

PANDA

A BI-ANNUAL NEWSLETTER ON FORESTS, ENVIRONMENT & WILDLIFE

Newsletter 2009



CENTENARY 2009

Forests, Environment & Wildlife Management Department
Government of Sikkim

Inside

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PANDA is a bi-annual newsletter published by the department of Forests, Environment & Wildlife Management, Government of Sikkim. This newsletter is aimed at disseminating environment, forest and wildlife information among the public at large and is also envisaged to serve as a medium to communication among foresters and others engaged in nature conservation in the State. Free and voluntary contributions for publication in the newsletter may be sent to Editors, PANDA, Forest, Environment & Wildlife Management, Government of Sikkim, Deorali -737102, Gangtok.

FRONT COVER PICTURE:

Newly re-designed emblem of Forest, Environment & Wildlife Management Department, Government of Sikkim on completion of 100 years of forest service. The emblem depicts eight lucky signs in one crest on the top and state's important heritage – Red Panda (State Animal), Blood Pheasant (State Bird), *Dendrobium nobile* Orchid (State Flower) and *Rhododendron niveum* (State Tree) at the bottom with conservation motto.

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Foreword

Forest Department having completed its centenary year 2009 since its establishment in 1909 has undergone many changes. In the journey to its 100th year, the Department of Forest, Environment and Wildlife Management has witnessed dynamic challenges which made it even stronger in the forestry, environment sustainability and conservation sectors. Its fields have become diverse and so have its responsibilities. The centenary gives us immense pride in realizing how far we have come. We however acknowledge that there is still room for accomplishment and improvement.

On this occasion, the PANDA bi-annual newsletter has one of its responsibilities in spreading and reaching information to the people. The roots of awareness today solely lie in information sharing where this newsletter is to be seen as a milestone in its form and function. This newsletter deals with disseminating forest, environment and wildlife information among the public at large and is also envisaged to serve as a medium for discussion among foresters and others engaged in nature conservation in the Himalayan landscape.

This bi-annual newsletter was launched in the year 1993, but due to certain circumstances it had been discontinued. Now it has resumed publication as a joint effort of all the editorial members of the department. PANDA has been rejuvenated.

We hope to continue this bi-annual newsletter in the future as a determined duty of our department. We also look forward to your suggestions and valuable comments. Articles, critical reviews and short communications related to the subject will also be accepted for publication in the forthcoming issues. It is your contributions that will help us realize our shortcomings and motivate us for better performance in future.



T. R. Poudyal, IFS (Retd.)
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Editorial.....



In the Centenary Year of the establishment of the Forest Department, the year 1905, that saw the forests of Sikkim being organized on a sound and scientific footing, it is heartening to note that the Departmental Newsletter-PANDA has resurfaced which had its birth in 1993. After a brief spell in the lap of the Department it went in hibernation. Thanks to the efforts of a few committed and dedicated officers particularly of the CCF, Shri C. Lachungpa who germinated this idea and thought it prudent to maintain the continuum for the sake of the Department.

There is no need to emphasize the importance and the necessity of such a news magazine in the present communication age. Otherwise we will be groping in the dark. It is the only way of reaching out to and interacting with the various sections of the stake holders, be it the educated elites, the forest fraternity in the country, the groups and organizations working for the conservation issues, environmental societies and bodies, members of the civil society, the planners and policy makers and above all with the members constituting the grass root level social layer.

The Department of Forests, Environment and Wildlife Management has over a century now evolved into an organization that has wider responsibilities of not only taking care of the forestry sector but also the compulsions of environmental conservation and ecological security of the state with retention of very sizeable forest cover as appropriate to the hills. Our achievements in all these fields are high, handsome and hilarious as per the findings of the various scientific organizations of the country. However, there is no room for complacency and inertia to be had in the fast scenario of climatic change and developmental perspectives. The department has to maintain a precarious balance between growth and conservation. In the context of hill economy it is just the most difficult task in the hands of foresters and the planners. So far so good. We have proved to be better conservationists than economists. If we want to continue the success story, we have to be equipped with more knowledge. And knowledge comes through spreading out and opening our doors and windows.

PANDA is such a window. Let us keep it open to let in more fresh air and let our own ideas and stories flow out to distant horizons. Keep it up.

LEST WE FORGET

Career Profile Series on Fore-Foresters



Sidkeong Tulku
(1879-1914)

Sidkeong Tulku, the familiar foresters' household name remains cherished in the annals of Forest Department's centenary long organized history. At a time when nature tended the wilderness areas in their primitive form and pristine glory, envisaging them for organized management marked a distinct watershed in the history of forestry organization. He pioneered and fathered the Forest Department and placed under core sector management. The period for such landmark vision roughly coincides between 1905 and 1914.

'The Tulku was an extraordinary man', so has he been described. His attributes: had a high intelligence, forceful personality, staunch enemy of the landlords, and of independent and assertive nature, etc.

He was born in 1879. On his completing two years education at Oxford in 1905, he plunged headlong into active administration of his kingdom duly assuming charges of forests, school and monasteries. Fired by intense zeal and the spirit to serve, he launched a number of reforms and development measures.

Tulku was a practical king an impatient one in as much as the governance of his kingdom was concerned. Through his down-to-earth approach to speed up the pace of modernizing the kingdom he is reported to have developed staunch animosity with the landlords of those days. Forests might have been the potent conflicting ground between the two as they were mostly vested with the landlords. Though the actual recovery process got underway only in the fifties, it was Chogyal Sidkeong Tulku that laid the foundation of such a move as early as the beginning of this century.

Though the administration of the 10th Chogyal of Sikkim was relatively short-lived, yet if we piece together a few records available here and there, they reveal an astoundingly lively spirit of the Tulku who within a very short span of administration laid a highly scientific, sound and stable forestry foundation.

It was during the short span of his administration that the forests were divided and demarcated into three distinct categories in order of their functions: the Reserve Forests, Khasmahal and the Gouracharan.

Where Reserve Forests were designed to be sacrosanct by virtue of the classification, the other two categories were public utility forests for fodder, firewood and grazing to be regulated by the newly constituted Forest Department. Forest therefore, hitherto considered as no man's property came to be recognized as a viable resource needing proper care and planned management. The Forest Department was further strengthened and a Forest Manual was prepared around 1914 to classify functions of the Department with a view to administering the forests.

The constitution of the Forests Department and demarcation of forests setting out goals of management through a written Manual during those initial primitive years when the tiny Himalayan kingdom was struggling to consolidate administratively are achievements deservedly worth recording. This assumes to be true because the forestry foundation laid down by the then Chogyal on sound footing remains strong and stable and has proved to increasingly meet the imperatives of the present day forestry concepts of land use, biodiversity, joint forest management, community forestry, ecological security and



environmental conservation. At a time when natural forests elsewhere in the world are either decimated or fast disappearing, Sikkim's pristine natural forests are the legacy of this diminutive, down-to-earth monarch who left a distinguished mark in the field of forestry.

The forest fraternity cherishes his name with unbound love and respect. We call him 'Father of Forestry' for as much to have set up the forestry department as to have it organized in a most scientific and conservation oriented manner such that a hundred years of its formation, this Department is resilient enough to meet the requirements of the present day shift in forestry concept - from one of economic and commercial resource to ecological and environmental support base, from production forestry to bio-diversity conservation, or more simply put from revenue -earning wealth to life support systems.

In the fast changing political, economic and communication scenario unfolding regionally, nationally and on international level, the contribution made by such eminent personalities who saw the future of the forests in the context of ecological and environmental parameters, 100 years ahead deserve



a place not only in history but in the hearts of the present generation.

In the Centenary Year, 2009, that the Forest, Environment and Wildlife Management Department celebrated as a part of the an inaugural function on 21st Feb., 2009 at the relics of the historic old palace site at Rabdentse, his name, contribution and commitment to the dear cause of forestry has been pegged. The sprawling forested highland has ultimately been consecrated to his memory. The Hon'ble Chief Minister, Dr. Pawan Chamling who

is spearheading a green movement in Sikkim ever since he assumed office in 1995 has paid rich tribute to the soul of this forester-monarch and dedicated the new Bird Park at Rabdentse by naming it 'Sidkeong Tulku Bird Park' in his memory. A befitting mark of respect.

The forest fraternity of Sikkim is deeply indebted to the king for his noble and visionary step that he took during his short tenure of administration.

-- **T R Poudyal, IFS (Retd)**

RIGORS AND REFLECTIONS OF RETIREMENT

T. R. Poudyal, IFS (Retd)

Having retired after an active and exhilarating service with the Government for more than thirty years, I am often confronted with an uneasy and discomforting query from all-time friends, colleagues, relatives and acquaintances which I find a little weary to respond and reply.

"Now that you are retired – what will you do? Or what are you doing?"

This is naturally an unsettling and unnerving question at a time when I

have not planned out and envisaged a concrete or worthwhile work plan as any other retiree. To escape this route and drudgery, having long pondered, I have devised a way out, to equip myself and quip quickly such that their hunger for my future tensed is nipped mercilessly. I have formulated and taken the refuge of four R's. They are: *Rest, Relaxation, Recreation and Retreat*. The letters are both inclined and declined to convey firmly the nature of times that confront us.

I strongly believe and advocate that retirement era should be construed as for rest, relaxation, recreation and retreat in that order. They neither abhor normal activities nor espouse physical and mental delinquency. On the other hand, they exhort us to live a full-throated life post retirement. Most fertile imaginations occur when your mind is at leisure or unoccupied. When you rest and relax, sublime thought waves deluge your mindset, the intellect is stimulated, the soul



stirred. It is an ideal time to rationalize your thought processes which might have deranged or derailed during the long servitude to the labyrinthine processes and paraphernalia incumbent upon every government set-up. One is free to spin or spiral the disjointed gross elements into more subtle and finer fecundities. With rest and relaxation one is recharged, and therefore, regenerated. Infusion of such vital inputs into the body systems introduces a measure of poise, balance and equilibrium; improves the immunity.

It is difficult and agonizing times all the same. A government employee remains concealed throughout his career within the cocoons of files and papers, note sheets and notifications, tags and pins, rules and regulations, systems and circulars, meetings and symposia, travel and allowances, pays and increments, seniority and promotions, laws and enforcements; cut off from the mainstream social life. By the time he steps out of that world, he would have lost a great of sheen and shine to dispel the darkness that lies ahead. Three scores of active service dissipate his vitality and render him almost unfit to launch a meaningful assault on the worldly adventurism. It castrates him mentally; rips open his physical deficiencies. He will perhaps feel disowned, downcast and nervous, shy and jittery, even decomposed and demoralized to navigate the unchartered waters ahead. This is clearly a watershed of life that delineates the living world with the hazy horizon of metaphysical plane.

The marriage and merger thereafter between a seemingly hierarchical, status and protocol conscious bureaucrat and a free-living member of the society is no less easy but

painful and sometimes irreconcilable. It requires a herculean effort to dismantle the mammoth fungus of egotism that has grown over the years, fed and nurtured by the perks and perquisites of the government, to be able to address the new demands of living.

Many undergo isolation shock and degenerate. Others are quick to adapt to vocations which will absorb their mind, might and money. Yet a third component is bold and brave enough to lower his self-esteem, dissolve his pride and plunge headlong to submerge into the sea of humanity before it.

It is against such a background, context and scenario that the volley of enquiries like the above about the future eats away your entrails. A philosophical or religious bent of mind perhaps would offset and lessen the impact to some extent.

