facilities	Hee Patal Dispensary, Police O.P. Upgradation of PHSC to PHC, Bank, AHVS Office, Hee- Patal School, Wildlife Office at Beri Khola, Community Hall	Concerned Government Department	
Children's Park, Picnic Point	Recreation - tourists and Children	Community Hall		Hee Patal
Cardamom Business	Income Generation	Better Marketing and Productivity		
Irrigation channel	Dhanbari Cardamom Field	Construction of Irrigation Channel	Irrigation Department	
Animal Rescue Centre	Rescue injured animals and for	Creation of an Animal Rescue Center	Wildlife Department + EDC	Tourist attraction

FSAP for Hee Patal

S No	Issue	Gaps	FSAP
1	Why Reserve Forests have degraded? Why wildlife numbers have dwindled? Habitat Improvement	1. Permanent cattle sheds [*Goths*] in forests. They need to be removed first, once this is done, habitat improvement in the form of dwarf bamboo thickets of Malingo and Pareng will regenerate automatically. These cattle shed owners [*Gothalas*] are not poor, and have the same economic status as all of us. Some of them are even from Sribadam village; they come here due to availability of water and good forests. These *Gothalas* also indulge in hunting and trapping of wild animals, and keep guns. Availability of medicinal plants has reduced drastically since livestock grazes them. Due to this competition from livestock, wild animals have been decimated. 2. Illicit felling of trees by rich persons who are involved in timber trade. Forest Department officials seize only poor persons. With money power, the rich persons manage to escape.	Department should focus on protection. First, the Goths should be removed from the forest. Then in blank areas Assisted Natural Regeneration can be carried out. Forest Guards should patrol regularly.
2	Culture Conservation	Repairs needed for Yap Tshering Gumpa	Renovation and Construction of kitchen for Yap Tshering Gumpa
3	Convenience of Children	Footpath for school not there	Construction of footpath from Hee Patal to school
4	Women Empowerment	Women not organized	Formation of a Mahila Samiti

Daily Routine Of Women

TIME	ACTIVITY
4:00 am	I wake up, set the fire in hearth burning and prepare hot water, tea and then boil food for cow and pig. Then I freshen up and perform Pooja
4:30 am	I give feed to cow, pig, poultry and goat. Then milk the cows, by this time my family wakes up and then I serve tea to everyone
5:30 am	After serving tea, I start preparing lunch
7:00 am	Once lunch is ready, and I serve it to my children
7:20 am	Then I leave for fodder collection in my own agricultural field
9:00 am	After returning from fodder collection I serve lunch to the elders in the family
9:20 am	Wash the utensils, clean kitchen and wash the clothes of my family
9:50 am	Leave for work in the agriculture fields (or to office, if employed)
12:00	I give feed to cow, pig, poultry and goat
2:00 pm	Again go for fodder collection in my own agricultural field
4:00 pm	After returning from fodder collection (or office if employed), I give feed to cow, pig, poultry and goat. Then milk the cows
4:30 pm	My children have returned home and I serve them evening snacks
5:00 pm	I start preparing dinner now
7:00 pm	After completing dinner preparation I watch TV or read books
8:00 pm	I serve dinner to my family
8:20 pm	Wash the utensils and clean kitchen
9:00 pm	Go to bed

RESPONSIBILITIES OF WOMEN
(AS PERCEIVED BY THEM)

1. **MEALS PREPARATION**
2. **UPKEEP OF CLOTHES OF FAMILY**
3. **NURSING OF CHILDREN**
4. **MANAGING LIVESTOCK, POULTRY AND PIGGERY**
5. **COLLECTION OF FODDER AND FIREWOOD**
6. **CULTIVATION OF VEGETABLES, MILLETS AND PLANTING SEEDLINGS**
7. **MARKETING FOR DAILY NEEDS**

Comparison of MSAP and FSAP for Hee Patal

GENDER ISSUES

1. FSAP much more Focused and Courageous:
Compared to MSAP, FSAP was much more courageous. Gap Analysis was much more incisive. Presence of cattle sheds [Goths] was directly related to destruction of forests and wildlife. The women discussed the Goth issue quite openly and fearlessly. Goth issue did not even figure in MSAP. However, some of them secretly did mention of the urgent need to remove the Goths secretly after the meeting.

2. FSAP aimed at Sustainability
While the MSAP focused on carrying out plantations and fencing for reducing the degradation of forests, FSAP aimed at removal of Goths. MSAP was based on short-term monetary benefits, while FSAP thought of the welfare of children [school footpath] and their future too.

3. How to involve women in public hearings?

a.Information about the meeting has to reach the village at least two days in advance. The messenger should inform that women are specifically invited, and their participation is necessary. Efforts should be made to invite middle aged and aged women, since they are not that shy. Educated women should also be informed. Uneducated, young women are too shy and insecure.

b. Special arrangements like vehicle should be arranged to transport women wherever possible.

c. Sitting Arrangement: Women should be asked to sit in the vantage point, and together in a group so that they feel secure.

d. Facilitator in the public hearings should ensure that the views of the women are incorporated, and he should specially encourage them.

e. If possible, separate meeting should be held for women, this is the only way that we can ensure their wholehearted participation. It should be ensured that no men are within earshot in these special all-women meetings.

e.g. At Hee Patal, in spite of ensuring a, b, c and d we did not get even a single point from women. Finally, point e was taken up over snacks and tea, and the ensuing FSAP was a refreshing change from the routine SAP. In addition, women specific issues [Construction of Gumpa Kitchen, formation of Mahila Samiti, footpath for children etc] could be recorded.

TRAGEDY OF COMMONS

A portion of the Hee Patal Reserve Forest was leased out by the Forest Department for Cardamom cultivation [Agro forestry Model] to the local community long time back. The lessees have fenced their cardamom plantations, and tend to it regularly. It is not surprising that this part of the Reserve Forest has tilled good forest cover, compared to the remaining Reserve Forest which has been heavily degraded by Goths.

The Stone Elephant and the Mermaid

LOCATION: Lower Hathi Dhunga, Ward No 5, Rinchenpong, West Sikkim
STORY AS TOLD BY: Azang Lepcha, s/o late Kalusing Lepcha, age 74 years, r/o L. Hathi Dhunga

Long ago, a demoness [Sumumu] used to inhabit the forests around Rinchenpong. Every night she used to take shelter under a huge stone and converse with her demon friends on the other bank of the Rangit. All the villagers were very afraid, and no body ventured out at night. They called this stone the Sumumu Dhunga [the stone of the demoness]. One day a woman, a traveler from a foreign land came to Rinchenpong. Unable to find a shelter for the night, she decided to rest for the night below Sumumu Dhunga. Since she was suffering from goiter, she was in great pain and difficulty.

At daybreak as the first rays of the sun touched her, she found that her pain had completely vanished. She reached out for her goiter, and lo, it had disappeared! She went to a stream nearby and looked at her reflection in the pool of water, the goiter had really vanished. She became very happy, and rejoicing left for her country. On reaching her country, she spread the word around, about the magical Sumumu Dhunga to here friends, and how it had cured her goiter overnight.

That night the villagers heard the Sumumu conversing with her demon friends, that how she had chanced upon a woman sleeping below her rock. She had taken a chunk of flesh form her throat, hoping that it would be nice and tender. However, since the woman had goiter, the flesh was very bitter, and the Sumumu had almost fallen ill with food poisoning. She had preserved the chunk of flesh, to teach others a lesson, not to deceive her again.

Soon her friend who was also in terrible pain from a goiter, the size of a tennis ball, decided to embark for Sumumu Dhunga, for cure. As advised by her friend she also retired below Sumumu Dhunga for the night. Hoping that come morning and she would be relieved form her predicament. Next morning, as she opened her eyes, to her horror, the goiter had grown to the size of a football overnight. She tried to wake up, but was unable to, on hearing her cries for help the villagers rushed to her rescue. Feeling pity for the lady from a foreign country, who was inconsolable, the village lads hoisted her over their stout shoulders and graciously agreed to help her return back to her country.

That night, the villagers overheard the Sumumu retelling to her friends across the river, how she had finally taken her revenge. Last night when the woman was sleeping, she had added the chunk of meat to her goiter. Then the Sumumu laughed aloud, there was thunder and there was lightening. The villagers became very frightened and prayed for divine intervention.

Guru Rimpoche, the enlightened one, was conducting penance in Tibet, when the fervent prayers of the villagers of Rinchenpong reached him. He immediately embarked for Sikkim, to free the villagers from the fear of Sumumu. After crossing the Rangit, the Guru decided to spend the night under the shelter of the Sumumu Dhunga. That night all the animals from the forests came to the Guru for his blessings and rested with him. The hoof marks of the barking deer, wild boar, horse, monkey and other animals can be still seen clearly on this rock. Next morning as the Guru was making his way up the Rinchenpong flank, his elephant refused to budge forward. On seeing a monkey on the top of a tree, the elephant had stopped dead on his tracks. The elephant refused to move in spite of repeated requests from the Guru,. Left with no other alternative, the Guru took out his sword and cut his elephant in three pieces transversely. The twenty feet long body of the elephant cut into three pieces can be still seen here, the head rolled down to the Rangit river bank. The curse of Guru Rimpoche, transformed the elephant into stone or Hathi Dhunga, as it is popularly know. As soon as the Sumumu came to know that Guru Rimpoche had come to slay her, she fled to regroup with her friends across the Rangit. Guru Rimpoche with his magical powers created an instead flood on the Rangit, and hence the Sumumu had to construct a bridge to cross the swirling waters of the Rangit. When she was on the verge of constructing this bridge, Guru Rimpoche reached the site and slew her on the spot. The demon bridge (Rakshashi Pul) can be still seen at Tatopani. Guru Rimpoche then cremated the Sumumu and conducted a penance inside the Tatopani cave. He blessed this place, and since then the holy hot springs of Tatopani have become a pilgrimage site.

While returning, Guru Rimpochi came across the alluring Rangit Mermaid [Limbooni Macha] basking on a stone, in all her glory. Her beautiful hair, cascading over her shoulders, azure blue in complexion and without scales, this unique fish can grow up to 200 kg and is endemic to the Rangit. With her breasts and hair, she can be easily mistaken for a woman. He requested her to follow him upstream to his abode. The mermaid unable to swim against the strong current of the Rangit, and the cascading waterfalls [Change] expressed her inability. In anger, he killed the mermaid, and cremated her on the riverbank. While cremating, he burnt his finger, and in reflex action, sucked his finger to cool the burn. Since then the Limbooni Macha is eaten by most of the Sikkimese.

This fish comes out in the night to feed and is very easy to catch. One end of a coir rope is tied to bait, and the other end is tied to a tree. When the Limbooni takes this bait, three to four persons are needed to collectively pull her ashore. The Rangit mermaid has become highly endangered and with the construction of the Rangit Dam, her habitat has got severely disturbed. The Limbooni Macha awaits her savior, to free her from the murky waters of the Rangit. Where the waters are still crystal clear and free of silt. Where she can breathe and be free.

D. TROPICAL ECOREGION

Biodiversity Strategy And Action Plan For Kitam, South Sikkim

DISCOVERY

1. Wild animals and birds (*mujur, banel, ban khukra, mirga, dumsi, bandar, kala, jharal, mal sapro, chituwa, ajingar, bhalu, kharayo* etc.)
2. Panchayat bhawan at Mickhola
3. School at Kitam
4. Health centre at Kitam
5. Irrigation channel from Gatta khola to Belbotey
6. Police Out post at Kitam
7. Horticulture centre at Kitam
8. Fisheries center at Kitam
9. Agriculture office at Kitam
10. PWD road
11. NTFP is found in the Kitam forests
12. Dhara *kholsa* at Kitam
13. Gom *khola* at Kitam
14. Field where peacocks perform a dance at Kitam
15. Trees like Salla, Saigun, Sal
16. Manpur khola
17. Electricity
18. Telephone
19. Private school at Kitam
20. 100 years old Baburam *Kothi* at Kitam
21. Purna boteytar (where a fight between Tibetan Bhutias and East India Company took place)
22. Tarey bhir at Kitam which has height of around 1000 m
23. Munal Club NGO at Kitam
24. Nau Yuvak Sangh at Kitam
25. Nari Samiti at Kitam
26. Bridha Sangh at Kitam which has a number of around 70 – 80 members
27. ICDS centre at Kitam
28. Bal Bikash Centre at Kitam
29. Multi purpose Co-operative Society at Kitam
30. Mushrooms.

DREAM OF KITAM

1. Modern nursery needs to be set up
2. Developed water source with plantation.
3. Self employed youth (small scale industries like soap, matches, carpentry, handicrafts, cutting, knitting, tailoring)
4. Flowers blooming along roadsides
5. Increase in different kinds of birds and animals in the forest
6. Repair of government offices
7. Increase in agricultural products
8. Modern technology of farming with high quality seeds
9. Economic development of Kitam village
10. Channels for irrigation
11. More Greenery
12. Small scale farms like piggery, dairy, poultry
13. Good management of live stock
14. Use of organic compost instead of urea
15. Gobar gas units
16. Rain water harvesting
17. No more forest fire

Strategy and Action Plan for Kitam

Activity	Purpose	Who	Where	Why	Local Resource	Other Resource	Success indicator
Modern nursery	Conservation of forest	IWDP and interested people	Govt. land		Take care of nursery	IWDP	Set up of nursery
Plantation at water sources	More water	Community and committee. Mr. K. B. Pradhan Upper Kitam, Mr. Baichung Lepcha Upper Mickhola, Mrs. Onkit Rai Lower Mickhola, Mrs. Dil Kumari Rai Lower Kopchey	Water sources	More water	*Sramdan*	Technical assistance from IWDP	Developed water sources
Rain water harvesting	Irrigation	Individual	Kitam		Accommodation for trainers	IWDP	Rain water harvesting
Self employment Poultry, Piggery, match making, soap making, carpentry, handicrafts, cutting, knitting, tailoring	To control unemployment	Individual	Kitam	-	Individual	Training	
Greenery	Fresh air, water	Community and Committee	Kitam and All over Sikkim		*Sramdan*	Technical assistance	
Modern method of farming and increase in agricultural productivity	Development of economic condition of villagers	Individual	Kitam		Show interest and accommodation for trainers	Technical assistance	

CONDENSING THE CSAPS

The CSAPs obtained from the 39 public hearings were segregated ecoregion wise and the aspirations of the local community listed out as "Biodiversity Conservation Issues". These issues were broadly classified into five categories namely, conservation issues, livelihood issues, infrastructure development, culture conservation and negative outside influences. Similarly, the actions needed to be taken against these issues were also listed down. Then these ecoregion wise CSAPs were clubbed into one table against these issues and actions needed.

Each issue and action of each public hearing was entered in this table.

BIODIVERSITY CONSERVATION STRATEGY AND ACTION PLAN
1. TROPICAL ECOZONE

No	Biodiversity Conservation Issues	Action	Total	Rong	Mamley	Poktok	Salghari	Kartikey	Mellidara	Rateypani	Kitam
A	**Conservation Issues**										
1	Conservation Initiatives	Eviction of Cattle Sheds	0								
		Joint Protection of Biodiversity	8	1	1	1	1	1	1	1	1
		Plough back benefits	0								
		Awareness	8	1	1	1	1	1	1	1	1
2	Plantation in private lands	Firewood and Fodder									
		Medicinal Plants	0								
		Wild edibles	0								
		Soil Conservation In Landslide Areas	0								
		Nursery of indigenous plants	8	1	1	1	1	1	1	1	1
		Firewood Plantation for Cremation	0								
3	Alternative Energy	Kerosene supply	0								
		LPG connections	0								
		Solar and Wind Mills	0								
		Bio Gas	8	1	1	1	1	1	1	1	1
B	**Livelihood Issues**										
4	Ecotourism Enterprise	Skill Development	2	1							1
		Advertisement	2	1							1
		Trekking Trails	2	1							1
		Ropeway	0								
		Code of Conduct	0								
		Kerosene Supply	0								
		Stray Dogs Control	0								
		Garbage Management	0								
5	Agriculture and Horticulture Development	Potato	0								
		Apple	0								
		Thin Shelled Walnut	0								
		Organic Vegetable cultivation	0								
		Large Cardamom plantations	0								
		Apricot	0								
		Wild Strawberry	0								
		Mushroom	0								
		Orange Crop	2			1	1				
		Food Processing	5			1	1	1	1		1
		Floriculture	7			1	1	1	1	1	1
		Reduction in Jhum Cultivation	0								
		Tea Plantation	0								

6	Animal Husbandry Initiatives	Milch Cows	7	1		1	1	1	1	1	1
		Yak breed improvement and insurance	0								
		Sheep	0								
		Angora Rabbit	0								
		Donkey / Ass	0								
		Stud Bull	0								
		Poultry	5			1	1		1	1	1
		Milk Collection Center	0								
		Cheese Plant	0								
		Fishery	0								
7	Micro enterprise Development	Handicrafts and Handloom	3		1				1	1	
		Wool Cottage Industry	0								
		Fermented Foods	1			1					
C	**Basic Infrastructure**										
8	Infrastructure development	Road, bridges, footpaths	1	1							
		Helicopter Service	0								
		Power project	0								
		Telecommunication	0								
		River bank protection	0								
9	Essential Services	Education	0								
		Health	0								
		Drinking Water and Treatment Plant	0								
		Sewerage and drainage	0								
		Improvement of drinking water source	8	1	1	1	1	1	1	1	1
D	**Culture Conservation**										
		Repair of places of worship	0								
		Hot spring conservation	0								
		Preserving traditional names of places	0								
		Amji Training Center	0								
		Traditional festivals	0								
		Preservation of sacred spaces	0								
		Sacred Lake	0								
		Traditional architecture	0								
		Traditional Food	0								
E	**Negative outside influences**										
		Pack animals of Assam Rifles	0								
		Tourists	0								
		Feral dogs	0								
		Poaching by Assam Rifles and GREF	0								
		Firewood depletion by GREF labor force	0								
		Controlling dynamiting by GREF	0								
		Army occupation of grazing land	0								
		Land mine casualties (animals)	0								
		Easy access to liquor from army stores	0								
		Easy access to tinned food from army stores	0								
		Undermining of Pipon System	0								
		Holungpa Settlers from Nepal	0								
		Himalayan Mountaineering Institute, Darjeeling	0								
		Tsokha Village Relocation	0								
		Humana NGO closure	0								

2. SUBTROPICAL ECOZONE

No.	Biodiversity Conservation Issues	Action	TOTAL	Sada Phamtam	Borong Polok	Ralang	Rabongla	Yangang	Lingmo	Yuksam	Karjee	Gangyap	Khecheopalri	Tashiding	Damthang	Wok Omchu	Lunchok Kamerey	Assangthang	Maniram Phalidara	Sorok Shyampani	Tangzi Bikmat	Turuk Ramabung	Sadam Suntaley	Uttarey	Dentam	Hee Patal	Bermiok Martam	Sribadam	Soreng	Sombaria	Ribdi	Chungthang
A	**Conservation Issues**																															
1	Conservation Initiatives	Eviction of Cattle Sheds	17	1	1	1	1	1	1	1			1		1									1	1	1	1	1	1	1	1	
		Joint Protection of Biodiversity	27	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
		Plough back benefits	3	1	1											1																
		Awareness	0																													
2	Plantation in private lands	Firewood and Fodder	2	1																												1
		Medicinal Plants	1																													1
		Wild edibles	1																													1
		Soil Conservation In Landslide Areas	0																													
		Nursery of indigenous plants	1													1																
		Firewood Plantation for Cremation	3							1		1																			1	
3	Alternative Energy	Kerosene supply	4													1	1		1		1											
		LPG connections	0																													
		Solar and Wind Mills	0																													
		Bio Gas	0																													
B	**Livelihood Issues**																															
4	Ecotourism Enterprise	Skill Development	17	1	1					1	1		1	1		1		1			1			1	1	1	1	1	1	1	1	
		Advertisement	15	1	1						1		1	1		1		1						1	1	1	1	1	1	1	1	
		Trekking Trails	8	1	1						1		1	1															1	1	1	
		Ropeway	0																													
		Code of Conduct	2		1					1																						
		Kerosene Supply	1							1																						
		Stray Dogs Control	1							1																						
		Garbage Management	2							1					1																	

5	Agriculture and Horticulture Development	Potato	0																												
		Apple	0																												
		Thin Shelled Walnut	0																												
		Organic Vegetable cultivation	0																												
		Large Cardamom plantations	7	1	1	1	1			1	1																				1
		Apricot	0																												
		Wild Strawberry	1																											1	
		Mushroom	1									1																			
		Orange Crop	2					1						1																	
		Food Processing	0																												
		Floriculture	0																												
		Reduction in Jhum Cultivation	1																											1	
		Tea Plantation	1				1																								
6	Animal Husbandry Initiatives	Milch Cows	8	1				1							1	1				1	1	1									1
		Yak breed improvement and insurance	0																												
		Sheep	0																												
		Angora Rabbit	0																												
		Donkey / Ass	0																												
		Stud Bull	0																												
		Poultry	3													1					1	1									
		Milk Collection Center	0																												
		Cheese Plant	0																												
		Fishery	1												1																
7	Micro enterprise Development	Handicrafts and Handloom	15	1						1		1	1	1		1			1	1	1	1	1				1	1	1	1	
		Wool Cottage Industry	0																												
		Fermented Foods	0																												
C	**Basic Infrastructure**																														
8	Infrastructure development	Road, bridges, footpaths	5								1	1	1	1																	1
		Helicopter Service	0																												
		Power project	0																												
		Telecommunication	0																												
		River bank protection	1																												1

| | | |

3. TEMPERATE ECOZONE

S. No	Biodiversity Conservation Issues	Action	Total	Lachen	Lachung
A	**Conservation Issues**				
1	Conservation Initiatives	Eviction of Cattle Sheds	0		
		Joint Protection of Biodiversity	0		
		Plough back benefits	0		
		Awareness	1		1
2	Plantation in private lands	Firewood and Fodder	2	1	1
		Medicinal Plants	2	1	1
		Wild edibles	2	1	1
		Soil Conservation In Landslide Areas	1	1	
		Nursery of indigenous plants	0		
		Firewood Plantation for Cremation	1	1	
3	Alternative Energy	Kerosene supply	1		1
		LPG connections	1	1	
		Solar and Wind Mills	0		
		Bio Gas	0		
B	**Livelihood Issues**				
4	Ecotourism Enterprise	Skill Development	1		1
		Advertisement	0		
		Trekking Trails	1	1	
		Ropeway	1	1	
		Code of Conduct	0		
		Kerosene Supply	0		
		Stray Dogs Control	0		
		Garbage Management	0		
5	Agriculture and Horticulture Development	Potato	1	1	
		Apple	1	1	
		Thin Shelled Walnut	1	1	
		Organic Vegetable cultivation	2	1	1
		Large Cardamom plantations	0		
		Apricot	0		
		Wild Strawberry	0		
		Mushroom	0		
		Orange Crop	0		
		Food Processing	0		
		Floriculture	0		
		Reduction in Jhum Cultivation	0		
		Tea Plantation	0		
6	Animal Husbandry Initiatives	Milch Cows	0		
		Yak breed improvement and insurance	1	1	
		Sheep	1	1	
		Angora Rabbit	1	1	
		Donkey / Ass	2	1	1
		Stud Bull	2	1	1
		Poultry	0		
		Milk Collection Center	1	1	
		Cheese Plant	0		
		Fishery	0		
7	Micro enterprise Development	Handicrafts and Handloom	1	1	

		Wool Cottage Industry	0		
		Fermented Foods	0		
C	**Basic Infrastructure**				
8	Infrastructure development	Road, bridges, footpaths	0		
		Helicopter Service	0		
		Power project	1	1	
		Telecommunication	0		
		River bank protection	0		
9	Essential Services	Education	2	1	1
		Health	2	1	1
		Drinking Water and Treatment Plant	0		
		Sewerage and drainage	0		
		Improvement of drinking water source	0		
D	**Culture Conservation**				
		Repair of places of worship	0		
		Hot spring conservation	1	1	
		Preserving traditional names of places	2	1	1
		Amji Training Center	2	1	1
		Traditional festivals	0		
		Preservation of sacred spaces	0		
		Sacred Lake	0		
		Traditional architecture	0		
		Traditional Food	0		
E	**Negative outside influences**				
		Pack animals of Assam Rifles	0		
		Tourists	1		1
		Feral dogs	2	1	1
		Poaching by Assam Rifles and GREF	2	1	1
		Firewood depletion by GREF labor force	0		
		Controlling dynamiting by GREF	0		
		Army occupation of grazing land	0		
		Land mine casualties (animals)	0		
		Easy access to liquor from army stores	2	1	1
		Easy access to tinned food from army stores	2	1	1
		Undermining of Pipon System	2	1	1
		Holungpa Settlers from Nepal	0		
		Himalayan Mountaineering Institute, Darjeeling	0		
		Tsokha Village Relocation	0		
		Humana NGO closure	0		

4. TRANS-HIMALAYAN ECOZONE

S. No	Biodiversity Conservation Issues	Action Plan	Total	Chho Lhamo	Lhonak
A	**Conservation Issues**				
1	Conservation Initiatives	Eviction of Cattle Sheds	0		
		Joint Protection of Biodiversity	2	1	1
		Plough back benefits	0		
		Awareness	1		1
2	Plantation in private lands	Firewood and Fodder	0		
		Medicinal Plants	1		1
		Wild edibles	2	1	1
		Soil Conservation In Landslide Areas	0		
		Nursery of indigenous plants	0		
		Firewood Plantation for Cremation	0		
3	Alternative Energy	Kerosene supply	0		
		LPG connections	1	1	
		Solar and Wind Mills	1		1
		Bio Gas	0		
B	**Livelihood Issues**				
1	Ecotourism Enterprise	Skill Development	0		
		Advertisement	0		
		Trekking Trails	0		
		Ropeway	0		
		Code of Conduct	0		
		Kerosene Supply	0		
		Stray Dogs Control	0		
		Garbage Management	0		
2	Agriculture and Horticulture Development	Potato	0		
		Apple	0		
		Thin Shelled Walnut	0		
		Organic Vegetable cultivation	0		
		Large Cardamom plantations	0		
		Apricot	0		
		Wild Strawberry	0		
		Mushroom	0		
		Orange Crop	0		
		Food Processing	0		
		Floriculture	0		
		Reduction in Jhum Cultivation	0		
		Tea Plantation	0		
3	Animal Husbandry Initiatives	Milch Cows	0		
		Yak breed improvement and insurance	2	1	1
		Sheep	1	1	
		Angora Rabbit	0		
		Donkey / Ass	0		