It is difficult transformation exacerbated by the pangs of separation between two different styles of living but nevertheless to be taken as static, dormant or hibernating thereafter.

Recreation, to me, is not a visual, audible or physiological fulfillment. It is an urge to be creative – of ideas and ideals, systems and beliefs, imaginations and understandings; a set of software to shape and safeguard the pillars of our sick society. Enlightened, articulate and informed senior citizens are factually speaking the creamy layers whose taste should percolate down the throats of young minds of our progeny. Their long experience, rich knowledge and profound intellect can help build simpler and more effective pathways to development. They can

act as catalysts to social change; be guides, philosophers and friends as they say, at a crucial and critical time when our youth feel beguiled and betrayed by the aged and the experienced.

Retreat, the final act, at one, convoys a sense of relief- from the burden of living, from the responsibility of rearing and from the rigors and ravages of falling old age. Cessation of active physical and mundane matters and seeking higher transcendental values defines this phase of life. Prayers and pilgrimages, musings and meditation, silence and spirituality, 'satsanga' and 'sadhana' performed and practiced will uplift the sagging spirit at this terminal phase.

Our birth as human beings mandates us that we prepare our soul for passage and surrender to the Supersoul. The Buddhists call it 'Nirvana', the Hindus 'Moksha' or 'Samadhi' and probably the Christians 'Liberation'.

The dynamics of living are complex and incomprehensible bordering sometimes on paranoia. The residual span of life post retirement provides an individual adequate time and space to unburden the vicissitudes and vagaries of post life, to emptying out the decay, dirt and filth accumulated paving the way for a clean mind for spiritual attainment.

Lord Buddha said:

“ Anger, drunkenness, deception, envy; these constitute uncleanness, not the eating of flesh.

It is not that which enters a man defiles him but that which comes out. ”



KEY STATISTICS OF SIKKIM

Geographical Area	7096 sq. km
Capital	Gangtok
No. of Districts	4
No. of Sub-divisions	9
Climate	Tropical, Temperate and Alpine
State Flower	Nobile Orchid- <i>Dendrobium nobile</i>
State Tree	<i>Rhododendron niveum</i>
State Animal	Red Panda – <i>Ailurus fulgens</i>
State Bird	Blood Pheasant – <i>Ithaginis cruentus</i>
Protected Area Network	2183.10 sq. km (30.77 %)
No. of Important Mountains & Peaks	28
No. of Glaciers	84
No of Lakes (Wetlands)	227
No. of Hot Springs	9
No. of Rivers & Streams	>104
Major Rivers of the State	Teesta and Rangit

No. of Species:

Flowering Plants > 5000	Mammals > 144
Rhododendron - 36	Birds -- 552
Orchids - 550	Reptiles - 33
Conifers - 16	Amphibians – 16
Ferns & Allies - 362	Fishes - 48
Tree Ferns - 9	Butterflies > 650
Bamboos – 28	
Primulas -30	
Oaks - 11	
Medicinal Plants - 424	
Recorded Forest Area	5841.39 sq. km (82.32%)
	Reserve Forests – 5452.39 sq. km
	Protected Forests (Khasmal) – 285 sq. km
	Protected Forests (Goucharan) -104 sq.km
Forest Land with Tree Cover	3289 sq. km (46.35%)
	Forest Cover – 3262 sq. km (45.97%)
	Tree Cover - 27 sq. km (0.38%)
Forest Cover	Very Dense Forest – 498 sq. km Moderately Dense Forest – 1912 sq. km Open Forest – 852 sq. km Scrub – 363 sq. km

- Compiled by ENVIS



Volume
1,083,319,780,000 km³

Average Density
5.41 (Specific gravity)

Mass
6,600 million billion tones

Maximum Radius (Equator)
6,378 km

Minimum Radius (Poles)
6,357 km

Length of Meridian Circle
40,009 km (circumference)

Circumference of Equator
40, 077 km

Total Surface Area
510,100,000 km²

Surface Area of the Dryland
149,400,000 km²

Surface Area of the Oceans
360,700,000 km²

Average Distance from the Sun
149,000,000 km

Source
Victoria Memorial Museum
Kolkata



NEWS & EVENTS 2008-09

State Green Mission Phase III Launched



Chintan Bhawan, Gangtok [May 12, 2008]:

Hon'ble Chief Minister, Dr. Pawan Chamling launched the third phase of State Green Mission, 'a mission of masses' to further expand its bio-diversity and give fillip to eco-tourism.

The state government had earlier in 2006 launched the Green Mission project in a bid to strengthen its rich bio-diversity which had led to an increase of two per cent in its forest cover from 44 per cent to about 46 per cent. The government then carried out a follow-up exercise under the Green Mission II in which over 10 lakh saplings were planted at an expenditure of Rs 2 crore. About 80 per cent of the saplings planted in all blocks of the state under the project have survived resulting in a significant increase in the vegetation. The third phase is targeted to cover 310km of avenue and 15 hectares of block plantation.

Organized by the State Forest, Environment and Wildlife Management Department, the function was also chaired by the advisors to the Chief Minister, HODs of various Departments, officials from the Forest Department, Panchayats, NGOs and students.



World Environment Day 2008 Celebrated

*Dalapchen-Aaritar,
East Sikkim
[June 5, 2008]:*

Organized by the State Forest, Environment and Wildlife Management Department in collaboration with the World Wildlife Fund (WWF), a State level World Environment Day on the theme "Kick the Habit Towards Low Carbon Economy" was observed at Dalapchen-Aritar, East Sikkim in huge participation of students and local people.



Plantation drive



Student's Rally



One Act Play by Students



Prize Distribution

Wildlife Week Celebration

[1st -22nd Oct 2008]:

Wildlife Week was celebrated with great pomp and zeal in all four districts of the state in following venues during 1st -22nd Oct to create awareness amongst students and general public to conserve and protect wildlife resources.

East : Ranka/ Rumtek Sr. Sec. Schools, 18th Oct 2008

West : Tashiding/ Gangyap, 20th Oct 2008

North : Lachung, 16th Oct 2008

South: Yangyang Pathing, 22nd Oct 2008

The programmes were organized in joint collaboration of the State Forest, Environment & Wildlife Management Department and WWF-Gangtok with the main focus on control of wildlife crime and general awareness amongst the people.

[Please Note: Usually Wildlife Week is celebrated during the 1st week of October, however, due to Dushera festival coinciding, it was decided to celebrate during 1st - 22nd October for the year 2008.]



National Environment Awareness Campaign 2008-09 on the theme 'Climate Change'



Forest Conference Hall, Gangtok
[February 11, 2009]:

Sponsored by the Ministry of Environment & Forest, Government of India and hosted by ENVIS Centre, Forests, Environment & Wildlife Management Department, Government of Sikkim, the National Environment Awareness Campaign 2008-09 on the theme 'Climate Change' has successfully been implemented in the state with the participation of 29 environmental NGOs.

A campaign began with the sensitization workshop held at forest conference hall on 11th Feb 2009. Participated by several senior officers of the department and NGOs, the workshop focused on the several issues like carbon trading, global warming and its impact, waste management, natural resources and the changing trend of Sikkim Himalaya.



The technical session by Mr. C. Lachungpa (IFS), CCF (LU & E) gave a strong message to the participating NGOs so as to encourage themselves despite meager financial grant-in-aid and act as building blocks in environment conservation in the society.

The zeal among the NGOs in betterment of their area was reflected in the interactive session. The presence of the HMF Shri S. B. Subedi gave the workshop a good momentum. The whole workshop turned out to be fruitful since the main motive of the workshop was realized.

List of Participating NGOs and Amount Sanctioned

	Name of the NGO and Address	Amount Sanctioned (in Rupees)
EAST DISTRICT		
1	Shiva Gram Sewa Samiti Pani House, Gangtok	7,000
2	Social Welfare Youth Association Rakdong Tintek	8,000
3	Matri Kalyan Samiti, Upper Tarpin	7,000
4	Tumin Dhanbari Chandra Jyoti Sanstha Tumin,	7,000
5	Navijyoti Sangh , Namrang	7,000
6	Nava Jagriti Sangha, Rhenock	7,000
7	Friends Association, Gangtok	7,000
8	Starlight Academy, Perbing	7,000
9	Ranka Progressive Society, Ranka	7,000
10	Mevedir, Daragaon Tadong	9,000
11	Manav Uthan Sewa Samiti, Gangtok	7,000
12	Green Point, Tumin	7,000
13	Ekta Sangh, Lower Tadong	6,000
14	Lossing Nava Jyoti Yuva Sangathan, Maching	6,000
WEST DISTRICT		
15	Sindrabong Khangchendzonga Eco-friendly society, Darap	7000
16	Himali Vikash Sansthan, Kaluk-Rinchenpong	7000
SOUTH DISTRICT		
17	Himalyan Educational Society, Temi	7000
18	Sikkim Paryavarjan Sangrakshan Sangh	7000
19	Youth Club, Melli Payong	7000
20	Upper Gaon Surya Jyoti Sang	7000
21	Basanta Pariwar	7000
22	Monokamana Sangh , Sadam	7000
23	Lakshya, Kitam	6000
24	Indrani Pariwar, Sumbuk	6000
25	Turuk Dev. Society, Turuk	8000
NORTH DISTRICT		
26	Endeavors Organisation , Kabi	8000
27	Mutanchi Lom Aal Shezum, Dzongu	7000
28	Pentok Welfare Association , Mangan	7000
29	Sr. Research Officer Wildlife & Biodiversity (Govt. Org.)	14000



World Wetlands Day 2009 Celebrated

Theme

"Upstreams-downstreams – Wetlands connect us all"

[2nd February 2009]

The importance of wetland conservation for livelihood sustenance vis-à-vis maintenance of eco-system; state-wide awareness, sensitization, extension and educational programmes were conducted by the DFO, Land Use & Environment Division in all the districts in collaboration and participation with project developers and local community during the Wetland Conservation Day.



Chungthang, North Sikkim



Majhitar, South Sikkim

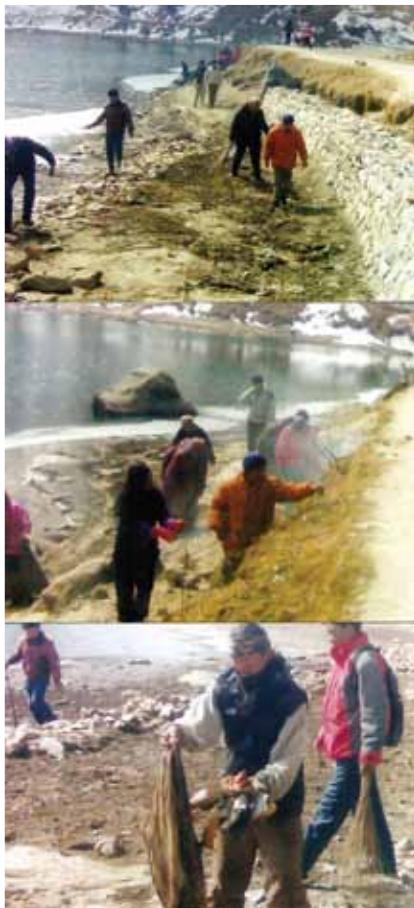


Phurchachu (Tatopani), West Sikkim



Tsongo, East Sikkim

The snapshot (below) reveals the conservation activities that were carried out by divisions during the World Wetland Conservation Day Celebration on 2nd February 2009.



Cleanliness drive of Tsongo Wetland Complex

The Himalayan State of Sikkim shelves a large number of fresh water lakes of varied sizes and dimension located in high elevated areas. These fresh water wetlands have been the main source of Teesta River in North Sikkim and Rangit River in West Sikkim. They are the perennial water supply to various tributaries of the river system and also serve as a halting station for long distance migratory ducks. Some of these wetlands are glacier fed and others are snow fed.

Few of the wetlands have shown adverse reaction to the effects of global warming. There is a drastic decrease of water level and subsequent degradation of catchment area. The conservation of these wetlands is very important to sustain the aquatic eco-system and water supply.

Considering the imperative role of these wetlands, the experts of Ministry of Environment & Forests, Government of India, Wetland Division Dr. S. Kaul, Director, was invited to the State during 2006 and selected largely degraded wetlands due to anthropogenic factors for appropriate management & conservation strategies. The programme was followed up by visit of Senior Scientist in the subsequent year too. The selections of the wetlands were based on a cluster of small fresh water lakes forming into a complex of wetland in order to match the standard of wetland as per the Ramsar Convention.

As follow up, the guidelines of Government of India, State Level Steering Committee under the Chairmanship of Chief Secretary was constituted to oversee and review the wetland conservation activity in the State. Around 115 such wetland were indexed and six wetlands were included in the National Wetland Conservation Programme of Ministry of Environment & Forests, Government of India. Out of these six wetlands, four wetlands have received financial assistance for management and conservation practices since 2007-08.

C. Lachungpa (IFS), CCF(LU&E)



GOVERNOR'S

GLOBAL CLIMATE SUMMIT

FINDING SOLUTIONS THROUGH REGIONAL AND GLOBAL ACTION

Beverly Hills, California, USA

[November 18-19, 2008]

- Compiled by ENVIS



Hosted by the Hon'ble Governor of California, Mr. Arnold Schwarzenegger and co-hosted by the U.S Governors, the Governors' Global Climate Summit focused on finding practical and sustainable solutions to fight against the Global Climate Change crisis and promote international action by forging international partnerships and advancing specific, practical cooperation by the industrial, energy, transportation and forestry sectors. The summit was participated by the Governors and Representatives of United States of America, Brazil, Canada, Republic of Indonesia, United Mexican States, China and India.

Dr. Pawan Chamling, the Hon'ble Chief Minister of Sikkim-India has been the only political leader from India to have been formally invited by the California Governor, Arnold Schwarzenegger to take part in the Summit thus representing the entire country. The Chief Minister's global reputation of green governance and his tremendous commitment towards combating great environmental challenges at the Himalayas have shown colours in the global scenario and have been gratefully acknowledged as one of the global environmental leaders. At the Summit, the Chief Minister made an in-depth presentation that manifested firm commitments of the country to combat climate change challenges.



Global Climate Summit Declaration

The guiding principles to advance the ongoing international efforts under the United Nations Framework Convention on Climate Change:

- ✓ Stabilize atmospheric concentration of greenhouse gases to avoid catastrophic climate change;
- ✓ Achieve quantifiable greenhouse gas emission reduction collectively;
- ✓ Provide technical assistance to and investment in sector specific activities, including transfer of clean energy research, and assistance with development, demonstration and deployment of climate change technologies, particularly in developing countries;
- ✓ Accelerate capacity building efforts targeted towards key sectors of our economies;
- ✓ Strengthen the ability of all regions of the world to adapt to climate change and assist those that are disproportionately affected, or most likely to suffer the consequences of climate change;



Goals to realize the above principles:

- ✓ Reduce greenhouse gas emissions in sectors with high environmental and economic benefits including; forestry, agriculture, cement, iron and steel, aluminum, energy and transportation;
- ✓ Employ those actions that are most suited to providing mutually beneficial outcomes, including technology transfer, incentive programs, sharing of best practices and market or non-market based programs;
- ✓ Pursue opportunities among the nations that complement existing efforts to further explore scientific mitigation and adaptation strategies;
- ✓ Scale up investments in climate friendly technologies and strategies;
- ✓ Grow economies and enhance overall quality of life through research, development and deployment of technologies;
- ✓ Focus research, development and deployment activities on energy efficiency and renewable energy technologies;



(For details please visit <http://www.governorsglobalclimatesummit.org>)



Centenary Celebrations of Sikkim Forestry



Rabdenste, West Sikkim [21st Feb, 2009]:

Centenary celebration of Sikkim Forestry was launched by the Hon'ble Chief Minister Dr. Pawan Chamling at Rabdenste, West Sikkim on 21st February, 2009. On the occasion, the chief minister laid the foundation stone of Sidkeong Tulku Bird Park.



MILESTONES (1909 TO 2009)

100 YEARS OF SERVICE

SIKKIM FORESTRY

1984: Kyongnosla Alpine Sanctuary and Fambong Lho Wildlife Sanctuary East Sikkim; Shingba Rhododendron Sanctuary, North Sikkim declared.

1987: Maenam Wildlife sanctuary, South Sikkim, declared.

1988: State formulates and adopts Sikkim Forests, Water Courses and Road reserve (Preservation and protection) Act, 1988.

1988-'89- Forest survey of India completes Forest Resource Survey of all districts.

1995:

- ❖ Sikkim Democratic Front (SDF) Government announces and adopts "Harit Kranti Dashak" for greener Sikkim through people's participation.
- ❖ Cattle grazing in Reserve Forests, an age old practice that has led to the depletion of forest wealth, banned.

1997:

- ❖ Ban on use of non-biodegradable materials like plastics, polybags etc.
- ❖ KNP extended from 850 to 1784 sq. km. (25.10% of total geographical area).

1998:

- ❖ State award "Rajya Van Samrakshan Evar Paryavarhan Puraskar" constituted.
- ❖ Rathong Chu hydro-electric project and 170 sq.km. proposed firing range in North Sikkim, abandoned.
- ❖ Barsay Rhododendron Sanctuary, West Sikkim declared.
- ❖ Introduction of participatory forest management involving active peoples' participation through Joint Forest Management Committees (EDCs) (26 June 1998).
- ❖ Subsequent notification issued for Eco-Development Committees (EDCs).

1945-46: Forests vested to the Darbar from under the ownership of landlords in different districts, a task ably implemented by Atal Singh Dewan, Range Officer.

1952: First Cadastral survey to demarcate Revenue and Forests Lands.

1972: Indian Peafowl introduced into lowland Sal Forests, South Sikkim.

1976: Extension of Indian Wildlife (Protection) act 1972 to Sikkim.

1977: Khangchendzonga National Park (KNP) of area 850 sq. km. declared.

1999:

- ❖ Dr. Pawan Chamling, Chief Minister of Sikkim adjudged Greenest Chief Minister of India by Delhi based Center for Science and Environment.
- ❖ Government adopts new nomenclature 'Forest, Environment and Wildlife Management Department' in tune with changing focus and shift approach and objective.
- ❖ Smriti Van (Memorial Forests) concept by Hon. Chief Minister at Bulbuley above Gangtok to take Forestry programmes to people's level. All strata of people, individuals, institutions, clubs, societies and non-governmental organizations participate by planting trees in memory of children, marriage, death etc. at a common venue and care, own and nurture trees to maturity. Smriti Vans now at each Panchayat Unit.
- ❖ Government formulates, adopts State Forests, Environment and Land Use Policy in view of growing concern for protection of forests, environment and wildlife vis-à-vis increased developmental tempo.



.....Milestones

2000:

- ❖ Khangchendzonga Biosphere Reserve with area 2619.92 sq.km declared.
- ❖ Total wildlife protected area 30.77% of total geographical area which is the highest in the country.
- ❖ Eco Clubs and Green fund for Schools, and colleges.

2001:

- ❖ Sacred peaks, caves, rocks, lakes, 'chhortens' and hot springs notified.
- ❖ Scaling of important peaks including the Mount Khangchendzonga banned.
- ❖ Network of JFMC/EDCs and Watershed Developmental Committees (WDCs) created.
- ❖ State Biodiversity Park at Tendong, South Sikkim established.

2002:

- ❖ Environmental Education introduced in Schools from nursery to class- 8.
- ❖ State Medicinal Plant Board (SMPB) set up to concretize action plan on medicinal plants in the state with Hon. Chief Minister as Chairman.
- ❖ Herbal Gardens created in different Panchayats units.
- ❖ Sikkim to go organic; ban on chemical fertilizers, pesticides.
- ❖ Pangolakha Wildlife Sanctuary, East Sikkim declared.

2003:

- ❖ Eleven Important Bird Areas (IBAs) in Sikkim identified and recognized by Government.
- ❖ Government of India, through its scientific wing, the Forest Survey of India records increase of forest cover in the state by 2% between the period 1994-2003, the result of department's relentless regeneration efforts and the Government's intense policy focus.

2004:

- ❖ Green indicators, 2004 a report developed by Noida - based groups find the Forest Protection Index of Sikkim to be the highest in the country. (0.903).
- ❖ First state in Himalayas to use Global Positioning System (GPS) to survey and demarcate Reserve Forest boundaries.

2005:

- ❖ Sikkim Ecology Fund and Environment Cess Act, 2005 framed. This Act provides for levy of Cess on industries, traders and consumers for articles which pollute environment.
- ❖ Ban on killing of wildlife strengthened.

2006:

- ❖ ENVIS (Environmental Information System) Centre established and website (www.sikenvis.nic.in) launched to reach information on status of environment and its related issues to wider level.
- ❖ Regulation of trekking Rules, 2006 notified.
- ❖ Kitam Bird Sanctuary, South Sikkim declared.
- ❖ State Green Mission launched to integrate people with nature and invoke mass support for the cause.
- ❖ Constitution of State Biodiversity Board to oversee and manage the rich biodiversity of the state.
- ❖ State Biodiversity Strategy and Action Plan (SBSAP) documented.
- ❖ Wetland Conservation Programme formulated and six wetland complexes included in National Wetland Conservation Programme.

2007:

- ❖ State Glacial Commission formulated.
- ❖ National Bamboo Mission launched.

2008:

- ❖ State of Environment (SoE) Report, the first of its kind in the state published.
- ❖ Eco-Tourism Directorate created.
- ❖ Hamro Van media venture on local cable TV launched for awareness.
- ❖ Chogyal Palden Thendup Namgyal Park, Gangtok, created.
- ❖ Sikkim Forests, Water courses and Road Reserve (Preservation and Protection) Act 1988 got assent from President of India (16 May 2008).

2009:

- ❖ Awarded following appreciation from Centre for Development Finance, a prominent NGO:
 - First in Natural Resources Management
 - First in performance in Land Use and setting up of state Council for Climate Change.
 - Second best ranking in Environmental Sustainability Index;
 - Tinkitam Fairieanum Conservation Reserve, South Sikkim for the protection of Orchid *Paphiopedilum Fairieanum* and its environment under declaration.
 - Working Plan under completion; Wildlife Management Plans under implementation.
 - Terms of Reference (TOR) signed between department and Japanese International Cooperation Agency (JICA) funded externally aided project with focus to promote ecotourism and natural resources conservation.

OUTBREAK OF FOREST FIRES ACROSS SIKKIM

[March 20]



The continuous dry spell in Sikkim in the month of March transformed the forest areas into virtual tinderboxes triggering major forest fires that ravaged many reserved forests and wildlife sanctuaries across the State.

Affected Areas:

East Sikkim:

Khesay, Gangyap, Sichey, Ganseh Tok, Daragaon, Nam Nang, Gangyap, Sang, Nazitam, Rongli, Basmey, Ranka Lingdum, Rongey, Namnang; Sang RF, Singcheyel RF, Nimthang RF, Syari RF, Rangpo, Rhodong Khasmal forest, Kopibari (private holding), Central Pandam Khasmal area, Basmey RF, Fambong Lho wildlife sanctuary.