		Stud Bull	0		
		Poultry	0		
		Milk Collection Center	1	1	
		Cheese Plant	2	1	1
		Fishery	0		
4	Micro enterprise Development	Handicrafts and Handloom	0		
		Wool Cottage Industry	1	1	
		Fermented Foods	0		
C	**Infrastructure development**				
7	Infrastructure development	Road, bridges, footpaths	0		
		Helicopter Service	2	1	1
		Power project	0		
		Telecommunication	0		
		River bank protection	0		
8	Essential Services	Education	1		1
		Health	1		1
		Drinking Water and Treatment Plant	1	1	
		Sewerage and drainage	0		
		Improvement of drinking water source	0		
D	**Culture Conservation**				
		Repair of places of worship	1		1
		Hot spring conservation	0		
		Preserving traditional names of places	2	1	1
		Amji Training Center	0		
		Traditional festivals	0		
		Preservation of sacred spaces	0		
		Sacred Lake	0		
		Traditional architecture	0		
		Traditional Food	0		
E	**Negative outside influences**				
		Pack animals of Assam Rifles	1		1
		Tourists	0		
		Feral dogs	2	1	1
		Poaching by Assam Rifles and GREF	2	1	1
		Firewood depletion by GREF labor force	0		
		Controlling dynamiting by GREF	0		
		Army occupation of grazing land	1	1	
		Land mine casualties (animals)	1	1	
		Easy access to liquor from army stores	2	1	1
		Easy access to tinned food from army stores	2	1	1
		Undermining of Pipon System	0		
		Holungpa Settlers from Nepal	0		
		Himalayan Mountaineering Institute, Darjeeling	0		
		Tsokha Village Relocation	0		
		Humana NGO closure	0		

Chapter 7

GOVERNMENT BIODIVERSITY STRATEGY AND ACTION PLAN

APPROACH AND INITIATIVES OF INTER LINKED SECTORS IN THE STATE GOVERNMENT

Areas / Sectors	Brief description of the major programs, projects undertaken by the State Government	Gaps and Strategy Needed for biodiversity conservation
A. Agriculture Allied activities		
Crop husbandry	Seeds, farm improvement, plant protection, commercial crop development & distribution of ginger, potato and large-cardamom seeds, extension and development of oil-seeds, small and marginal farmer development, development of fruits, vegetable and horticulture, floriculture, agricultural research and education, Indo-Swiss project for horticulture, animal husbandry and dairy. Greenhouse technology, massive extension and training program for farmers, mushroom cultivation, integrated pest and disease control.	**Gaps** Change in cultivation practices Introduction of improved and exotic varieties Commercialization of agriculture, population increase, Lack of documentation of traditional knowledge of conservation practices in agriculture from generation to generation, Conservation programmes are not well reflected in the projects or plans Lack of redressal forum to discuss the gaps of inter and intra departmental activities. Linkage or networking amongst the departmental projects and activities for conservation strategy is lacking
Soil & water conservation	Soil survey, investigation and testing, soil conservation in forest, agriculture and urban areas. Reclamation and treatment of landslide / slip areas, studies and technological input for soil erosion, landslide and slip areas. Catchment area treatment, watershed development scheme in watershed and agriculture. Strengthening of State Land use Board.	**Gaps** Inventory of industries and identification of pollution sources needed Waste water -treatment plants needed Monitoring of water quality needed
Animal husbandry	Veterinary hospitals and dispensaries, prevention and control of animal diseases, intensive cattle development, poultry development, sheep and bull development, piggery development, goat development, angora rabbit farming, yak farm projects and other livestock. Pasture, fodder and feed development program. Distribution of milch cow and piglets to the rural poor. Creation of special cell for disease investigation and cattle development program with Indo-Swiss project.	**Gaps** Decline in 'Siri' Cow, Yak, Indigenous Sheep populations over the decades Problems of Cross Breeding, Habitat Change, Mixed Farming, Natural Calamities like untimely snowfall Introduction of exotic fodder species with potential to escape to the wild
Dairy development	Extension and training to the farmers, assistance to the cooperative societies and other bodies, milk unions, integrated dairy development program. Cheese processing plant at Dentam, milk processing farm at Mangan, milk chilling plant at Kabi and special program for quality control.	**Gaps** Decline in 'Siri' Cow, Yak, Indigenous Sheep populations over the decades Lack of milk processing plants in the temperate ecozone where yak and sheep rearing is a vital means of livelihood
Fisheries	Development of inland fisheries, seed production for trout, carps and catfish, conservation of riverine fishery, fish farmers development program, survey, research, training and extension.	**Gaps** Limnological studies of all water bodies – both lotic and lentic systems lacking Inventory of species of zoophytic origin with regards to planktons, nektons, benthos plus the vegetation needed Introduction of exotic fishes in fresh water bodies specially in the subtropical and temperate ecozone

Forestry & Wildlife Afforestation Programs	Protection of Forest, Environment and Wildlife, afforestation, regeneration and soil conservation, development of Medicinal Plants under the State Medicinal Plants Board, IWDP, IAEP, national parks, sanctuaries, biosphere reserves, sericulture, aesthetic and urban forestry, parks and gardens, Smriti Van, Catchment Area Treatment, compensatory afforestation, bamboo development, strengthening of nurseries, strengthening of infrastructure, building, communication, special forest protection by providing wireless sets and arms. Research, technological and educational program. Greening of urban areas and Important Bird Area Programmes of BNHS	**NTFP and Medicinal Plants** Trans-border smuggling of medicinal plants Lack of knowledge for harvest and post harvest techniques (value addition) Lack of technology like agro technology and biotechnology Lack of systematic survey of medicinal plants Lack of documentation of indigenous system of use and cultivation of medicinal plants Lack of skills, training and capacity building of resource manager Establishment of progeny garden of different crops Documentation of genetic diversity of cultivated and semi wild plants is needed Domestication and cultivation of medicinal plants and NTFP in private holdings needed Recognition of role of women folk in conserving medicinal plants and NTFP needed Phytochemical evaluation of medicinal, aromatic and other NTFP resources needed Incentives to local herbal practitioners to improve their skills needed Status survey of endangered medicinal plants **Wildlife** **Cause** Human population increase Cattle population increase Negative impacts of developmental activities Illegal collection and exploitation of plants from forests Encroachment of forest land Poaching and Hunting **Gaps in Governmental schemes** i. Lack of people's participation in the past ii. Lack of coordination amongst various departments iii. Lack of monitoring and feedback of impact of government schemes iv. Lack of regular census of wildlife **Strategy and Action Plan** Preparation and implementation of Management Plans for all the protected areas Wildlife laws to be strictly implemented Entry into protected areas to be regulated Schemes such as snow leopard project, red panda project, musk deer project need to be proposed *Ex-situ* conservation initiatives such as the HZP at Bulbuley needs to be strengthened Discouraging plantations of monoculture and encouraging plantation of wild edible plants Setting up of a wildlife intelligence network to prevent smuggling of wildlife products and hunting Discouraging plantations of monoculture and encouraging plantation of wild edible plants Decentralization of administrative and financial powers to division level Formation and strengthening of EDCs around PAs **Orchids, Rhododendrons and Wild Flora** **Gaps:**

		1. Destruction of habitat 2. Over exploitation of wild flora 3. Forest fire 4. Road construction 5. Grazing in forests 6. Increase in forest cover is cause of population decline of *Dendrobium heterocarpum* and *D. nobile* **Action Plan:** 1. Adoption of species by interested families 2. Micro-propagation in labs 3. Banning collection from the wild Incentives for propagation of rate species through tissue culture and commercialization 4. All persons dealing with export of wild plants or domestic cultivation should get registered with Wildlife Wing of Forest Department 5. Nursery Development for propagation, Green house and glass house for propagation
Food, storage & warehousing	Establishment of new food grain *godowns*, purchase of buffer stock, strengthening of public distribution system, issue of new ration cards, food processing, food subsidy to the poor people, constitution of state consumer protection council, state consumer commission and district forum. Massive awareness by government as well as through NGO's.	
Agricultural research & education	Adaptive trial (agri + horti), micronutrients campaign, research in animal husbandry, development of marketing and quality control, high yielding variety program, dry land development program, drought prone area program, strengthening of price support system, research program on high altitude pasture. Program for establishment of agriculture / horticulture colleges/universities.	**Gaps** State Government Agencies are confined to developmental programmes for direct benefit of the people. Research and Developmental programmes is confined to Central Government agencies Lack of Ex-Situ gene banks with state government agencies. Establishments of herbal gardens, repository of local plant genetic resources and gene banks is needed along with coordination with ICAR. ICAR have a national project on conservation, characterization and evaluation of biodiversity of India. National Bureau of Plant Genetic Resources (NBPGR) is the leader in this field. NBPGR has the largest gene bank in Asia with a capacity of 10 million samples. Even seed, karyotype may be preserved by them for long term. The biodiversity having economic importance is registered in the name of individual or organization.
Fertilizers and pesticides	Extensive training program for farmers, proper use of manure, fertilizer and introduction of composting and vermiculture program.	Need to revert back to organic farming systems
B. Rural Development		
Special program for rural development IRD & allied programs DPAP IREP	70% of the budget is being provided for the rural areas for poverty alleviation, provide minimum amenities and generation of employment opportunities. Programs such as Jawahar Rojgar Yojana / Swarna Jayanti Gram Swarajya Yojana, strengthening of Panchayati Raj System and community development. IREP, NRSE, IRDP, TRYSEM, DWCRA, rural bridge, rural water supply, rural sanitation, monthly remuneration to panchayats, rural housing scheme, distribution of GCI sheets, construction of panchayat ghar and community center. Program: rural work to rural youths, creating of model villages in each constituency and Jawahar Gramin Samridhi Yojana. Under land reforms, a land bank scheme i.e. free land to landless poor *Sukumbasis*	

Areas development Programs NRIP/JRY Land reforms Other rural development Programs Community development & panchayats Assistance to local bodies	has been launched, computerization of land records done and cadastral survey using modern technology, GIS, is in process. Panchayati Raj and the empowerment of the rural poor, infrastructure development for panchayats, construction of zilla panchayat bhavan and panchayat ghar, appointment of panchayat assistant in all the gram panchayats. Training and capacity building of all the panchayat members in various rural development programs, 30% of departmental budget directly to panchayat. State's policy decision that good agricultural, cultivable land should not be diverted for non-agricultural purposes.	
C. Irrigation & Flood Control		
Major, Medium and Minor irrigation projects Watershed development (IWDP) Rainwater harvesting in rural areas Ground water pumps & boring Command area development Flood control Others	Strengthening, maintenance and restoration of existing irrigation system and flood control facilities. Extension and construction of a new network of minor irrigation channels. Accelerated irrigation benefit program. Assisting to Panchayati Raj institution for maintenance and minor repair of irrigation systems. Civil protection and construction work in river training for flood control. Preventive and control measures, reclamation and rehabilitation of flood affected/landslide areas, anti-erosion program, jhora training and disaster management program. Augmentation of water sources of irrigation and minimizing soil erosion as a flood control measure, intensive conservation and development of watershed areas by the agriculture department, Department of Forest, Environment and Wildlife, RDD, Irrigation and other related departments. Pilot project on rainwater harvesting at Sadam, South District (encouragement of NGO's program) and extension to other areas. Integrated development of agriculture through irrigation facilities	
D. Energy State electricity board Others (Non Conventional)	Re-strengthening and re-furbishing the existing power generation stations, transmission lines, distribution systems, and electric installments. Construction of new mini/micro hydroelectric projects namely Rabom-chu HEP, Rolep I, II & III HEP, Mangley HEP, Ralang-chu HEP and Chakung HEP. Construction of Tista stage V HEP (510 MW) through NHPC. Completion of ongoing projects, constitution of Power Development Corporation, construction of new transmission lines, diesel power stations, rural electrification, development non-conventional source of energy, new and renewable source of energy, bio-gas, solar energy etc. Prevention of theft of power, transmission losses, better revenue collection	**NHPC** **A Details of Ongoing Schemes:** 1. Compensatory afforestation over 250 ha of degraded land 2. Catchment Area Treatment 3. Reservoir Rim Treatment 4. Wildlife Conservation Plan including separate plan for butterflies 5. Fishery Management Plan 6. Green Belt around project area 7. Landslide stabilization **BGaps** 1. Lack of awareness and education regarding environment and biodiversity 2. Lack of public participation 3. Lack of coordination between the state government and the user agency 4. Difference in vision of sustainable development between various stake holders

E. Transport Roads & bridges	Maintenance and up-gradation of existing roads, construction on new roads and bridges in rural areas, stabilization of landslide prone stretches. Metal ling of fair-weather roads	
Public transport services	Operation and maintenance of Sikkim Nationalized Transport, acquisition of new fleet, introduction of helicopter service, construction of helipads in all the districts.	
Urban bus services	Construction and improvement of the state bus terminus at Gangtok, and in other towns, introduction of city buses. Introduction of a full-fledged private taxi / transport service.	
Rural road transport	Introduction of more bus services to rural areas, construction of passenger waiting sheds, precautions and measures to prevent accidents, introduction of private taxi services. Introduction of a full-fledged private taxi / transport service.	
Urban traffic control	Earmarking of parking lots for taxis, private vehicles, buses, and other vehicles. Timing and regulation of traffic, construction of parking stands, awareness training, signboards, and development of efficient traffic police. Construction of traffic control points. Program for construction of pedestrian pathways and over bridge, waiting sheds and traffic points.	
New road connectivity	For the smooth movement of traffic in rural and urban areas, connectivity to the various roads is being provided, which helps during the landslide and blockages of roads during monsoon season.	
F. Science, Technology And Environment		
Scientific Research	Research and development on application of remote sensing, tissue culture, bio-technology, medicinal plant, health, environment, agriculture, horticulture and forest. Mapping using modern technology like GIS for wetlands, watersheds and others. Landslide zonation, glaciological studies, construction of planetarium. Creation of science club library in all the schools of the state. Training of rural youth in different fields, school dropouts etc. The government has taken tremendous initiative and launched a number of successful programs on pilot and extension basis, for generating self-employment and capacity building of the rural and urban community. Through the efforts of Science and Technology, a number of unemployed youth have gainful employment / self-employment.	**Gaps** 1. Decline in Traditional Foods 2. Invasion into one food culture by multinational companies through media and advertisements 3. Non promotion of our traditional foods and traditional preparation of foods 4. Use of excess chemical fertilizers and pesticides 5. No capacity building of communities 6. Non development of protocol for mass production of wild edible mushrooms **Major Gaps in the Governmental Schemes** 1. No department is looking into microbial aspects 2. No research and extension institutions concerning microbial diversity in the state 3. Potential of microbial diversity is yet to be recognized **Major Gaps in Information, vision, policy and legal structure** 1. Status is unknown 2. Assessment and documentation yet to be done 3. Dissemination of traditional methods 4. Valuation and Value Addition 5. Patenting and IPR 6. Commercialization as joint ventures 7. Biodiversity Bill should have specific provisions for microbial diversity **Strategy to Plug the Gaps:** 1. Special focus on Microbial Diversity needed 2. Inclusion of traditional knowledge system specially of fermented foods in the existing school curriculum to reconfirm their importance

		3. Focus on taxonomy of important microorganisms associated with ecosystem in College and University Syllabus 4. Up gradation of traditional food fermentation technology **Action Plan:** **A. Short Term** Mass production of wild edible mushrooms Promotion and publicity of importance of traditional fermented foods Training and Capacity Building **B. Medium Term** Survey of important sources of Microorganisms Research projects specific to microbial diversity Setup microbial diversity expert committee at state level **C. Long Term** Establish National Institute of Microbial Diversity in Sikkim, Setup Microbial Collection Center, Marketing: Attract private investment to, explore the importance of untapped microbial genetic resources, Training manpower in modern taxonomy of microorganisms isolated from various ecosystems
Ecology & environment and State Pollution Control Board	Regular monitoring of air and water pollution, environmental impact assessment. Setting up of standards for industrial establishments, processing for environmental clearance, awareness, extension and training programs, strengthening of research and other developmental activities Program on research and study on the impact of tourism, eco-tourism, hotel industry etc in rural and urban area. Mass National Environmental Awareness Campaign (NEAC) program for schools, panchayats, NGO's, youths, army and government agencies as well.	Inventory of industries and identification of pollution sources needed Monitoring of water quality needed
Tourism	Programmes to develop tourism destinations, wayside amenities, promoting the nature, culture and adventure components of tourism. Capacity building of the villagers in the tourism enterprise, promoting villager tourism, home stays, helicopter rides etc Tsomgo Lake Development Development of Saramsa Garden Bulbuley Development Program Samdruptse Development Program	**Gaps:** Lack of Awareness, Poverty, Non involvement of local people, Over Centralization, No maintenance funds, Non sharing of Information, Lack of documentation, publicity, training and involvement of all stake holders in the various programmes **Strategy and Action Plan:** Inclusion of conservation of biodiversity mandatory in all governmental schemes, Continuous awareness program Vision statement and Policy Statement for all the departments needed, Plans for direct economic benefits for the local people from tourism Laws and rules to regulate the negative impacts of tourism Provision for maintenance of tourist facilities
River action plan (River Valley Project) and Others (Catchment Area Treatment)	Afforestation, soil and moisture conservation, reclamation and rehabilitation of landslides / slip areas, investigations and surveys and training of streams / jhoras. Fuel wood, fodder; pasture development and fruit plantations, awareness, extension and training. Application of new and modern technology for minimizing soil erosion, control, reclamation and rehabilitation of landslide/slip areas.	

G. Social Services		
Primary education Rural primary education Urban primary education Technical education	In strengthening and improvement of infrastructure in primary schools, junior high schools, high and higher secondary schools, senior secondary school etc. Establishment of more number of Navodaya Vidyalaya. Program of free textbooks, free uniform, free mid-day meals and special scholarship. Up-gradation of schools and quality education. No tuition fees in all the government schools. Opening of new schools in rural areas and a drive for enrolment of children with special emphasis on the girl child. Establishment of more educational institutions, colleges, universities and technical education for higher education. Establishment of monastic and Sanskrit Vidyalaya. Establishment of Academy for Arts, Literature and Music in Sikkim. Development of infrastructure for technical and vocational education. Setting up of State Education Board, Computer Education Centers. Formulation and implementation of externally aided project for higher technical education. Manipal Institute of Technical and Medical education, Center for Computer and Communication Technology, polytechnic set up. A special program for Information Technology and setting up a Software Technological Park Strengthening the program for adult education.	Need to develop awareness in students by introducing study of biodiversity of the state in school and college levels Need to introduce study of endangered plants and animals at college level Need to stress on the study of traditional values, customs etc which entails the conservation of biodiversity
Medical & public health Rural medical & public health Urban medical & public health Others	Strengthening of infrastructure and management of existing hospitals, primary health centers and dispensaries. Establishment of better health facilities in rural and urban areas, especially creation of more rural health sub-centers for better accessibility to rural population. A program on State Illness Assistance Scheme for treatment of people below poverty line. Program for improvement of child health, leprosy, AIDS, family planning, pulse-polio immunization. Maternity financial assistance to poor families. Special drive to educate the people, students and youth about water borne diseases, health, hygiene, sanitation, alcoholism, drugs etc. Medical education, training and research, prevention and control of diseases, prevention and control of blindness and prevention and control of Tuberculosis.	
Safe drinking water supply Urban drinking water supply Rainwater harvesting in urban areas Rural drinking water supply Others	Strengthening of infrastructure and better management for existing water supply network in rural and urban areas. Strengthening of water testing lab for testing the water of all urban centers. A special project with AusAid, for improvement and augmentation of water supply system, using modern technology. Augmentation of the capacity of treatment plan at Gangtok and other urban towns, strengthening of water distribution system, construction of water treatment facilities in all the places having existing water supply system. Improvement of water supply system for tourist potential points. Assistance to panchayats for village water supply schemes. Mass awareness for minimization of wastage of water, water pollution, water treatment, water borne diseases. Special emphasis for protection and development of watershed area of the water source. Improvement, renovation and augmentation of water supply for rural marketing centers. A pilot project on rainwater harvesting at Sadam, South District (NGO initiative) has	

	been very successful. In addition, the government has decided to launch a special program for rainwater harvesting for urban areas as well as other places.	
Sanitation Rural sanitation facilities Urban sanitation facilities Others	Strengthening of infrastructure and better management of existing sanitation facilities in rural and urban areas. A special project with AusAid, for appropriate sanitation technology Mass awareness campaign for sanitation in rural and urban areas both. Baba Ambedkar Centenary program on sanitation. Assistance to panchayats for rural sanitation. Construction of household latrines, committee latrine and community bathing cubicles in rural areas. Collection centers for house-waste, collection of biodegradable and non-biodegradable solid waste in different color bins, community bins, solid waste disposal program, arrangement of sweepers, vehicles for garbage transport in urban areas.	
Sewerage and sewerage Treatment Systems in Urban Areas Laying of new sewer lines Installation of new sewerage Treatment systems O & M of sewerage and sewerage treatment systems	Strengthening of infrastructure and better management of existing sewage network. Renovation of existing sewage treatment plan. Strengthening and renovation of trunk and main sewer lines. Augmentation of sewage network in Gangtok and other urban towns. Extension of sewer system to the new areas of all urban towns. Extension of existing sewer system to the peripheral areas of Gangtok and other urban towns. A special project with AusAid for augmentation and better management of sewerage system using modern technology.	
H. Urban And Regional Planning And Development		
	Development and implementation of master plan for Gangtok town. Slum area improvement program and a special program on environmental improvement of slums in Gangtok and other urban towns. Development of parking lots, pedestrian walkways and pedestrian over-bridges, improvement of urban roads, construction of hat sheds. Construction of ropeway and development of new satellite towns Development of small and medium towns A special program for enhancement of urban environment, green belts, aesthetic forestry / parks and gardens, sanitation drive, traffic control, regulation of construction and protection of watershed and surrounding areas of urban towns to prevent natural calamities, landslides etc by proper drainage management, training of streams / jhoras and massive afforestation programs.	

INDIAN ARMY BSAP

Indian Army BSAP					
Activities	**Why**	**Who**	**Where**	**How**	**Success Indicator**
1. Bio-monitoring by Army	In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence	Army, Forest Dept, CEE	High altitude areas of North and East Sikkim	Pictorial information booklet and Pictorial questionnaires for the armed forces depicting endangered fauna and flora should be developed with the assistance of the State Forest Department and Centre for Environmental Education (CEE) 1.Forest Dept to make pictorial questionnaires for the armed forces depicting endangered flora and fauna 2.The armed personnel during their regular Long Range Patrolling (LRP) could fill up questionnaires for Bio-monitoring and forward the same to their headquarters3. These filled up questionnaires could then be collected by the Forest Dept and this data compiled to give valuable information on the presence, abundance and threats to our endangered biodiversity in restricted areas of alpine zones in Sikkim Suitable training should be imparted to some key officials who could act as resource personnel for providing environmental awareness to various field units	Pictorial questionnaire developed by Forest dept. and CEE regularly used by field personnel Regular collection of data from the army headquarters and liaison between Forest and Army
2. Army Support for joint patrolling	In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence The Forest Dept is understaffed and lacks infrastructure in these remote high altitude areas.	Army and Forest Dept.	High altitude areas of North and East Sikkim	The army could support the forest patrolling party by providing manpower and other logistic support	Joint patrolling for WL and regular exchange of information between Forest and Army
3 Reduce the damage due to Developmental Activities by GREF / BRO	GREF/BRO is like the contractor for the army. They implement the various developmental activities based on the plan or design of policy of the army. In addition, these motor-able roads are a necessity for heavy equipment needs to be transported for combat.	Army and Forest Dept	Sikkim	1. Alignment of roads should be chosen such as to create minimum damage to the environment. Forest area should be avoided as far as possible 2. Labor Camps should be at selected places. Forest area should be avoided as far as possible 3. Lower hillside damage should be controlled 4. Rehabilitation and Conservation works should be undertaken simultaneously with developmental activities 5. Illegal fuel wood should not be used by the laborers and BRO should make special provision for providing kerosene to them	Minimal environmental damage around GREF/BRO establishments and area of influence; Awareness at all levels especially field level

Indian Army BSAP					
Activities	**Why**	**Who**	**Where**	**How**	**Success Indicator**
4 Sensitizing the armed forces towards biodiversity conservation	Army has a major presence in the remote locations of north and east Sikkim. Therefore, if they could be sensitized to reduce their negative impacts and increase their positive impacts the overall gains would be enormous. Though sensitivity towards conservation in the armed forces has been on the rise from 1990 onwards, there is still a long felt need to improve the awareness levels	Army and Forest dept.	Sikkim	1. An easy to understand awareness booklet on nature conservation should be prepared for distribution to different units of army 2. Army should organize frequent training camps and awareness workshops for different units for Environment / Biodiversity Conservation	Awareness booklet developed by Forest Dept and CEE and available at the remotest outposts at field level
5. Reducing animal casualties due to Land Mines in border areas with China	Instances of Kiang (Wild Ass) and other endangered wildlife being killed and injured by land mine blasts. Preserving the migratory corridor between India, China and Tibet for wildlife.	Army	Mined areas of North and East Sikkim	1. Due to security reasons these land mines cannot be removed. As per the 1949 Geneva Convention, these mines need to be fenced with barbed wire. 2. This perimeter fencing should be improved and strengthened by the army so that no wildlife crosses it and is blown up.	No more casualties of the endangered Globally Threatened wildlife
6. Eliminating feral dogs around army cantonments	They subsist on the leftovers of the army cantonment and cook house. Feral dogs are a major threat to wildlife. They roam around in packs. There have also been instances of armed personnel being mortally wounded by these packs.	Army veterinary unit and Forest Dept. with technical assistance from AH&VS dept., NGOs	Army cantonments in North and East Sikkim	Army should get rid of feral dogs located in and around their camps They could take help of appropriate civil authorities if required for the purpose.	Reduction in feral dog sightings around army camps

Chapter 8

STATE BIODIVERSITY STRATEGY AND ACTION PLAN

INTRODUCTION TO THE COMMUNITY PRIORITY INDEX (CPI) MODEL

The 39 ecoregion wise CSAPs were condensed into one Sikkim State BSAP. The priorities given to the various issues were ranked and listed as the Community Priority Index (CPI). This CPI model of sustainable development at village level has been prepared ecoregion wise to ensure that the diversity in peoples voice is not lost. Appropriate weightages have been given to ensure that all the ecoregions are equally represented.