West Sikkim:

Nethang, Malbasey, Pipaley, Tatopani, Sakyong, Barsey Rhododendron Sanctuary, Achalay RF, Tatopani RF, Reshi RF, Sakey RF, Sakyong RF, Burung RF, Raksang RF

North Sikkim:

Dikchu, Lower Phodong (private holding)

South Sikkim:

Melli Tribeni RF, Malbasey RF, Rabongla RF, Sumbuk RF, Tumin RF, Sadam Tareybir, Salghari, Ralong.



LEOPARD AT LARGE IN SOUTH SIKKIM



Picture by: Mr. Chenga Lachungpa, Wildlife Guard, South Sikkim

Usha Lachungpa
Sr. Research Officer (WL)
30th November 2008

Many years ago, a leopard killed a goat at Melli-Kerabari. We published an article with this title in our newsletter PANDA with a line Drawing by Mr. Sudhi Zong Lucksom.

This supreme predator, one of the 'Big-Cats', was back in Sikkim this November. Few know that the 'Chituwa' (because of spots or rosettes on its fur-coat), like the Tiger is in fact responsible for the health of our forests. What better form of biological control for our many crop invaders, especially in the South district! Monkeys, Wild Boar, Barking Deer and even Peafowl are its favourite, preferred food. It only turns to domestic livestock like cattle and goats when wild prey is not available in its natural home.

This month a large Leopard was spotted by the villagers of Melli in the Taarey Bhir area. Local brave hearts tracking the animal daily saw the Leopard and also heard its calls. We encouraged them to feel hopeful about their new guest who has come to help solve their problems of crop depredation just when harvests are due or in. In fact they along with local forest officials are still scouring the area, spreading awareness, keeping vigil and giving us daily reports.

Now for the first time, we even have a photograph, thanks to the efforts of the team. On 29th November 2008 at

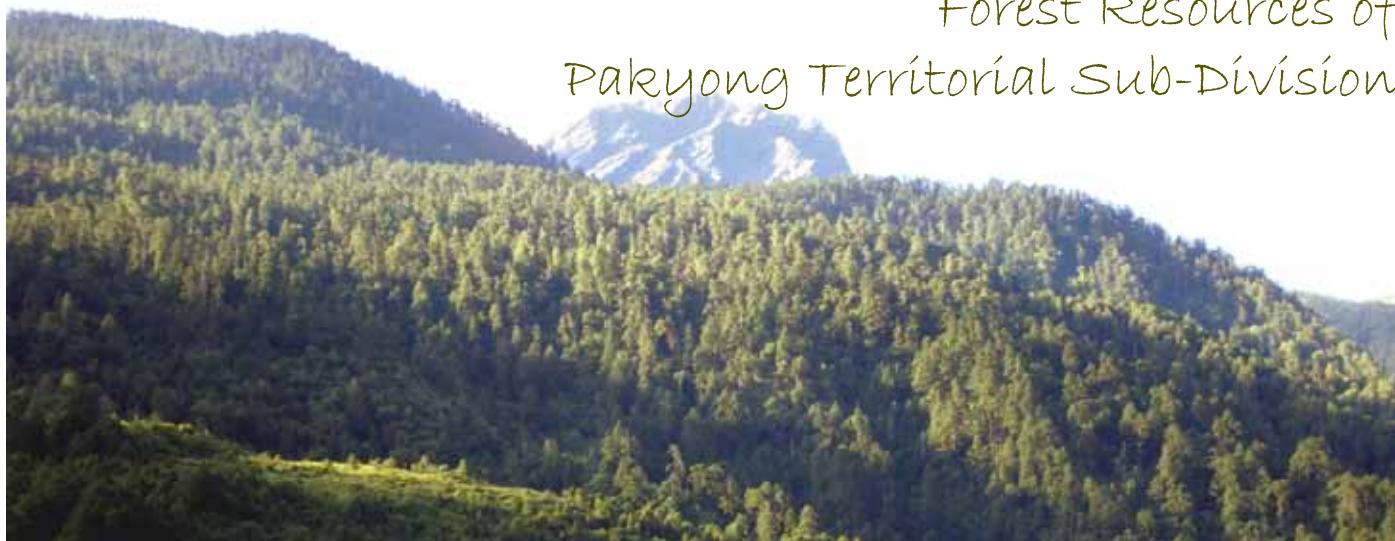
around 3.00 pm at Khani Khola Forest, Mr. Chenga Lachungpa, Wildlife Guard for South Sikkim was possibly the first Sikkimese to photograph the elusive big cat, thus confirming its identity. The adult Leopard is clearly visible, perched on a large rock as close as 500m. The entire team especially Mr. Bigyan Rai and his colleagues as well as the DFO (WL) South and his men deserve commendation (see *picture below*). They now have the responsibility for their guest's safety and keeping away potential poachers. What we should also note is that leopards are not as shy as tigers. Where tigers will avoid villages and people at all costs, leopards may come into villages to take prey like dogs, goats and even cattle, if deprived of their natural prey in the forests.

Any sighting of a wild predator is a good sign. Its timing is also perfect. The Leopard is perhaps migratory, in search of new territory. It can even climb trees. If it decides to settle, and if we can keep away our livestock from the forests, this big cat is going to be of great help to the surrounding villages plagued by crop raiding Majurs, Banders, Mirga and Banel. It will also clean our forests of any sick or weak wildlife which could pose a health hazard for our domestic animals. By respecting its privacy and avoiding conflict situations, it is we who stand to gain from its presence. It would be a shame if we were to lose it like we lost our endangered Sal Forest Tortoise to unscrupulous members of the most dangerous species on Earth.



Brave hearts: Mr. Bigyan Rai (Centre: in white T-shirt) with his colleague.

Forest Resources of Pakyong Territorial Sub-Division



*Kusum Gurung, ACF (LU & E),
East Division*

Pakyong Range is one of the oldest Ranges of Sikkim Forest Department since its inception during Chogyal's reign. It then comprised of Pakyong block, Pathing block and Rhenock block. It is now a Sub-Division under East Territorial Division.

Pakyong Territorial Sub-Division along with Rongli Territorial Sub-Division was also constituted as Pakyong Territorial Sub-Division for a period of two years w.e.f April 2005 till February 2007.

Pakyong Territorial Sub-Division now comprises of Pakyong Range and Barapathing Range. Pakyong Range is bounded by Assam Lingzey, Ranipool and Singtam blocks in North; Rangpo block in West; Rhenock block in the south and by Barapathing block in East.

Barapathing Range is bounded by Kyongnosla block in the north; Assam Lingzey and Pakyong block in the South West and Rongli block in the South East direction.

The climate of the Sub-Division ranges from sub-tropical in lower belt area to temperate in high altitude area.

The sub-Division has forest nursery at Karthok of 1 ha which is fulfilling the seedling demands of locals for plantation in their private holdings as well as for departmental works. The Department has also created a park 'Shanti Van' in nearby nursery area for recreation purposes

under State Green Mission. Similarly, Tourism Department has developed many infrastructures in Karthok RF for tourism purposes (diverted forest). The said area has a great potential of being developed into one of the hotspots for eco-tourism. The remnants of fort (gari) can be seen at the top of Karthok RF where it shares the boundary with Sumin RF.

Since, the 1998 National Forest Policy Resolution envisages people's involvement in the development and protection of forests for meeting the genuine demands of fuel wood, fodder, small timber and non-timber forest produce including medicinal plants for the villagers for bonafide use, Joint Forest Management Committees (JFMC) have been constituted in the state by the Forest Department under the guidance of MoEF, Gol and there are eleven numbers (11nos) of JFMCs in Pakyong Sub-Division actively participating in the forest protection.

Floral Wealth:

The Sub-Division has different types of forest like oak forest; mixed forest of katus, chilaunay, sal, simal, siris, panisaj etc. These forests were earlier opened up for coupe cutting by the Forest Department and were planted for scientific management of the area. The practice of coupe cutting has been stopped since long.

Taungya cultivation was also followed particularly in Karthok forest area under Pakyong block during early days with

much success and good plantation of dhupi, pipli, phusrey champ etc can be seen even today.

Reserved Forests of the Sub-Division are Amba, Pacheykhani, Dhanuke, Bhasmay, Karthok, Barapathing, Pachey, Thekabong and Parakha. These RFs have been demarcated and the boundary pillars have been erected for Amba RF. During early days, mineral ores were excavated from Dhanuke RF area but now it has stopped and the tunnel is being plugged.

Besides coupe cutting no other silvicultural intervention has been carried out in the forest for past years. Recently, a proposal for thinning down Dhupi plantation has been made for Karthok RF.

Some of the NTFPs/MFPs found in the forest area of Sub-Division are *Pyllanthus emblica* (amala), *Terminalia chebula* (harra), *Syzygium cumini* (jamuna), *Hamiltonia suaveolens* (bhuichampa), *Rhus javanica* (bhakimlo), *Litsea polyantha* (kutmero), *Bauhinia vahlii* (bhorla), *Sterculia villosa* (odal), *Bombax ceiba* (simal), *Oroxylum indicum* (totola), *Ostodes paniculatus* (bepari), *Macaranga* spp (malata), *Mallotus nepalensis* (malata), *Morus* sp (kimbu), bhujetro, ritha, bamboo, parijat, *Moringa oleifera* (drumstick), aule nigro, chewri, mango, amaru, *Baccaurea sapida* (kusum), *Azadirachta indica* (neem), *Swertia chirata* (chiraita), *Heracleum* sp (chimphing), *Bergenia* spp (Pakhanbhed), Majhito etc.



Faunal Wealth:

The Sub-Division has faunal species like Barking Deer, *Ashame Macaque*, Hare, Porcupine, Forest Squirrel, Weasel, Wild Pig, Wild Cat, Leopard, Red Fox, Nigalo, snakes, lizards, rodents, butterflies, insects; different birds like crow, Maina, Sparrow, Dove, Long-tailed Minivet, Parakeet, Bulbul, Cheel, Peafowl, Treepie, Drongo, Blue Whistlinglinghrush, Magpie, Barbet, Woodpecker, Indian Blue Robin, Flycatcher, Tit, White-crested Laughingthrush, Babbler, Red Jungle Fowl, Kaliz, White capped Redstart, Owl etc.

Management Problems:

The following are some of the management problems of the Sub-Division:

1. Forest fire control: Forest fire results in huge loss of floral and faunal wealth and sometimes the damages are irreparable. To manage this problem, fire watchers are employed during dry season to look over the area and report any fire incidences

immediately to the concerned field staff. The low lying belt of forest area near Rangpo Chu involving Bhasme RF, Pacheykhani RF, Dhanuke RF and also Amba RF are more prone to forest fire. Therefore, fire camp has also been installed at Labrey, Rorathang for the dry season. Fire lines are also created and managed regularly. Awareness campaigns have also been organized involving local public, panchayats and JFMC members for effective management of forest fire. Controlled burning is also done to remove leaf litter from ground surface.

2. Weed: *Mikania nicrantha* a climber is obnoxious and invasive weed which is posing problem in the plantation areas as well for the natural regeneration. Its faster growth overcomes growth of artificial and natural regeneration. And the maintenance of plantation area becomes costly and tedious. Its proper management should be given priority in the silvicultural

interventions to be carried out in the near future.