OBJECTIVE OF THE CPI MODEL

Quantitative representation of qualitative issues for ease in interpretation

METHODOLOGY OF THE CPI MODEL

1. The CSAPs obtained from the 39 public hearings were segregated ecoregion wise and the aspirations of the local community listed out as "Biodiversity Conservation Issues". e.g. "Conservation Issues"

2. These issues were broadly classified into five categories namely, conservation issues, livelihood issues, infrastructure development, culture conservation and negative outside influences. Similarly the actions needed to be taken against these issues were also listed down. Then these ecoregion wise CSAPs were clubbed into one table (matrix) against these issues and actions needed.

3. At each CSAP level the issues which were raised were given one point and the issues which were not raised were given zero point

4. These rankings at CSAP level were clubbed ecoregion wise and their rankings averaged to obtain the CPI score. This CPI is an indicator of the priority given to that particular issue by the villages in that ecoregion.

LIMITATIONS OF CPI MODEL

Though this model tries to crystallize the priorities of the community on a particular issue, certain priorities specific to a particular village and not present in the other villages do tend to get lost. In this case the village specific CSAP needs to be referred to.

HOW TO INTERPRET THE CPI SCORE

COMMUNITY PRIORITY INDEX		INTERPRETATION
From	To	
0.00	0.15	Low Priority
0.16	0.50	Medium Priority
0.51	0.75	High Priority
0.76	1.00	Top Priority

Secondly, this is basically a compilation of all the CSAPs and only in few instances has it been possible for the GSAP to have been combined at this stage.

SIKKIM STATE
BIODIVERSITY STRATEGY AND ACTION PLAN

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
		Tropical	Sub tropical	Temperate	Himalaya	TOTAL		
		Community Priority Index (CPI) 0.00 - 0.15 Low 0.16 - 0.50 Medium 0.51 - 0.75 High 0.76 - 1.00 Top						
A	Conservation Issues							
1	Issues for Conservation Initiatives							
	Grazing in Forests	0.00	0.59	0.00	0.00	0.15	In the tropical villages though there is grazing in forests, cattle brought home. (CPI = 0.00) Transhumance by graziers especially in the subtropical villages is prevalent. These graziers migrate to the temperate forests in summer in search of better grazing pastures and return only on the onset of winter. During their stay in the temperate forests these graziers stay in temporary sheds called *Goths*. Here they carry out extensive lopping of trees for fodder, use excessive firewood and also indulge in smuggling of NTFP and poaching of wildlife. More than the grazing it is these graziers who cause damage to the biodiversity values. (CPI = 0.59) Graziers from the temperate village graze their cattle in the alpine and trans-Himalayan grasslands above the tree line. (CPI = 0.00)	1. Revival of sustainable rotational collection / sustainable and non-destructive harvesting of medicinal plants, wild edibles through local JFM, EDCs 2. Carrying Capacity based Rotational grazing with rest periods, as solutions for traditional graziers from temperate villages in alpine and trans-Himalayan grasslands 3. Eviction of sub-tropical and temperate Cattle Sheds from Wildlife Protected Areas
	Illicit Felling Wildlife Poaching including NTFP and Medicinal Plants,	1.00	0.93	0.00	1.00	0.73		

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Biopiracy	1.00	0.93	0.00	1.00	**0.73**	In the tropical and sub tropical ecoregion to control illicit felling the villagers have extended full cooperation and would like their stake institutionalized by the strengthening of JFMC / EDC. While this issue has not received priority in the temperate ecoregion In the alpine and trans-Himalayas, army and GREF have a major presence and outnumber the few nomadic graziers who are at their mercy. There is a pressing need to strengthen the forest and wildlife infrastructure to keep a check on wildlife poaching and piracy. Little awareness on issues like biodiversity registers, biopiracy, Acts and Legal implications;	4. Joint Protection of Biodiversity by communities and Forest department 5. Biodiversity Registers maintained by communities ecozone-wise, 6. Awareness of bio-piracy issues, Acts and Legal actions 7. Capacity building programmes for forest officers and field staff as well as JFM, EDCs on various aspects of forest conservation and management 8. Strengthening of physical infrastructure of Forest department for effective forest protection mechanisms
	Poaching incidences by Assam Rifles and GREF	0.00	0.00	1.00	1.00	**0.50**	Wildlife population especially of Himalayan Marmot, Woolly Hare, Blue Sheep, Nayan etc. has drastically declined in areas of Muguthang and Kerang (Khering) in trans-Himalayas where there are permanent camps of Assam Rifles. Forests and Wildlife around Labor colonies of GREF has been badly impacted in both the temperate and trans-Himalayan areas	9. Strengthening of infrastructure for Forest Department and strengthening of local communities (JFMC, EDC) 10. Education of the army through NGOs and CBOs
	Firewood depletion by GREF labor force	0.00	0.03	0.00	0.00	**0.01**	A large labor force of foreign nationals is engaged in road construction activities in the ecofragile regions of North Sikkim. Since GREF does not provide them with kerosene they are very dependent on the locally available firewood like Rhododendron, Juniper etc.	Forest and District Administration to ensure that: 11. GREF should provide kerosene and other alternatives to firewood to their laborers. 12. Labor Camp areas should be at selected places only. 13. They should also ensure that these laborers do not settle down in the localities after the project is completed

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Excessive blasting by GREF for road construction	0.00	0.03	0.00	0.00	**0.01**	Excessive blasting disturbs the landscape resulting in flash floods and landslides. This is very visible in the subtropical region of Chungthang village of North Sikkim	14. Forest and District Administration to ensure Minimum and Controlled dynamiting by GREF
	Habitat destruction by Tshokha village within KNP	0.00	0.03	0.00	0.00	**0.01**	This issue is specific to the subtropical Yuksam region in west Sikkim wherein the Chogyal settled 9 Tibetan refugee households in 1969. Today this Tshokha village falls within Khangchendzonga National Park. These villagers are themselves eager to shift out of the park	15. Relocation and Rehabilitation of Forest Villages by National Park authorities
	Habitat Destruction by HMI within KNP	0.00	0.03	0.00	0.00	**0.01**	The trainees along with the support staff, number over 200 in one group. There are a total of ten groups in a year, spending three weeks each at the HMI Training Camp on Rathong Glacier. Irreversible Habitat destruction of Blue Sheep, Snow Leopard and Pheasants	16. Relocation of HMI camp outside KNP as per Act and Supreme Court ruling 17. Habitat destruction by trekkers and porters of Himalayan Mountaineering Institute, inside the National Park to be stopped by taking appropriate legal and administrative action by Park authorities and Home Department 18. Planned and restricted HMI activities inside National Park 19. EDCs should be strengthened and empowered for development of sustainable Eco-tourism in Alpine areas Fuel requirement (Kerosene, Biogas) should be ensured for trekkers and no Trees and bushes for fuel wood should be cut by trekkers in national park

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Lack of Awareness	1.00	0.00	0.50	0.50	0.50	Most of the awareness programs have mainly targeted the subtropical region Whereas in tropical zone it is a very important issue. In temperate and trans-Himalayas with a major presence of Army and GREF, awareness and sensitization is necessary and vital Overall, little awareness on issues like biodiversity registers, biopiracy; Need for revival of rotational collection/harvesting of medicinal plants, wild edibles, etc. rotational grazing with rest periods	20. Awareness of bio-piracy issues by Forest Dept., Sc.&Tech Dept., 21. Awareness of Acts, laws & legal actions, penalties 22. Revival of ecofriendly traditional systems of rotational and non-destructive scientific harvesting with rest periods especially for medicinal plants and rotational grazing 23. Preparation of documentaries and use of local media by all inter-linked depts. 24. EDC members should be trained for functioning as effective guides for tourists
2	Plantation in private lands							
	Firewood and Fodder Demand	0.00	0.07	1.00	0.00	0.27	In tropical zone due to easier availability of LPG, Kerosene, etc. and warmer climate this is not an issue. Fodder plantations (Amliso, Napier, etc.) already exist in private lands. Still there is shortage. As we move on to the colder climates the requirement increases substantially. While in the trans-Himalayas due to the harsh climate there is no scope for plantations and people mainly use yak dung fuel and recently solar energy.	25. Firewood and Fodder Plantations by Forest Dept. to be intensified on private and community land, degraded forest land especially Goucharan and Khasmal through JFMCs

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Increasing demand for medicinal plants	0.00	0.03	1.00	0.50	0.38	Most of the valuable high altitude medicinal herbs like *Aconite*, *Nardostachys*, *Podophyllum*, *Picrorhiza*, *Ephedra*, etc. are in great demand both locally and for export. The state government has still banned their collection from the wild for commercial purposes. In the higher altitudes people still depend on traditional health systems unlike in the lower belt where there is easy access to allopathic drugs and government hospitals.	26. Availability of planting material, seed, etc. Medicinal Plant Cultivation techniques and Marketing by Forest Dept. (State Medicinal Plants Board) or through cooperatives, Villagers and NGOs 27. Forest Dept. to empower local people over their surrounding natural resources, so that they can be active in stopping outsiders from collecting medicinal plants (by formulating a Draft, Passing it, through JFMC/EDC who would put it in their Code and Getting it passed by Panchayats in Gram Sabhas,) 28. More community-based Bio-Centres with Green House and Shed House facilities should be developed for peoples' empowerment for use of appropriate technologies for modern nursery, medicinal plant cultivation.
	Demand for wild edibles (ferns, nettles, roots, tubers fruits, flowers etc)	0.00	0.03	1.00	1.00	0.51	Pressing need to conserve wild edibles in the higher regions due to increased exploitation from "negative outside influences" like army, GREF and their laborers and impact of developmental activities like road construction, etc. E.g. Collection of *Rheum nobile* for decoration purposes, while the villagers consider it a delicacy with medicinal properties	29. Wild edibles Cultivation and Marketing by Forest Dept Cooperatives, EDC/JFMCs, private entrepreneurs and NGOs 30. Forest Dept. to empower local people over their surrounding natural resources, so that they can be active in stopping outsiders from collecting wild edible plants (by formulating a Draft, Passing it, through JFMC/EDC who would put it in their Code and Getting it passed by Panchayats in Gram Sabhas,) 31. More community-based Bio-Centres with Green House and Shed House facilities should be developed for peoples' empowerment for use of appropriate technologies for modern nursery, floriculture; mushroom, vegetable cultivation.

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Landslide Control	0.00	0.00	0.50	0.00	**0.13**	Landslide control is relevant for the whole state. However the issue has arisen in the temperate zone due to difficulties in stabilizing these areas especially in North Sikkim.	32. Soil Conservation protective works, minimum disturbance to soil, vegetation cover through Watershed Committees, JFM/EDCs and related division of Forest Dept., Irrigation and Land Revenue depts. in Landslide Areas 33. Use of modern technologies for Bio-Engineering measures for control of landslides through the above.
	Requirement of Seedlings	1.00	0.03	0.00	0.00	**0.26**	Improved nurseries are needed especially in the lower belt to assist in cultivation of agriculture, horticulture and forestry plants. In the higher altitudes animal husbandry, cultivation of medicinal plants and tourism are the main livelihood options	34. Nurseries (Modern, Home, Farm) of indigenous plants through JFMC/EDC community nurseries to grow 60% seedlings for the department and 40% flori/horticultural varieties for their own, by Forest, RDD, Horti and Agri depts. 35. Generating awareness for taking up tree plantation by women for future financial security 36. Avenue plantations on various roads, community land by JFM/EDCs 37. Development of 'Smriti Van' in every village by JFM/EDCs
	Firewood requirement for cremation	0.00	0.10	0.50	0.00	**0.15**	In the sub tropical and temperate region Oak and Juniper wood are preferred for cremation purposes. Both species are very slow growing with poor natural regeneration. Now with growing population this has adversely affected the forest cover. Hence the villagers have opined the need for fast growing firewood plantations like *Alnus nepalensis*	38. Firewood Plantation near cremation grounds through JFMC/EDC community nurseries
3	Alternative Energy							
	Requirement of Kerosene	0.00	0.14	0.50	0.00	**0.16**	In subtropical and temperate regions due to shortage of firewood, villagers have demanded subsidized supply of kerosene	39. Kerosene supply through Food & Civil Supplies, RDD and other inter-linked Depts. 40. Promotion of other saving-saving devices such as solar and bio-gas