3. Man-animal conflict: During recent year's local public have reported the incidences of man-animal conflict particularly in the area of Pacheykhani and Tareythang. *Ashame Macaque* has been reported to be the main cause of crop damages and losses in the above area.
4. Illicit felling: the incidences of illicit felling have gone down in the Sub-Division recently. The regular patrolling of the forest area and awareness created by people's participation have helped in minimizing the incidences.

The floral and faunal abundance of the 'Jungles of the East' needs to be nurtured, conserved and protected. It beckons us to be more aware of the wealth around us. Let us all join hands in safeguarding our natural wealth.

Know Your Protected Areas

Urmila Thapa, ACF (W/L), North

What are protected areas? How are they protected and why? Who are they protected against? These are some of the questions that come to mind naturally. And these are the very questions that we ought to know the answers to, as an aware and informed citizen.

In India we have, at present four categories of protected areas (PAs). These are **National Parks**, **Sanctuaries**, **Conservation Reserves** and **Community Reserves** which are provided legal sanctity by the Wildlife (Protection) Act 1972. However, there are six categories specified by the IUCN

(International Union for Conservation of Nature) and different countries have different categories of PAs as per their requirements and norms laid by their Governments. A definition of a PA given by the IUCN reads:

"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources and managed through legal or other effective means."

The Protected Areas are dealt in Chapter IV in the Wildlife (Protection) Act, 1972 starting

with Sanctuaries. Once the **State Government** notifies its intentions to declare an area as a sanctuary under section 18 of the WL (P)A, 1972, it undergoes the process of acquiring the area within two years ensuring that all rights and claims are settled within this time period. Then finally under section 26 (A) the area is declared as a **Sanctuary** which can be any area comprised within any reserve forest or any part of the territorial waters, which is considered by the State Government to be of adequate ecological, faunal, geomorphological, natural or zoological significance for the purpose of protection,



propagating of developing wildlife or its environment, to be included in a sanctuary. The subsequent sections, till sec 34 (A), provides such an area with legal protection and also vests the powers of protection on various offices and authorities within the Forest and Wildlife Departments. Similarly the **State Government** declares an area as a **National Park** under sec 35 (4) and the protection clauses apply to a National Park as they apply to a sanctuary.

The **State Government** may, after having consultations with local communities, declare any area owned by the Government, particularly the area adjacent to National Parks and Sanctuaries and those areas which link one PA with another, as a **Conservation Reserve** u/s 36 (A) for protection of landscapes, seascapes, flora, fauna, and their habitats. The State Government may, where the community or an individual

has volunteered to conserve wildlife and its habitat, declare any private or community land not comprised within a National park, sanctuary or a conservation reserve as a **Community Reserve** u/s 36 (C) for protecting fauna, flora and traditional or cultural conservation values and practices. Some of the protection clauses in relation to a sanctuary apply to the Conservation and Community Reserves but not all.

Some Restriction and prohibitions within Sanctuaries and National Parks under the WL(P), 1972

Section 27 restricts entry into a **PA** except on being granted permission by the Chief Wildlife Warden or by an authorized officer. Any person residing rightfully within a PA is bound to assist any forest or police officer demanding his aid for preventing the commission of any offence against WL (P) A, 1972 or in investigation of any such offence.

An important clause is **sec 27(3)** which states that no person shall, with intent to cause damage to any boundary mark of a sanctuary or to cause any wrongful gain as defined in the Indian Penal code (45-1860), alter, destroy, move or deface such boundary mark. **Section 29**

prohibits destruction of any kind within a PA, which includes prohibition to remove any wildlife including forest produce, or destroy or damage or divert the habitat of any wildlife, stop or enhance the flow of water except in accordance with a permit granted by the Chief Wildlife Warden.

Section 30 prohibits causing of fire within a PA. **Sec 31** prohibits entry into a PA with weapon.

Section 32 bans on use of injurious substance within PAs.

Section 51 of WL (P) A, 1972 specifies penalties for contravening any provision of this Act.

Protected areas not only offer protection to wildlife and their habitats but ensure environment stability of the surrounding regions. PAs also provide opportunities for rural development and rational use of marginal lands, generating income and creating jobs, for research and monitoring, for conservation education, and for recreation and tourism hence, we as citizens are bound to join hands in safeguarding our resources and enjoy the benefits provided by their conservation.

Current Figure of Protected Areas in India

PA Category	Nos	Area (in sq.km)	% Coverage
National Parks	97	38,223.89	1.16
Wildlife Sanctuaries	508*	118,400.76	3.60
Conservation Reserves	6	92.33	0.003
Community Reserves	2	16.26	-
Total Protected Areas	613	1,56,733.24	4.77

*Existing **Saraswati Plantation** and **Bir Bara Ban Wildlife Sanctuaries** have been de-notified and declared as Conservation Reserves vide Haryana Govt. Notification No. S.O. 78/C.A.53/72/S.18 and 36-A/2007 dated 11th October 2007. (Changes are based on official letter of Addl PCCF (WL) of Haryana, dated 18th January 2008)



In Sikkim we have, presently, 8 Protected Areas which comprises of 1 National Park and 7 Wildlife Sanctuaries that cover almost 31 per cent of the total geographical area of the state.

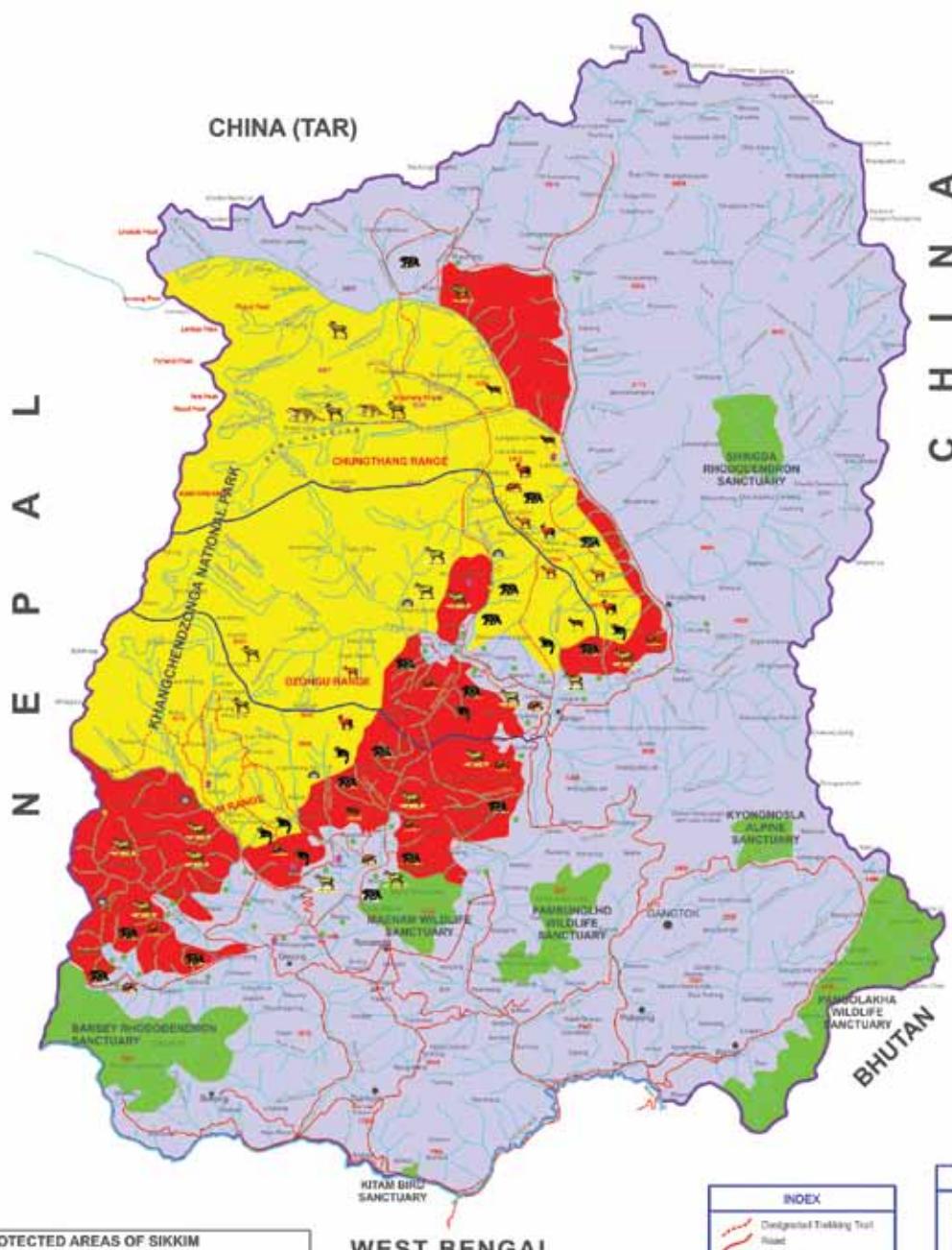
WILDLIFE PROTECTED AREAS OF SIKKIM

SN	Name	Area (sq. km)	District	Bio-geographic Province	Altitude (m)	Notification No. & Date	Co-ordinates	
							Long (East)	Lat (North)
1	Barsey Rhododendron Sanctuary	104.00	West	2 C	2110 - 4100	50/WL/F/95/269/F & WL dt: 08.06.96	88° 02' to 88° 11'	27° 10' to 27 13'
2	Fambonglho Wildlife Sanctuary	51.76	East	2 C	1524 - 2749	34/WL/82 dt: 02.04.84	88° 29' to 88° 35'	27° 10' to 27° 23'
3	Kyongnosla Alpine Sanctuary	31.00	East	2 C	3292 - 4116	45/WL/83/625 dt: 29.08.84 Extended vide 45/WL/F/92/1585/F & WL dt: 05.12.1992	88° 44' to 88° 45'	27° 22' to 27° 24'
4	Maenam Wildlife Sanctuary	35.34	South	2 C	2000 - 3263	63/WL//F/86 dt: 09.03.87	88° 21' to 88° 25'	27° 21' to 27° 25'
5	Pangolakha Wildlife Sanctuary	128.00	East	2 C	1760 - 4390	26/WL/F/89 dt: 07.11.00	88° 35' to 88° 51'	27° 09' to 27° 22'
6	Shingba Rhododendron Sanctuary	43.00	North	2 C	3048 - 4575	46/WL/F/92/1585/F&WL dt: 05.12.92	88° 43' to 88° 46'	27 43' to 27 48'
7	Khangchendzonga National Park	1784.00	North/ West	1 B & 2 C	1400 - 8598	95/KNP dt: 26.08.07	88° 03' to 88° 39'	27° 27' to 27° 53'
8	Kitam Bird Sanctuary	6.00			320 - 875	39/FEWM/2005 dt: 03.02.05	88° 20' to 88° 22'	27° 06' to 27° 07'
Total area (A)		2183.10						
9	KNP Buffer zone	836.00	North/ West					
10	Khangchendzonga Biosphere Reserve (KNP+Buffer =1784+836)	2620.00	North/ West	1 B & 2 C	2725 - 5537	1/KNP/WL/27 dt: 17.05.1997	88° 27' to 88° 33'	27° 33' to 27° 40'
Total Geographic area (Sikkim)		7096.00						

- Note:
- Protected Area Network does not include area under buffer zone of a biosphere reserve
 - Total area under administration by Forests, Environment & Wildlife Management Department
(RF i/c PAs) + Khasmals + Gaucharan =5452+285+104=5841 Sq km)
 - Territorial Sector [RF + Khasmals + Gaucharan = 3268.90 + 285 + 104 = 3657.90 Sq. km] i.e. 51.55% of State's Geographical area
 - Wildlife Sector [KNP + Sanctuaries = 2183.10 Sq. km] i.e. 30.77 % of State's Geographical Area.