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Requirement of LPG	0.00	0.00	0.50	0.50	0.25	In tropical and subtropical regions LPG connections are easily available due to better accessibility Due to shortage of firewood in the temperate and trans-Himalayas villagers have demanded LPG connections for cooking purposes	41. LPG connections through Food & Civil Supplies, RDD, Agriculture, Power and other inter-linked Depts. and Eco-development schemes of WLPAs
	Requirement of Solar and Wind Energy	0.00	0.00	0.00	0.50	0.13	Due to the absence of firewood in the trans-Himalayas and abundant sunshine and wind power this issue needs to be addressed	42. Solar Lighting And heating and Wind Mills through Rural Dev Dept., NGOs and other schemes
	Requirement for Bio Gas	1.00	0.00	0.00	0.00	0.25	Due to the warmer climate and presence of stall-fed cows in the tropical zone the villagers have felt the need of biogas to meet their energy demands.	43. Provision for Bio Gas plants through JFMC /EDC NGOs/KVIC
B	Livelihood Issues							
4	Ecotourism Enterprise							
	Ecotourism Revenue Ploughback	0.00	0.10	0.00	0.00	0.03	Most of the revenue especially from tourism in protected areas is from the subtropical belt. So there is a need for ploughing back this revenue for village development, cleanup campaigns and maintenance of ecotourism facilities.	44. Plough back benefits (revenue from tourism) to WL Protected Areas through relevant village committees, Forest and Tourism depts. for village development, cleanup campaigns and maintenance of ecotourism facilities. 45. Restricted tourism in eco-fragile areas. JFM/EDCs should be empowered to regulate and control unsustainable activities
	Lack of capacity	0.25	0.59	0.50	0.00	0.33	Skill development is a high priority issue especially in the areas that have been opened up for tourism. E.g. Nature guide, porter, cook, lodge operator, drivers etc	46. Skill Development (Entrepreneurship development, Capacity building) Programs through Forest, Tourism depts. and JFMC /EDC/NGOs for development of organizing capabilities, leadership guiding and formulation of self-help groups 47. JFM/EDCs should be empowered to regulate and control unsustainable activities

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Lack of Publicity	0.25	0.52	0.00	0.00	0.19	The need to market our unique ecotourism product was felt specially in the tropical and subtropical zone	48. Documentation, Codes and Guidelines, Advertisement through Forest, Tourism depts. and NGOs
	Improvement of Trekking Trails	0.25	0.28	0.50	0.00	0.26	Creation of ecofriendly trekking trails to culture and nature related tourist destinations in tropical, subtropical and temperate ecoregions opened to tourism	49. Eco friendly Trekking Trails should have JFM/EDC members as Guides 50. No use of cement and tar coal. 51. No building construction inside Protected Area / Forest Area, only tenting and camping facilities in designated areas (outside Forest Areas / near potential Eco-tourism sites) 52. Passive housing structures for Solar lighting in Alpine areas should be promoted in Eco-tourism sites
	Need to empower the villagers for preserving their nature and culture	0.00	0.07	0.00	0.00	0.02	Panchayats may be empowered to formulate and enforce the village specific code of conduct to regulate the negative impacts of tourism	53. Code of Conduct to be formulated by Forest, Tourism depts. Also for building constructions befitting local environmental conditions. 54. JFM/EDCs should be empowered for enforcing Code of Conduct
	Shortage of kerosene for trekkers and tourists	0.00	0.03	0.00	0.00	0.01	The kerosene stock of the MPCS is inadequate to meet the heavy demand by tourists entering protected areas (Khangchendzonga National Park) Food and Civil Supplies Dept, Government of Sikkim should increase the Kerosene quota for tourist destinations	55. Food and Civil Supplies, Tourism Depts. to increase the quota of kerosene 56. No tourist groups should be permitted to camp inside PA / Forest area unless they carry sufficient quota of kerosene or LPG
	Garbage dumped at tourist destinations	0.00	0.07	0.00	0.00	0.02	Reduction, reuse and recycling of garbage to be enforced by the Panchayats, JFMC, EDC through the village code of conduct	57. Include in village code of conduct through Forest Dept and JFMC /EDC and Tourism dept. 58. JFM/EDCs should be empowered to ensure that tourist sites are garbage-free and that all groups carry back their waste for safe disposal outside the PA / Forest area

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
5	Agriculture and Horticulture Development							
	Decline in the production of Potato, Apple and Thin Shelled Walnut Native Sikkim Apple (*Malus sikkimensis)* needs to be preserved	0.00	0.00	0.50	0.00	**0.13**	In the temperate ecoregion due to unscientific use of chemical fertilizers and pesticides coupled with the introduction of new pests and pathogens the soil fertility and the viability of these plants has decreased. Rejuvenation programmes of agriculture and horticulture departments for these crops should incorporate the experiences of the village elders who suggest areas of Lachen, Lapdong, Selep, Tha-Kajong, Latong and Gangya especially for walnut, Thangu and Lachen, Lachung for potato and Lachen and Lachung for apple Native Sikkim Apple (*Malus sikkimensis)* needs to be preserved.	59. Participatory Rejuvenation programs needed 60. Also for *Malus sikkimensis* through involvement of Forest, Agri/Horticulture Depts. with active involvement of experienced community members in selecting some *in-situ* sites, like MPCAs building their capacity, especially in Lachen and Lachung valleys in north Sikkim 61. More emphasis should be given to indigenous fruit tree species
	Decline in soil fertility	0.00	0.00	1.00	0.00	**0.25**	In the temperate ecoregion unscientific use of chemical fertilizers and pesticides in the past has reduced the soil fertility. Revival of traditional ecofriendly farming practices along with modern organic farming techniques need to be adopted	62. Reverting to Organic Farming as a policy decision of the government, Agri/Horticulture Departments. to also encourage vermiculture and other ecofriendly techniques 63. Capacity building of farmers in organic farming by the Agri/Horticulture departments
	Requirement for improved varieties of large cardamom	0.00	0.24	0.00	0.00	**0.06**	Large cardamom is an important cash crop of the state in the subtropical ecoregion. Since this is a shade loving species even forest lands have been illegally encroached upon with this crop Need for rejuvenation programmes incorporating organic farming of horticulture department with inputs from Spices Board for this crop in private lands in a participatory manner	64. Participatory Rejuvenation programs for Large Cardamom with inputs from ICAR, Spices Board incorporating organic farming

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Need for edible Mushroom cultivation	0.00	0.03	0.00	0.00	**0.01**	Propagate the indigenous varieties of edible mushrooms at various ecoregions to conserve our wild genetic stock. This crop has a high potential for earning revenue Propagating cultivation of exotic oyster and button mushrooms to reduce the pressure on the wild varieties	65. Encourage cultivation of wild and exotic mushrooms together with processing and value addition facilities as private enterprises under ecodevelopment schemes around PAs
	Requirement for improved varieties of orange	0.25	0.07	0.00	0.00	**0.08**	Identification of pests and pathogens and prophylactic treatment Documentation of indigenous varieties of orange and other citrus fruit and their *in situ* and *ex situ* conservation urgently as many of them are not only important larval food plants of Papilionid butterflies, they are also highly medicinal.	66. Rejuvenation programs for Orange, *in-situ* conservation of wild citrus in sub-tropical belt by declaration of species as protected, *ex-situ* organic cultivation in community nurseries around PAs with help from relevant research organizations like Citrus Die-back Research Station, Darjeeling
	Requirement for Food Preservation and Processing Technologies	0.63	0.00	0.00	0.00	**0.16**	In the tropical ecoregion where there is an extensive production of vegetables and fruits, local food preservation and processing technologies need to be encouraged. This coupled with modern packing technologies would add value to the indigenous product and give better returns to the farmer.	67. Agriculture and Horticulture departments to facilitate the enhancing of capacities of farmers, NGOs and self-help groups
	Increased introduction of exotic / hybrid flora for commercial purposes; No State Level Gene Bank	0.88	0.00	0.00	0.00	**0.22**	In the warmer tropical zone, floriculture is being seen increasingly as a livelihood option for small cultivators by the Floriculture department of the government. With increased trials and introduction of exotic flora, there is need for preserving the indigenous breeds of local orchids and other valuable flora. State level Gene Bank needed to save and perpetuate valuable genes traditionally preserved	68. Floriculture development in tune with preservation of indigenous breeds, Establishing of State Gene Bank, value addition through appropriate marketing in the long term (e.g. 'Jewel Orchids' of Sikkim)

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Slash and burn on steep slopes. (the unsustainability of this practice is more recent)	0.00	0.03	0.00	0.00	**0.01**	On steeper slopes in the subtropical zone, cultivation of Millet ('kodo') is traditionally done by Jhumming. This practice of 'Bajmey', 'Phaadey' is no longer sustainable resulting in landslides, etc. Awareness drives coupled with change in cropping pattern is needed	69. Reduction in Jhum Cultivation through adoption of appropriate technology while preserving local breeds and appropriate changes in cropping patterns. 70. Modification of unsustainable land-use practices in landslide affected areas 71. R&D programmes for pilot studies of landslide affected areas using bio-engineering and bio-technological interventions
	Effects of Tea plantations	0.00	0.03	0.00	0.00	**0.01**	An issue arisen in the subtropical zone. Tea plantation requires removal of existing vegetation from intended areas. It has traditional used chemical biocides detrimental to the long-term survival of the farm and surrounding flora and fauna, especially invertebrates. Hence this can be an enterprise in private holdings practicing organic farming.	72. Organic Tea Plantation as private enterprise
6	Animal Husbandry Initiatives							
	Husbandry of high yielding livestock (local and exotic/hybrid)	0.88	0.28	0.00	0.00	**0.29**	In tropical and to some extent in subtropical regions there is demand from the community for high-yielding exotic/hybrid or local milch cows The implication of this for indigenous breeds is that we may lose them in a kind of no-win situation if we are to remove grazing from forests An issue linked with biogas potential in the villages. This would further reduce pressure of grazing and firewood collection from surrounding forests Lack of State Level Gene Bank, Decline in 'Siri' Cow along with indigenous Sheep populations over the decades needs urgent attention.	73. Fodder Banks and controlled pasture development, 74. Alternative / Supplementary fodder 75. Stall-fed Milch Cows, Bio-Gas Plants through EDCs, 76. Preservation of 'Siri', indigenous sheep breeds in State Level Gene bank, 77. Species exhibited in 'Indigenous Domestics' exclosure in State Zoological Park, smaller exhibits in 'Village-tourism' circuits 78. Improvement of sheep breeds through cross-border crosses facilitated by the government.

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Decline in yak breeds	0.00	0.00	0.50	1.00	**0.38**	In Temperate and trans Himalayas, problem of in-breeding of yak has surfaced due to closure of international border. Village elders have suggested introduction of fresh stock from Ha valley of Bhutan. AH&VS department to take villagers into confidence while formulating and implementing such programmes keeping their vast field experiences in mind.	79. Yak breed improvement research More collaborative programmes with National Yak Research Centre 80. Yak insurance by AH&VS and also by Army for land-mine casualties 81. Diversification and value addition of yak milk, wool and hide
	Decline in indigenous Sheep varieties	0.00	0.00	0.50	0.50	**0.25**	Lack of State Level Gene Bank, Decline in indigenous Sheep populations needs urgent attention. Similar problem with loss of free movement across the international border. Disease problem due to meat-on-hoof for defence personnel, quarantine issues, etc. Government and ISPS to keep in mind not to introduce lowland/exotic species with low adaptability to high altitudes and without consulting village elders Lack of milk processing plants in the temperate ecozone where yak and sheep rearing is a vital means of livelihood	82. Improvement of local Sheep breed of hardy Tibetan stock through cross-border crosses facilitated by the respective governments.
	Introduction of exotic breeds of rabbit (Angora)	0.00	0.00	0.50	0.00	**0.13**	Introduction of exotic breeds of Rabbit like Angora and others for wool and meat as alternative livelihood source, coupled with awareness, extension programmes. A new venture seemingly lucrative given the high returns for the wool, it is still in trial stage	83. Angora Rabbit farming capacity building programmes by AH&VS Dept. and village communities, keeping in mind the repercussions of accidental escapes into the wild, especially nearby PAs.
	Mules for army and tourists, employment potential, especially during road blocks	0.00	0.00	1.00	0.00	**0.25**	Demand is exclusively from temperate villages of Lachen, Lachung, areas cut off during regularly occurring landslides and roadblocks. Need Breeder Donkey/Ass for Mules with help of AH&VS department.	84. Procurement of Donkey / Ass for Mule farming through AH&VS Dept.

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Improvement of existing breed of livestock for more meat, milk, etc. to decrease the existing pressure on forests	0.00	0.00	1.00	0.00	**0.25**	Again, demand from Lachung, Lachen of temperate zone, areas with villagers grazing cattle in forests. Fewer exotic stall fed cows mean no cattle in forests, though it means loss of indigenous hill breed 'SIRI' cow. Also exotic cattle have more meat, milk, aid from government This is dangerous, and seems contradictory to the goal of this action plan as it means actually advocating the loss of indigenous breeds Instead, one needs to consider innovative methods of increasing the value of the indigenous breeds, while looking into the fodder need issues. This is however not a recommendation for the deliberate displacement of indigenous breeds.	85. Provision of Stud Bull from AH&VS department, Preservation of 'Siri', indigenous sheep breeds in State Level Gene bank, smaller exhibits of 'Siri' in 'Village-tourism' circuits, improvement of yak, sheep breeds through cross-border crosses facilitated by the government.
	Improvement of poultry breeds, indigenous and exotic; preserving the wild *Gallus gallus* population	0.63	0.10	0.00	0.00	**0.18**	Demand is from warmer tropical and subtropical zone where there are more villages. 'Bustee' chicken, eggs preferred over exotics despite higher cost. Exotic varieties also being popularized by government as viable livelihood option. This is dangerous, and seems contradictory to the goal of this action plan. We are actually advocating the loss of indigenous breeds! Instead, one needs to consider innovative methods of increasing the value of the indigenous breeds, while looking into the fodder need issues. This is however not a recommendation for the deliberate displacement of indigenous breeds. This is also the only belt in Sikkim for the wild stock of the Red Junglefowl *Gallus gallus,* which sometimes breeds with the local domestic chicken.	86. Enhancing capacity of NGOs, Cooperatives, Self-help Groups and development of programmes for Poultry. 87. Preservation of Red Junglefowl indigenous breed in State Level Gene bank, Species exhibited in 'Indigenous Domestics' exclosure in State Zoological Park, smaller exhibits in 'Village-tourism' circuits

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Need for better marketing of milk and milk products from temperate and trans Himalayas where Yak, Sheep, Goat and cow population occurs	0.00	0.00	0.50	0.50	**0.25**	Yak, Sheep, Goat and cow population occurs in temperate and trans-Himalayas where so far there are is no processing unit. Milk products and meat, etc. are processed in traditional manner by dehydrating into local cheese, dried meat, etc. In Thangu region milk could be seasonally collected from Chho Lhamo-Lashar regions and transported to Rabum for processing. Milk could also be collected from Chungthang. Lachung for sale to army, AR and public. Employment opportunities for locally trained youth	88. Competitive sector, more federations / Milk Unions 89. 300 lt capacity Milk Collection Center at Thangu, processing center at Rabum by Cooperatives with technical assistance from AH&VS or ISPS 90. More diversification and value addition of milk and milk products
	Lack of Cheese processing plant in livestock dominated areas of trans-Himalayas	0.00	0.00	0.00	1.00	**0.25**	Traditionally dried cheese from trans Himalayan zone has limited market and needs improvement and value addition for more economic returns. Cheese plant at Rabum can process milk and products collected at Thangu from trans-Himalayan region. It will need to be powered by electricity from micro-hydroelectric projects on Tatum Chu and/or Chaten	91. Creation of Cheese Plant at Rabum with Electricity facility from micro-hydroelectric projects on Chaten and Tatum streams
	Scope for development of fisheries	0.00	0.03	0.00	0.00	**0.01**	Demand has arisen in sub tropical zone from Wok Omchu Preservation of indigenous 48 species and varieties including Mahseer and Limbunee Maachaa, species endangered due to large dam projects is a priority Protection of Common Otter, Osprey in fisheries project areas needs awareness and attention	92. Fishery development with preservation of indigenous species in mind 93. Enhancing capacity of NGOs, Cooperatives, Self-help Groups for development of programmes

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
7	Micro enterprise Development							
	Revival /Protection of indigenous handicrafts and handloom	0.38	0.52	0.50	0.00	0.35	Issue arises in areas opened up for 'eco' tourism in tropical, subtropical and temperate regions. Popularization of local crafts would lead to revival of use of natural dyes and cultivation of local raw material Involvement of village EDCs would speed revival of many biodiversity rich crafts on the verge of dying out.	94. Production of local raw materials 95. Infrastructure facilities for Handicrafts and Handloom as private enterprises facilitated by Ecodevelopment programmes 96. Training and Capacity building programmes 97. Marketing through Cooperatives and Self-help groups
	No Wool Cottage Industry in trans Himalayan region	0.00	0.00	0.00	0.50	0.13	Most of the state's sheep occur in trans Himalayas. Wool is processed at household level for domestic use.	98. Wool Cottage Industry as private enterprises facilitated by Ecodevelopment programmes of the Government 99. Improved low cost technology input is needed here using natural dyes for basic processing of wool which could form important local cottage industry for villagers 100. Promotion of cultivation of vegetable dye species

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Need for Gene banking of microbial diversity; Major gaps in Traditional fermented foods promotion, processing, preservation, wild edible mushrooms; Major Gaps in the Government Schemes, no R&D institutions; Major Gaps in Information, vision, policy and legal structure, Valuation, Value Addition, Patenting and IPR	0.13	0.00	0.00	0.00	**0.03**	The major gaps in microbial studies are mostly to do with traditional fermented food technology in the tropical warm areas	101. Preservation, Promotion of Traditional Knowledge of Fermented Foods Especially in warmer tropical zone: **102.** Inclusion of traditional knowledge system of fermented foods in school curriculum, upgradation of traditional knowledge, preservation and value addition through: **Short Term** 103. Mass production of wild edible mushrooms 104. Promotion and publicity of importance of traditional fermented foods 105. Training and Capacity Building **Medium Term** 106. Survey of important sources of microorganisms 107. Research projects specific to microbial diversity 108. Setup microbial diversity expert committee in state level **Long Term** 109. Establish National Institute of Microbial Diversity in Sikkim 110. Setup Microbial Collection Center 111. Marketing: Attract private investment to explore untapped microbial genetic resources 112. Training manpower in modern taxonomy of microorganisms
C	**Infrastructure Development**							
8	Infrastructure development							
	Environment damage during construction activities of roads, bridges, footpaths	0.13	0.17	0.00	0.00	**0.07**	These activities commoner in lower regions; Damage at construction time. E.g. Earth Cutting spoils are dumped down hill sides impacting large areas below Need to incorporate biodiversity conservation in development policies	113. EIA and EMP to be mandatory for all projects 114. Road, bridges, footpaths to be eco-friendly. 115. Raising of Road/Avenue Plantations of Bamboos, etc. as dust and noise sinks 116. Use of eco-friendly technology at every stage

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Communication problems, damage to environment in trans-Himalayas	0.00	0.00	0.00	1.00	**0.25**	Especially in the higher regions, Construction and maintenance of Infrastructure including Roads, Hospitals etc. difficult and cause damage to the fragile alpine and grassland ecosystem Damage by pack animals over time is often irreversible	117. Helicopter as an essential Service provision to remote areas in north Sikkim
	Environmental issues related to large dam projects	0.00	0.00	0.50	0.00	**0.13**	Micro hydroelectric projects needed especially in the steeper reaches of the temperate zone Lack of awareness and education regarding environment and biodiversity, of public participation, of coordination between the state government and the user agency, Difference in vision of sustainable development between various stake holders	118. Detailed survey of potential micro-hydel sites 119. Micro Hydroelectric Power projects to be encouraged No big dams should be allowed in ecologically sensitive areas 120. Comprehensive EIA and EMP in all cases 121. Community-based management for Micro-hydel projects
9	Essential Services							
	Environmental Education and sensitization at all levels	0.00	0.00	1.00	0.50	**0.38**	Environment education needed in curriculum Need emphasis of Role of Education in Biodiversity Conservation, Develop awareness in students by introducing study of biodiversity of the state in school and college levels; Stress on the study of traditional values, customs etc which entails the conservation of biodiversity	122. Strict enforcement of environmental laws by all project implementing agencies 123. Environmental Education and sensitization at all levels 124. Well defined body for environmental education 125. Generation of appropriate educational and publicity material for environmental education and awareness

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Health issues in remote areas Encompassing nutritive foods including traditional diet, medicinal plants conservation and use, traditional medicinal systems, diverse agricultural produce, foods from the wild	0.00	0.00	1.00	0.50	**0.38**	Hospitals needed in temperate and above, practicing environmental friendly disposal of biomedical waste,	126. Revitalization of local health traditions 127. Health / Biomedical Waste management programmes, encompassing nutritive foods including traditional diet, wild edibles, medicinal plants conservation and use, LHT or traditional medicinal systems, diverse agricultural produce, foods from the wild
	Need for safe drinking water in remote areas	0.00	0.03	0.00	0.50	**0.13**	In subtropical village of Chungthang, like in many other areas of the state, the issue of safe drinking water exists. Its treatment pipelines, etc. needs regular upkeep and maintenance In trans-Himalayas where ground is frozen for many months, villagers requested for shallow portable borewells so they could dig four feet below the ground to get drinking water even during winter	128. Safe Drinking Water and Treatment Plants in rural and urban areas, also around all PAs to be facilitated by the RDD, Forest and PHED 129. Strict Protection of springs and water sources 130. Plantation along water sources by the JFM/EDCs
	Need for sewerage and drainage in developing villages	0.00	0.03	0.00	0.00	**0.01**	Remote areas undergoing urbanization need proper sewerage and drainage systems. E.g. Chungthang. Improper local systems could cause landslides and other ecological damage besides introducing harmful microbes into the ecosystem	131. Sewerage and drainage of habitations around PAs by the UD&HD, PWD, RDD and PHED
	Improvement of drinking water source	1.00	0.00	0.00	0.00	**0.25**	Most villages in tropical zone depend on percolated water Improvement of catchment areas through plantations by villagers, protection of water source through prevention of grazing, firewood collection, etc. are urgent needs	132. Improvement of drinking water source through recharge of Underground aquifers **133.** Improvement of catchment areas through plantations by villagers, protection of water source through prevention of grazing, firewood collection by Forest, RDD and PHED
D	**Culture and Traditional Knowledge Conservation**							

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Decline and loss of Traditional culture including traditional food, dance, festivals, etc.	0.00	0.03	0.00	0.00	**0.01**	Linking up with local festivals to spread the message of conservation (e.g. Biodiversity Mela organized during Pang-Lhabsol to honor Mt. Khangchendzonga at Chungthang, North Sikkim) Loss of entire cultures e.g. that of the Dokpas in the trans-Himalayas	144. Organize biodiversity festivals annually, highlighting traditional cultural values 145. Provide alternative source of income to younger section of Dokpas e.g. in ecotourism, yak-safaris, handicrafts, nature guides, mountaineering guides, etc. 146. Setting up of Sikkim Biodiversity Conservation Board
	Pollution of sacred spaces due to negative influences of tourism, construction activities etc	0.00	0.03	0.00	0.00	**0.01**	Major tourism impact has been in the subtropical ecozone so far. Sacred spaces need to be closed for mass tourism. Also, education of tourists to cultural aspects and sensitivity	147. Preservation of sacred spaces, caves, lakes etc through Management Plan and legal action by Forest, Ecclesiastical depts. and District administration 148. Education of tourists to cultural aspects and sensitivity through NGOs 149. Preparation of Catchment Area Treatment Plans for important Lakes 150. Identifying detrimental activities and awareness generation through JFM/EDCs to minimize them
	Undermining of Pipon System	0.00	0.00	1.00	0.00	**0.25**	This issue is very relevant in the Lachen and Lachung villages of North Sikkim where Pipon system of traditional village administration is still followed. However today it conflicts with the Panchayati Raj System. Positive aspects of Pipon System need highlighting to adapt to the changing scenario or, panchayats should adapt to the Pipon system, when/when the latter is more effective, especially where citizens' movements are active, or where the implementation of the Panchayat Scheduled Areas act is effective)	151. Pipon system needs to Evolve with positive aspects of both systems (Pipon and Panchayat) for effective implementation in these two last areas of Lachen and Lachung in North Sikkim.

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Loss of traditional styles of architecture	0.00	0.03	0.00	0.00	**0.01**	Government buildings should have traditional architecture Village code of conduct should emphasize on retaining traditional, low cost, ecofriendly style of architecture with modern amenities.	152. Preservation of Traditional architecture as a community enterprise 153. Building construction on fringes of PAs and other forest areas to be taken up in keeping with local environment setting/landscape and architecture. Multi-storied structures to be avoided.
	Presence of International company at Yuksam	0.00	0.03	0.00	0.00	**0.01**	This is an important issue only in the sub tropical Yuksam village where an international company has acquired a large chunk of land in this sacred biodiversity rich landscape. Humana is presently occupying the abandoned Rathong Chu power project colony. They have purchased the land from the state government (which earlier belonged to the villagers), which is currently under review.	154. Customary rules related to land ownership and transfer of land should be respected by international NGO working in the State
E	**Negative outside influences**							
	Depletion of fodder resources by Pack animals of Assam Rifles due to grazing on forest land	0.00	0.00	0.00	0.50	**0.13**	In the Muguthang Trans-Himalayas the permanent Assam Rifle camps bring in a large number of pack animals (horses and mules) regularly for transport of rations to remote outposts. These compete with the domestic livestock like yak and sheep for fodder and also spread disease	155. Alternative to pack animals like helicopter service etc needs to be explored. 156. Tie-up with Animal Husbandry department for fodder and disease control issues, development of pasture land, animal feed depots, etc.
	Culture erosion	0.0p	0.00	0.50	0.00	**0.13**	Local culture erosion due to lack of awareness programs for tourist guides. There is lack of village code of conduct for villagers as well as visitors to these culturally sensitive areas	157. Each village to have its own Code of Conduct for Eco-tourism. Environment protection and Forest protection 158. No interference in local culture, mass awareness and valued dignity to traditions to be ensured by NGOs