PROTECTED AREAS IN SIKKIM



PROTECTED AREAS OF SIKKIM	
1. Khangchendzonga Biosphere Reserve	2619.92 Sq. Km.
2. Barsoi Rhododendron Sanctuary	104.00 Sq. Km.
3. Kitam Bird Sanctuary	6.00 Sq. Km.
4. Maenam Wildlife Sanctuary	35.34 Sq. Km.
5. Pambumgho Wildlife Sanctuary	51.76 Sq. Km.
6. Pangolakha Wildlife Sanctuary	128.00 Sq. Km.
7. Kyongnosla Alpine Sanctuary	31.00 Sq. Km.
8. Shingba Rhododendron Sanctuary	43.00 Sq. Km.

Note: 1794 Sq. Km of Khangchendzonga National Park includes in the KBR.

INDEX	
	Designated Trekking Trail
	Road
	River (Khola, Chhu)
	Lake (Phewa, Chhu)
	Sacred Cave
	Holy Spot
	Monastery
	Feng Village of KBR
	KBR - Core Zone
	KBR - Buffer Zone
	Sanctuaries

WILD ANIMALS OF KBR	
	Snow Leopard
	Gaur
	Himalayan Tahr/Bear
	Musk Deer
	Himalayan Tahr/Shark
	Blue Sheep
	Red Panda
	Serow
	Wild Boar

Forests, Environment & Wildlife Management Department, Government of Sikkim





Red Panda
Ailurus fulgens
State Animal



Blood Pheasant
Ithaginis cruentus
State Bird



Nobile Orchid
Dendrobium nobile
State Flower



Rhododendron
Rhododendron niveum
State Tree

WILDLIFE PROTECTED AREAS (PAs) IN SIKKIM - AN OVERVIEW

H.P. Pradhan, IFS
Chief Conservator of Forest (Wildlife)

1. OVERVIEW

- The term wildlife encompasses all uncultivated flora and undomesticated fauna. Every species has the right to live and every threatened species must be protected to prevent extinction.
- Water, wilderness and wildlife are irrevocably interlinked. With mounting industrial and demographic pressures, wilderness areas, which are the richest repositories of wildlife and biodiversity have either shrunk or disappeared. Their continued existence is crucial for the long term survival of the biodiversity and the ecosystems supporting them.
- Effective ecosystem conservation is the foundation of long-term ecological and economic stability. Conservation of biodiversity is directly linked with conservation of ecosystems and thus with water and food security.
- Habitat loss is caused by infrastructural developmental projects for short term economic gains undermining ecological security.

2. PERSPECTIVE MANAGEMENT STRATEGIES

The Department of Forest, Environment & Wildlife Management in the state has been adopting and implementing following strategies for smooth and effective management of Protected Areas i.e. Sanctuaries and National Parks which are oriented towards protection, conservation and preservation of pristine flora and unique Himalayan fauna in the state.

(i) Strengthening and Enhancing the Protected Areas Network:

There are 8 (Eight) PAs comprising of 7 (seven) Sanctuaries and 1 (one) National Park. Efforts have been made to increase the extents of PAs in the state to strengthen and enhance the biodiversity as the main strategy for conservation and protection of most of the rare and threatened wildlife species and biodiversity in the state. Proposal for creation of inviolate areas within the sanctuary under Critical Wildlife Habitats had been selected and submitted in the Ministry and will be authenticated after the scientific study.

(ii) Effective Management of Protected Areas:

Maximum efforts have been made for effective management of PAs in the state by adopting suitable management techniques based on scientific and ecological data viz:

- Improvement of degraded habitat by suitable management practices under CSS scheme.
- Restriction of thoroughfare in core zone and development of eco-tourism including trekking by the adventure tourists only in buffer areas.
- Control of forest fire, grazing, disease, poaching and trade of wildlife and its derivatives.
- Intensive management through organization of anti-poaching activities, trap demolition and patrolling by the wildlife officials with the active participation of Eco-Development Committees.
- Intensive measures have been taken

up for mitigation of man-animal conflicts in and around the Pas.

- Scientific and ecologically sound management plans for all PAs are in the final stages of preparation.

(iii) Conservation of Wildlife and Endangered Species and their Habitats:

- The conservation of Wildlife and Endangered Species and their habitats has been proposed to be initiated in all PAs in the state by way of conducting status surveys of all endangered species covering all groups of rare and threatened species of flora and fauna. The logistic and financial resources from the Ministry, GOI are required for conducting such studies. Inviolate areas for such species have also been proposed and identified within the PAs to declare them as Critical Wildlife Habitats for intensive protection and conservation of rare and threatened species. The field survey and study of Red Panda habitats and its population in all PAs has been taken up in the state in close coordination of WWF-India, Sikkim.
- There is a dire need of developing capabilities for planned ex-situ conservation such as captive breeding of Red Panda, Musk Deer and Snow Leopard in accordance with IUCN guidelines.
- Need to strengthen the techniques of capture, translocation by tranquilization of displaced and problem herbivores considering the growing trend of crop depredation



by wild boar, porcupine, barking deer, monkeys and occasionally Himalayan Black Bear.

(iv) Restoration of Degraded habitats outside Protected Areas:

- Habitat improvement within the PAs has been taken up under the fund provided under 100 % CSS.
- There is a dire need to develop, restore and manage degraded habitats outside PAs vital for spatial movement of spill-over animal population and requirement of basic biological resources of fringe forest dwellers living around the PAs.
- Need to identify and develop degraded habitats around each PAs and in potential 'Wildlife corridors'. Fund for implementation of such schemes has been provided by the Ministry, GOI.

(v) Control of Poaching and Illegal Trade in Wild Animal and Plant Species:

Efforts have been made by the Department for effective prevention of poaching and illegal wildlife trade in the state by conducting intensive patrolling, surveillance, and vigilance by the territorial and wildlife officials with the help of EDCs. But the manpower resource is poor due to shortage of frontline staff which needs to be addressed during the meeting for special Wildlife Crime Cell and enforcement agencies for combating such activities to be funded under CSS.

- Efforts have been made for providing adequate professional skills in prosecution matters related to wildlife offences for the frontline staff.
- Efforts have been made for requisite information and database on wildlife offences to devise suitable strategies to combat wildlife crime and detection.
- Maximum efforts have been made to secure and prohibit smuggling of wildlife along the international borders by setting up check post and patrolling by wildlife and territorial staff.
- The wildlife personnel must have a status at par with the police in the use of weapons and the equipment to enable them to combat the poaching and illicit trade effectively. Secret Fund is to be provided for intelligence gathering in cases of illegal trade of animals and their derivatives.

(vi) Monitoring and Research

- Survey and studies of wildlife

population are being carried out for preparation of Management Plans, but field efforts are hampered due to lack of proper field equipments for tracking/ monitoring/ documentation due to paucity of funds for the purpose.

- Other issues like research and regular, long-term monitoring using reasonably sophisticated field equipments needs to be strengthened.

(vii) Human Resource Development and Personnel Planning:

- Efforts have been made for posting of wildlife trained and skilled manpower for better management of Protected Area and its habitat. Maximum people participation using EDCs, Panchayats, Pokhari Sanrakshan Samitis and communities has been ensured for planning and management of PAs in the state.
- The department is deputing ACFs and Range Officers for training every year for Diploma and Certificate courses to Wild Life Institute of India, Dehradun to ensure better management of wildlife within and outside PAs as well.

(viii) Ensuring Peoples' Support & Participation in Wildlife Conservations.

- Initiated orientation programmes for PA staff, local youth, panchayats, and EDC members and Para-military forces in close co-ordination with WWF-India, Sikkim for developing local capacities to implement developmental activities by the local communities and EDCs around PAs.
- Developed guidelines and passed resolution for EDCs for effective implementation of programme and protection and conservation of PAs.
- Employment opportunities are provided to the local communities for various protection measures and conservation works such as fire protection, improvement of habitats, water holes, distillation of wet lands etc.

(ix) Conservation Education and Protected Area Interpretation.

- Time to time capacity building programme has been organized for different level of frontline staff and target groups like para-military forces, BRTF, EDCs member, local youth to educate them on wildlife conservation, illegal trade of animals and trade in derivatives.
- Prepared and developed wildlife conservation brochures and leaflets both in English and in local languages

highlighting the needs of conservation , role of forest and wildlife resources in the environment

(x) Tourism in Protected Areas

- Eco-tourism in PAs and outside PAs as well are fast growing in the state to inculcate in visitors an empathy for nature, both animate and inanimate and to provide a communion with nature rather than to merely ensure sightings wild animals.
- Necessary strict guidelines and rules for protection and conservation of the natural resources, waste disposal have been laid down and implemented for tourism in PAs. Trekking rules have also been extended and implemented for adventure tourism to prevent bio-piracy and other illegal activities by the tourists and visitors.
- Local Tourism Development Committees by involving local stakeholders and members of the Eco-Developments have been constituted for formulation of environment friendly eco-tourism implementation, regular monitoring the impacts of ecological effects on wildlife habitats.
- All the development and promotion of eco-tourism projects within and outside the PAs have been prescribed in the wildlife Management Plan and implemented by the Forest Department in close coordination of Tourism Department and local tourism development committee.
- Time to time capacity building programme for tour operators, local stake holders for bringing awareness to them for rules and regulations governing eco-tourism are emphasized.

(xi) Domestic Legislation and International Conventions:

- The management of PAs, conservation of floral and faunal bio-diversity, protection of existing fauna-avifauna etc. has been done under the strict provision of Wildlife (Protection) Act, 1972 and other Acts related with the environment.
- Time to time review of the Acts is required at the Centre with a view of making them more oriented and relevant to the realities of the present day which is imperative while rules in various issues related to environment and wildlife should be prepared in consultation with the states



(xii) Enhancing Financial Allocations for Ensuring Sustained Fund Flow To the Wildlife Sector.

- The fund provided by the ministry under CSS is not sufficient for effective management of PAs especially for infrastructure like Office and residential quarter of the frontline staff.
- There are growing trends of crop depredation by the wild animals like wild boar, porcupine, barking deer, monkeys, even some cases by Himalayan Black Bear. Fund for provisions for procurement of tranquilizer gun and drugs are inadequate and this sector needs to strengthen in order to capture and translocate displaced animals and release in suitable habitats.
- Funds are inadequate for filling up vacancies and creating new posts in wildlife sector especially for combat forces in area facing severe poaching, check post guards and sufficient equipments.
- Special provision of fund needs to be provided for restoration and improvement of habitats in outside PAs and animal corridor .

(xiii) Integration of National Wildlife Action Plan with Other Sectoral Programme.

- Integration of various Central and State Government schemes have to be made for development of areas outside PAs

3. Progress Report of the Implementation of the Management Plan of PAs.

The preparation of Management Plan for all PAs in the state has been completed. The inordinate delays are due to difficulty in procuring relevant maps as most of Sikkim falls under Restricted Area and Protected Area, under the custody of the

military. So far correspondence is being pursued with the SOI for procuring the maps. The Management Plan has been prepared on the basis of the guidelines issued by the Ministry.

4. Man and animal conflicts:

The state is rich in floral and faunal diversity. There is no distinct population of tiger and other super predators except Snow Leopard in the alpine habitats. But there is scattered population of common leopard (*Panthera pardus*) and occasional predation of domestic livestock. Low density of large predators seems to indicate thriving and abundant population of prey species like Wild boar (*Sus scrofa*), porcupines (*Hystrix indica*), Macaques (*Macaca assamensis*) which have been reportedly raiding the standing agricultural and horticultural crops in the fringe villages causing damages to public property.

The threat of Himalayan Black Bear (*Selenarctos thibetanus*) in many fringe villages is quite serious with considerable destruction of cardamom and maize crops in some areas. In some cases killing and preying on poultry, domestic bee-hives, and domestic pigs by the bear are reported.

The conflicts of domestic livestock with wild ungulates are reduced to minimum due to ban on grazing in Reserve Forests for last ten years resulting into low mortality, restriction in hunting and increase in welfare factors like resting, breeding and feeding grounds, leading to considerable increase in wildlife population. The Department has conducted detailed survey of the different location and area where the agriculture crop of the fringe villagers have been damaged by wild animals during 2008-09.

The state Government has issued notification for scheduled rate for crop compensation and granted Rs.15.50 lakhs ex -gratia/relief to the affected

families through crop assessment committee in different parts of the state.

Determination of Critical Wildlife Habitat:

The Department has identified inviolate areas within the Wildlife Protected Areas and proposed to declare them as Critical Wildlife Habitats. These areas needs to be validated by scientifically backed investigations with strong logistic and financial resources for conducting such studies from the Ministry, GOI. The State Government has constituted State Level Committee as per the directives issued by the ministry vide letter No. D.O. No.1-39/2007-WL-I (Pt) dated 30th August, 2007

Other initiatives

- Introduced participatory management of PAs involving active people participation through Eco-Development Committees (EDCs).
- Declaration of "Sling-Dong Fairreanum Conservation Reserve at Upper and Lower Tinkitam, Omchu, Sanganath and Nardang, South Sikkim vide notification no. 24/CWLW/GoS/FEWMD/308/WLC/08 dated 05.11.2008.
- Construction of Sidkeong Tulku Bird Park at Rabdentse, West Sikkim covering an area of 18.85 Hectares at a total cost of Rs. 6,52,59000.00 (Rupees six crores fifty two lakhs fifty nine thousand) only.
- Construction of Butterfly Park at Rangrang, North Sikkim covering an area of 26.5 Hectares at a total cost of Rs. 1,24,42,000.00 (Rupees one crores twenty four lakhs forty two thousand) only under the scheme Wildlife Management Plan under Teesta Stage -V- NHPC.

NUMBER OF WILDLIFE OFFENCES CONVICTED AND PENDING IN THE COURT

Sl. No.	Year	No. of Cases	Compounded	Settled through court	Pending
1	2003-04	3	2	0	1
2	2004-05	3	0	3	0
3	2005-06	4	2	1	1
4	2006-07	3	0	3	0
5	2007-08	3	1	0	2
6	2008-09	4	0	0	4
Total		20	5	7	8



KHANGCHENDZONGA BIOSPHERE RESERVE AND ITS SIGNIFICANCE

J. B. Subba
Joint Director (KNP/KBR)

Biological Diversity

Flora:

Floristic Wealth is rich and diverse both in composition and in value. Forest represents variegated plant communities due to climatic and edaphic factors.

Forest Types:

Seven major forest types are as under:

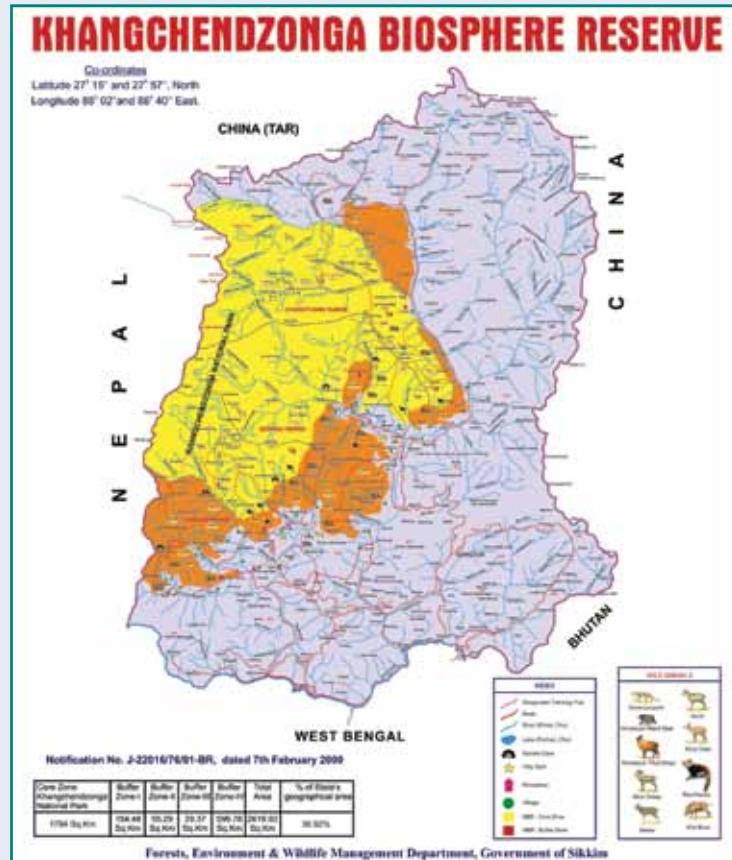
- (1) Sub-Tropical Broad-Leaved Hill Forest (1200-1800m)
Tree Species: *Schima*, *Macaranga*, *Sapium*, *Castanopsis*, *Eugenia*.
Shrubs: *Clerodendrum*, *Baliospermum*, *Emblica*.
- (2) Himalayan Wet Temperate Forests (1800-2400m) Tree Species: *Acer*, *Michelia*, *Juglans*, *Rhododendron*, *Tsuga (Hemlock)*
Shrubs: *Rosa*, *Rubus*, *Berberis*, *Viburnum*.
- (3) Temperate Broad-leaved Forests (2400-2700m) Tree Species: *Quercus* (Oak), *Acer*, *Populus*, *Larix*, *Abies densa*, *Castanopsis*, *Magnolia*, *Engelhardtia*, *Schima*, *Cinnamomum*.
- (4) Mixed Coniferous Forests (2700- 3250m)
Tree Species: *Abies*, *Acer*, *Picea*, *Juniperus*, *Rhododendron* and smaller bamboo varieties- *Arundinaria* spp.
- (5) Sub-Alpine Forests (3250-3700 m)
Tree Species: *Rhododendron* spp. is predominant. *Gaultheria*, *Eunomys*, *Viburnum*, *Juniperus* and *Rubus*.
- (6) Moist Alpine Forests (3700-4000 m)
An alpine meadow where tree growth is completely arrested, bushy vegetation with xerophytic characteristic species is common. Stunted bushy species of Rhododendrons mixed with clumps of *Juniperus*, *Salix*, *Berberis*, *Rosa* and *Lonicera* are common.
- (7) Dry Alpine Forest (Above 4000 m) Vegetation: Scattered stunted thorny Scrubs- *Berberis*, *Juniperus*.

Alpine Zone is sub-divided into:

- (a) Alpine meadows with predominantly grasses.
- (b) Alpine scrub with scattered bushy vegetation.
- (c) Alpine barren with no vegetation cover.

Administration:

Khangchendzonga Biosphere Reserve KBR) is divided into three administrative ranges – one Division and one Circle under Chief Wildlife Warden.



Sl. No	District	Name of Range	Core Zone (sq.km)	Buffer Zone (sq.km)	Total (sq.km)
1	North Sikkim	Chunghang	816.00	188.48	1004.482
2	-do-	Dzongu	612.00	102.66	714.663
3	South-West Sikkim	Yuksom	356.00	544.78	900.78
Total			1784.00	835.92	2619.92

Demography (Socio-economic features):

KBR is surrounded by 30-35 villages. The rural economy mostly depends on Agriculture, Horticulture and Animal Husbandry.

Global Importance:

- (i) KBR has exceptional natural beauty due to its unique geomorphic feature:-

Mountains & Peaks	- 23
Glaciers	- 18
Rivers and streams	- 72
Lakes	- 18
- (ii) KBR harbors population of rare and endangered high altitude flora and fauna some of which are endemic to the Eastern Himalayas.
- (iii) KBR has high concentration of flora (Orchids, Rhododendrons, medicinal plants, Himalayan Flowers) and fauna (Birds, Butterflies and Moths).



UNIQUENESS OF KBR

- ❖ **KBR** is having unique mountain ecosystem due to variations in elevation, climate, landscape, habitat and vegetation types. Plants endemic to eastern Himalayas are found here. It is one of the highest eco-systems in the world.
- ❖ **KBR** includes Trans-Himalayan zone (Cold desert), typically Tibetan Plateau near Indo-Tibet (China) border in North Sikkim which harbors animals like- Snow Leopard, Blue sheep, Tibetan Snowcock, Nayan, Himalayan thar (Shapi), Mountain goat (Serow), Musk Deer, Common leopard, Himalayan black bear, Ghoral, etc.
- ❖ **KBR** has varying eco-clines from Sub-Tropical to near Arctic areas (1220-8586m) with several major North-South and West-South trans-boundary watersheds.
- ❖ **KBR** has areas of high religious significance. Sacred places have been notified by the State Government; i) Caves: - 6, ii) Sacred Rocks: - 7, iii) Sacred Lakes: - 18, iv) Sacred Hot springs: - 9, v) Holy Monasteries:- 5
- ❖ 80% of core zone of the Biosphere Reserve is a vast water reservoir which supports thousands and thousands of life systems down below and towards plain areas.
- ❖ Motorable roads do not touch the boundary and neither pass through the KBR area, so the pristine eco-system is maintained undisturbed so far.

ISSUES, CONCERNS AND THREATS

- i. Increasing Mountaineering/ Trekking operations
- ii. Bio-piracy
- iii. Hunting/Poaching of animals
- iv. Some extent of grazing by Yaks/ Sheep
- v. Medicinal plants collection from the Park
- vi. Garbage
- vii. Insufficient Infrastructure- Quarters, log huts, footpaths, log bridge etc.
- viii. Incense (*Dhup*) collection
- ix. Proposed Power Projects
- x. Construction of roads by Army
- xi. Feral dogs, etc.
- xii. Fuel supply for tourists & trekkers-options
- xiii. Scientific documentation of unique elements & ethno-botany
- xiv. Habitat diversity assessment Eco-tourism promotion, livelihood and capacity building
- xv. Medicinal plant cultivation & marketing promotion of Eco-developmental activities
- xvi. Research support to Management Encouragement of cultural tourism
- xvii. Biodiversity Conservation & Education

CUMULATIVE PHYSICAL AND FINANCIAL ACHIEVEMENTS SINCE DESIGNATION OF KBR IN THE YEAR 2000 TO MARCH 2008.