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Nature and Culture erosion by Holungpas from Nepal	0.00	0.03	0.00	0.00	0.01	Heavy dependence, exceeding the carrying capacity of Yuksam and lack of ownership with the natural resources Competition with local community in ecotourism related employment opportunities. Source of anti social activities, crime and slum like development	159. Issue of Holungpa Settlers from Nepal should be tackled by taking administrative action with due policy decision.
	Feral Dogs	0.00	0.03	1.00	1.00	0.51	Areas with tourism or army presence are breeding grounds for feral dogs. Today there are a menace not only to the humans but also to the endangered wildlife like Himalayan Marmot, Wooly Hare, Blue Sheep, Voles, Mouse hare, Weasels and a host of ground nesting birds including pheasants, snow finches, snow partridges, snow cock etc The Tibetan Mastiff of Sikkim has become extinct due to cross breeding with the domestic mongrels	160. Feral dogs need to be eliminated/controlled, through humane means 161. Rehabilitation programmes for Tibetan Mastiff *in-situ* on the Tibetan Plateau among the Dokpas, breeding of the species as 'Guardian Dog for big households, awareness and publicity drives, involvement of veterinary personnel, links with cross-border breeders, NGOs, etc.
	Army occupation of grazing land in North Sikkim	0.00	0.00	0.00	0.50	0.13	Sealing of the International border which China has restricted the area available for grazing to the livestock that earlier had access to the Tibetan grasslands. This is resulting in inbreeding and put tremendous pressure on the carrying capacity of these grasslands	162. Army should not restrict traditional rights of rotational (seasonal) grazing of trans-Himalayan livestock (Yak, Pashmina Goats and Sheep of Tibetan stock) on Forest Land as these are unable to shift to lower altitudes, have already extremely restricted grazing zones due to land-mined areas resulting in fodder shortage, inbreeding and casualties 163. No grazing from cross border to be permitted by Army and Forest Department 164. Trans-Himalayan Conservation Area to be identified including different sites for *in-situ* conservation of Globally Threatened species like Nayan

No.	Biodiversity Conservation Issues	Ecoregion					Detailed Interpretation	Action Plan
	Land mine casualties (Wildlife and trans-Himalayan livestock)	0.00	0.00	0.00	0.50	0.13	In trans Himalayan Sikkim (IB with China) national security issues take priority over all other issues. Upkeep of fencing of Land mined areas needs to be urgently done to prevent casualties of Kiang, Nayan, Tibetan Wolf, Tibetan Gazelle, Yak, Snow Leopard etc as well as domestic livestock.	165. Army to upkeep effective and proper fencing of mined areas and should not restrict rotational grazing in traditional areas (outside land-mined sites) to reduce further casualties especially of **Globally Threatened** species like Nayan through watch and other preventive measures
	Easy access to tinned food from army stores (linked with Polution of sacred spaces)	0.00	0.00	1.00	1.00	0.50	This issue is very relevant in the Temperate and Trans Himalayas of North and East Sikkim where disposal of date expired tinned food of the army has to be strictly enforced so that it does not enter the domestic market in the remote villages. Consumption of this has adversely affected the health of the villagers and increased polution of many remote areas.	166. Village EDCs should be strengthened and empowered for regulating and ensuring safe disposal of tinned foods and garbage from these areas
		9.63	**5.69**	**23.50**	**16.00**	**13.70**	**Total**	

BIODIVERSITY STRATEGY AND ACTION PLAN FOR INDIAN ARMY IN SIKKIM

No.	Biodiversity Conservation Issues	Ecoregion	Detailed Interpretation	Action Plan
1	Bio-monitoring by Army	High altitude areas of North and East Sikkim	In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence	1. Pictorial information booklet and Pictorial questionnaires for the armed forces depicting endangered fauna and flora should be developed with the assistance of the State Forest Department and Centre for Environmental Education (CEE) 2. Forest Dept to make pictorial questionnaires for the armed forces depicting endangered flora and fauna 3. The armed personnel during their regular Long Range Patrolling (LRP) could fill up questionnaires for Bio-monitoring and forward the same to their headquarters. These filled up questionnaires could then be collected by the Forest Dept and this data compiled to give valuable information on the presence, abundance and threats to our endangered biodiversity in restricted areas of alpine zones in Sikkim 4. Suitable training should be imparted to some key officials who could act as resource personnel for providing environmental awareness to various field units
2	Army Support for joint patrolling	High altitude areas of North and East Sikkim	In the remote high altitude areas of North and East Sikkim only the army has the requisite infrastructure and a continuous presence The Forest Dept is understaffed and lacks infrastructure in these remote high altitude areas.	1. The army could support the forest patrolling party by providing manpower and other logistic support

No.	Biodiversity Conservation Issues	Ecoregion	Detailed Interpretation	Action Plan
3	Reduce the damage due to Developmental Activities by GREF / BRO	All over Sikkim	GREF/BRO is like the contractor for the army. They implement the various developmental activities based on the plan or design of policy of the army. In addition, these motor-able roads are a necessity for heavy equipment needs to be transported for combat.	1. Alignment of roads should be chosen such as to create minimum damage to the environment. Forest area should be avoided as far as possible 2. Labor Camps should be at selected places. Forest area should be avoided as far as possible 3. Lower hillside damage should be controlled 4. Rehabilitation and Conservation works should be undertaken simultaneously with developmental activities 5. Illegal fuel wood should not be used by the laborers and BRO should make special provision for providing kerosene to them
4	Sensitizing the armed forces towards biodiversity conservation	Throughout Sikkim	Army has a major presence in the remote locations of north and east Sikkim. Therefore, if they could be sensitized to reduce their negative impacts and increase their positive impacts the overall gains would be enormous. Though sensitivity towards conservation in the armed forces has been on the rise from 1990 onwards, there is still a long felt need to improve the awareness levels	1. An easy to understand awareness booklet on nature conservation should be prepared for distribution to different units of army 2. Army should organize frequent training camps and awareness workshops for different units for Environment / Biodiversity Conservation
5	Reducing animal casualties due to Land Mines in border areas with China	Trans-Himalayas in North Sikkim	Instances of Kiang (Wild Ass) and other endangered wildlife being killed and injured by land mine blasts. Preserving the migratory corridor between India, China and Tibet for wildlife.	1. Due to security reasons these land mines cannot be removed. As per the 1949 Geneva Convention, these mines need to be fenced with barbed wire 2. This perimeter fencing should be improved and strengthened by the army so that no wildlife crosses it and is blown up.

No.	Biodiversity Conservation Issues	Ecoregion	Detailed Interpretation	Action Plan
6	Eliminating feral dogs around army establishments	Army establishments in North and East Sikkim	They subsist on the leftovers of the army cantonment and cook house. Feral dogs are a major threat to wildlife. They roam around in packs and have been seen hunting the threatened wildlife of the area, including Globally Threatened species like Nayan (Cuvis ammon) injured by land-mines. There have also been instances of armed personnel being mortally wounded by these packs.	1. Army should get rid of feral dogs located in and around their camps 2. They could take help of appropriate civil authorities if required for the purpose

Chapter 9

REFERENCES AND BIBLIOGRAPHY

Ali, S. 1962. *The Birds of Sikkim.* Oxford University Press.

Haribal, M. 1992. *The Butterflies of Sikkim Himalaya and their Natural History.* Sikkim Nature Conservation Foundation (SNCF), Gangtok, Sikkim

Hooker, J. D. 1855. *Himalayan Journals.* Today & Tomorrow's Printers & Publishers, 24B/5 Original Road, New Delhi. (4th Indian Reprint 1987)



SBSAP banner in Lepcha during Pang Lhabsol, North Sikkim



Biodiversity linked with 'Pang Lhabsol' worshipping Mt. Khangchendzonga



Bhutia folklore on Biodiversity during festival



Emphasis on women's role in Biodiversity conservation



2nd State Level Meeting at Gangtok



NTFP working group during 2nd SLM



Orchids and Medicinal plants GSAP group discussion



Agri-Diversity GSAP group discussion



Forestry & Biodiversity GSAP group discussion



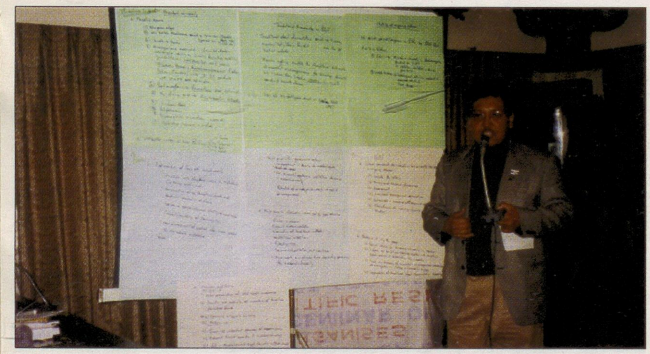
Eco-Tourism and Biodiversity GSAP group discussion



Mining, Hydel-project (NHPC GSAP group discussion



Presentation of NTFP SAP



Presentation of Microbial Diversity SAP



Presentation of Army SAP



Presentation of Aquatic Ecosystem SAP



Public response at 'Dharma Dhoka' play, Yoksum



Public Hearing at Sombaria, West Sikkim



NBSAP Team at Hilley, West Sikkim



Public Hearing at Soreng, West Sikkim



Resource Mapping of Karjee



Conservation & Religion: A Play "Dharma Dhoka"

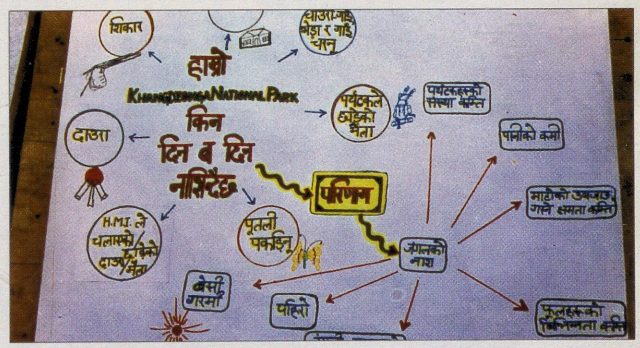


Chart of threats to Khangchendzonga Ntl. Park



Khecheopalri Lake: Now and 10 years hence



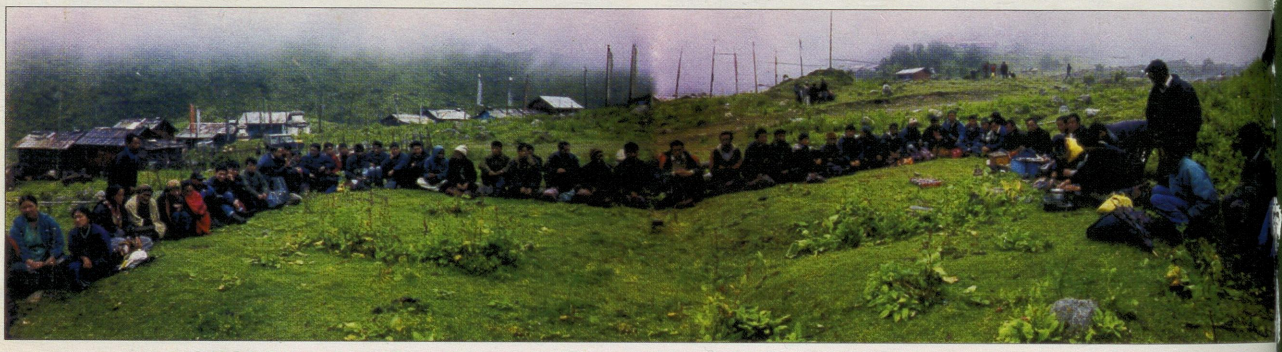
Effect of Cattle-shed or 'goth' in the forest



Model of the Khangchendzonga Ntl. Park



NTFP and Handicrafts Exhibition



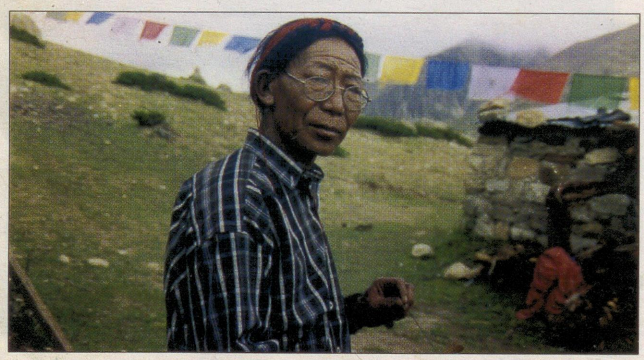
NBSAP hearing of Lachenpas at Thangu, North Sikkim celebrating Drukpa Tseshi



SBSAP Team in the cold desert at Lhonak



Religion in Sikkim protects Biodiversity



A Dokpa (Nomadic Tibetan Pastoralist) at Muguthang



Exotic Livestock displayed during 'Pang Lhabsol' Biodiversity Mela



Milarepa was an 11th century Buddhist hermit who lived in the Himalayan valleys along the Nepal, Sikkim and Tibet border. Milerapa's deep compassion for wildlife and love for wilderness fostered a spirit of harmony between man and nature in the Himalayas.

Milarepa's Plea

Snow, rock and clay mountains are my hermitages.
Snow and glacial rivers are my drinking water
Deer, gazelle and blue sheep are my livestock
Lynx, wild dog and wolf are my guards
Langur, monkey and brown bear are my playmates
Thrush, snow cock and griffon are my garden birds
If this appeals to you, please join me

Taken from a poster published by TMI and ICIMOD designed by Lhakpa Norbu Sherpa, painting by Karma Lama





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