PHYSICAL /FINANCIAL ACHIEVEMENTS 2000 -2001 TO 2007- 2008			
SI. No.	Item of Work Components	Phy	Fin (in lakhs)
1	Infrastructure Dev. Activities	Interpretation centre and renovation log huts - 6 Nos. & 5km. Trekking trail construction & renovations etc.	40.30
2	Eco-Development Activities	426 ha., 1.5 km. 1722 families, 25 fishery pond & 1000 nos horticulture plants	74.97
3	Forest Protection	10camps, 14 wireless & 25 km, boundary demarcation	13.50
4	Social Welfare Activities	795 families, cane bridge, 21villages for health camps & immunization & 5 km. mule trek	38.00
5	Habitat Management	90 families broom grass & 1465 ha. Afforestation	162.03
6	Forest Research and Education	Awareness – 3 - places, signage & posters - 60 nos, 120 nature trip & Computer and LCD	22.87
7	Staff Welfare Activities	Warm kits	1.00
8	Over Head Exp.		2.00
Total:			354.67

(Rupees: Three crores fifty four lakhs and sixty seven thousand, only)

PARK MANAGER'S FUTURE PLAN

- Habitat improvement through afforestation/ regeneration with indigenous wild fruit bearing, fodder & flowering plant species.
- Application of modern Information & Technology (IT) in wildlife conservation.
- Development of infrastructure & communications for protection & conservation activities.
- Awareness building amongst general public; local communities and government staff.
- Capacity building of staff for acting as naturalists.
- Research and studies on Himalayan natural resources.

ECO-TOURISM ACTIVITIES

- Eco-friendly Accommodation: adequate but unpretentious lodging and dining facilities
- Nature Camps
- Visitor Interpretation Centers
- Garbage disposal facility
- Watch towers for Wildlife Viewing
- Regulated Angling
- Herbal Ecotourism
- Development and improvement of water bodies
- Trekking trails, Wildlife trails
- Protection and conservation of Musk Deer, Snow Leopard, Red Panda, butterflies, birds including all natural resources of the Biosphere Reserve.
- Research, extension, survey and study of floral and faunal populations in the KBR
- Distribution of fuel wood saving items like; LPG, improvised Chula, solar heaters, Bhukhari for heating and cooking in the forest fringe village.



BAMBOO AND ITS POTENTIAL

Dr. Tika Prasad Sharma

Forest, Environment & Wildlife Management Department, Government of Sikkim

Bamboos are conspicuous group of plants with multifarious uses, belonging to the sub-family *Bambusoideae* of family Poaceae. According to Soderstrom & Ellis (1987), there are 1250 species of bamboos under 75 genera all over the world. India is the second largest diversity centre for bamboos with 18 genera and 128 species (Seethalakshmi & Kumar 1998) of which 28 species, 1 var. and 1 form belonging to 9 genera are recorded in Sikkim (Sharma & Borthakur 2007). Bamboo forests cover about 14 million hectares of the earth's surface, 80 per cent of which is present in Asia (Tewari 1992). Tropical Asia can be referred as the centre of bamboo germplasm (Biswas 1988). Bamboo occupies the habitats from sea level to high mountains upto an altitude of 3300-4000m. Bamboos are intermingled with life, culture, and tradition of various human races from the prehistoric period. The various potential of bamboos are discussed below.

ENVIRONMENTAL POTENTIAL

Bamboo absorbs 12 tonnes of atmospheric carbon dioxide per hectare and releases 35% more oxygen than equivalent strands of trees. So it helps cleaning and filtering the polluted air around us. Bamboo leaves, clump-sheaths and old culms that die and fall to the ground, decompose and create a thick humus layer that enriches the soil. Its net like root system creates an effective mechanism for watershed protection, stitching the soil together along fragile riverbank and anchors the topsoil along steep slopes. Bamboo is a pioneering plant and can be grown in soil damaged by overgrazing. Bamboo absorbs water faster than most plants and is used for cleaning sewage and even more important it soaks up heavy metals.

SOCIO-CULTURAL POTENTIAL

Bamboo "the miracle plant" with its many

remarkable properties including strength, lightness and flexibility as well as nutritional and environmental value, has more than 1500 documented application, ranging from providing cradle for the new born baby to a bier for the dead, medicine to poison, religious rituals and from toys to aircrafts. Bamboo is deeply rooted in our culture and civilization. An ancient Indian scripture (Rig Veda, 1500 B.C) often refers to archery. The ancient classics were written on bamboo slates, and when the Chinese invented paper in the 9th century, it was made of bamboo.

ECONOMIC POTENTIAL

A number of marketable products have been developed out of bamboo that is well appreciated by the consumers all over the world. The value added products of bamboo also provides enough opportunity for employment and income generation. Some of the major industrial utilization of bamboo includes paper, bamboo charcoal, bamboo mat roofing, incense sticks etc.

- 1) **Bamboo charcoal:** The high calorific value and the relatively low ash content of bamboo culms, offer the best requirements for producing industrial quality raw material for renewable energy.
- 2) **Paper:** Approximately 2.5 million tonnes of air dried bamboo are being used for paper making in India. The high content of cellulose make the paper made out of bamboo fine in texture, water resistant, ink absorber and fuzzes less. *Dendrocalamus strictus* is the main species used for paper making in India. The other species used for paper is *Bambusa tulda*, *B.balcooa*, *Dendrocalamus hamiltonii* and *Melocanna baccifera*.
- 3) **House construction:** Bamboo is very useful for house construction, especially in earthquake prone areas. It is being employed in different ways as a building material for roof, structure in the form of purlins, flooring, doors, walling etc.
- 4) **Bamboo Mat Board (BMB):** The Bamboo Mat Board is a layered composite comprising several layers of woven mats having internal bond making mats. BMB sheets up to 6mm thick as alternate to plywood panels.
- 5) **Bamboo Mat Corrugated Sheets:** BMCS have been found to be water proof and resistant to decay and it is an alternate to asbestos, cement, GI and aluminum sheets. Sheets are not only eco-friendly, but also possess high strength and resistance to weathering, suitable for construction of shelters in earthquake and other disaster prone regions.
- 6) **Bamboo Furniture:** Bamboo furniture is light, cheap and eco-friendly.
- 7) **Bamboo Flooring:** Laminated bamboo parquet is a unique flooring material with many advantages such as its smoothness, sound insulation and stability.
- 8) **Bamboo Matchsticks:** Matchstick making from bamboo is highly relevant due to the scarcity of timber generally used for this purpose.
- 9) **Bamboo Chopsticks:** As an important part of the culinary culture of the eastern countries, chopsticks possess great market potential .The global market for chopstick is US\$300 million.
- 10) **Incense (Agarbatti) stick:** The agarbatti industry in India is estimated to be worth Rs 2,000 crores. Moreover manufacture of agarbatti sticks create livelihood for a large number of people.





Bamboo House



Bamboo Furniture



Bamboo Sticks



Bamboo Charcoal



Bamboo Dress



Bamboo Drink



Some of the facts related to bamboos are:

- Renewable, fast growing (1.21m in 24 hours), Harvestable in 3-5 years.
- Higher carbon fixation potential (83 ton per hectare).
- Bamboo clump reduces the temperature by 4° to 10° Celsius.
- Bamboo charcoal has more calorific value than wood charcoal.
- Bamboo is 27% stronger than red oak and 13% harder than hard maple.
- Can be grown on degraded and deforested land
- Bamboo with its extensive system of roots and rhizomes can conserve soil and water in catchments areas, minimize silt downstream and control flash floods in the valleys and plains.
- Watershed management can be effectively tackled by planting of bamboo where other trees failed to yield results.
- Bamboo is more effective in controlling landslides.
- Sir Thomas Alva Edison used Bamboo fiber as filament in his first electric bulb.
- A bamboo plant is considered as holy symbol in the house.
- 2.5 million People worldwide use bamboo and one billion people live in bamboo houses.
- The World market for bamboo products is US\$10 billion.
- China earns 144 million US dollars every year from bamboo.
- Bamboo has more than 1500 documented applications.

MEDICINAL POTENTIAL

Tabasheer or *Banslochan*, a siliceous material found in the hollow culms of bamboo is used as a cooling tonic and aphrodisiac and for the treatment of asthma and cough. Leaf juice of *Bambusa* bamboos is good for blood purification and used to treat leucoderma, and for healing of wounds.

FOOD POTENTIAL

The new shoots of *Bambusa tulda*, *Dendrocalamus hamiltonii*, *Phyllostachys edulis*, *Sinarundinaria hookeriana*, *S. maling* are edible and are used in different countries. Bamboo shoots provide nutrition to millions of people worldwide. Taiwan alone consumes 80,000 tones of bamboo shoots annually.

Considering the potential of bamboos, there is an immediate need to carry out their massive plantation in forest and non-forest areas for socio-economic development in an eco-friendly way.

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FASCINATING WORLD OF WILDLIFE

- An Overview

by

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Leopard

Photo courtesy: Dr. Madan K. S. Shanker

[18th March 2009]:

As a veterinarian, I am very attached with the animal world, precisely speaking "DOMESTIC ANIMALS" and am always with them in their world. You may be surprised with the word 'world' repeating again, in fact the answer is – the word 'world' defines itself to be its own empire; and animals have their own empire in contrast to human empire. I get easily engulfed by their suffering and cheer up at their wellbeing, quite magical! Is it not..!

Sometimes, I wonder about the animals which live in forests throughout their lives, struggling every second for survival against predators, food scarcity, natural calamities and the hunter. In spite of this, they make us happy and cheerful; when peacock shows his ballet, barking deer jumps around the flock and the birds chirp musical tunes. There are number of species in the natural habitat of fauna and flora, which are on the verge of extinction. From every second to hour, we all are losing unattended and ignored species of fauna and flora around the world as a whole. So, when will we address this situation in a rational manner? That's why there is still a big question mark on the definition of "ECOLOGY"...! Obviously, it is for us to understand.

Fortunately, with the declaration of reserve and protected forests in most parts of Sikkim including Bird Sanctuary and Biodiversity Park by Government of Sikkim, I am thrilled and encouraged to do something special for the betterment of wildlife. Frankly speaking! For the last one year, I have got a great opportunity to serve the wild 'FRIENDS', offered by some forest officials and senior scientist. Just to feel their hearts and to touch their souls, I underwent a week-long wildlife training at Wildlife Institute of India, Dehradun, Uttarakhand.

Unlike domestic animals, wild animals and birds have different temperament and behavior towards strangers. My first experience with wildlife was handling peafowl at Forest Nursery, Baguwa, South Sikkim, on instruction from Disease Investigation Cell, Department of AHLF & VS, Deorali to collect samples (blood serum, tracheal swab and cloacal swab) to be sent to HSADL (High Security Animal Disease Laboratory), Bhopal, Madhya Pradesh, for scanning for AI (Avian Influenza) virus and for DNA bar-coding at Wildlife Institute of India, Dehradun. Likewise, I got a chance to handle an injured barking deer which was a gunshot case.

Now, specifically talking about the wildlife

reserve, the Bird (Peacock) Sanctuary at Kitam-Mazitar, South Sikkim, which has abundant species of fauna and flora, is yet to be explored and managed technically. As a matter of fact, our state has unique varied topographical and climatic conditions, enabling the wildlife to sustain and proliferate by forming their own eco-biological setup. Within a kilometre or two, stretching vertically or horizontally, we can see distinct climatic conditions here, which is why wild animals adapt themselves by moving from one place to another in search of food and shelter. Therefore, their eco-biological system is very delicate to withstand intervention by human populace. Hence carefully planned strategy should be carried out, if at all, conservation of wildlife is to be achieved. This is possible only when forest science is clubbed with veterinary science for execution of conservation work plan.

Tourism boom in the state has necessitated the present hour to be very vigilant and we have to think twice in the conservation planning strategy for sustaining eco-biological setup consisting of fauna and flora. Every tourist interest spot is in the vicinity of reserve forest and wildlife sanctuaries so they are equally vulnerable to human



intervention, thereby causing imbalance in eco-biological system as a whole. Often, we heard about the wild predators causing great loss of livestock and crops damaged by deer, wild boar and birds. These are burning examples of disturbed eco-biological system. Hence, tourist

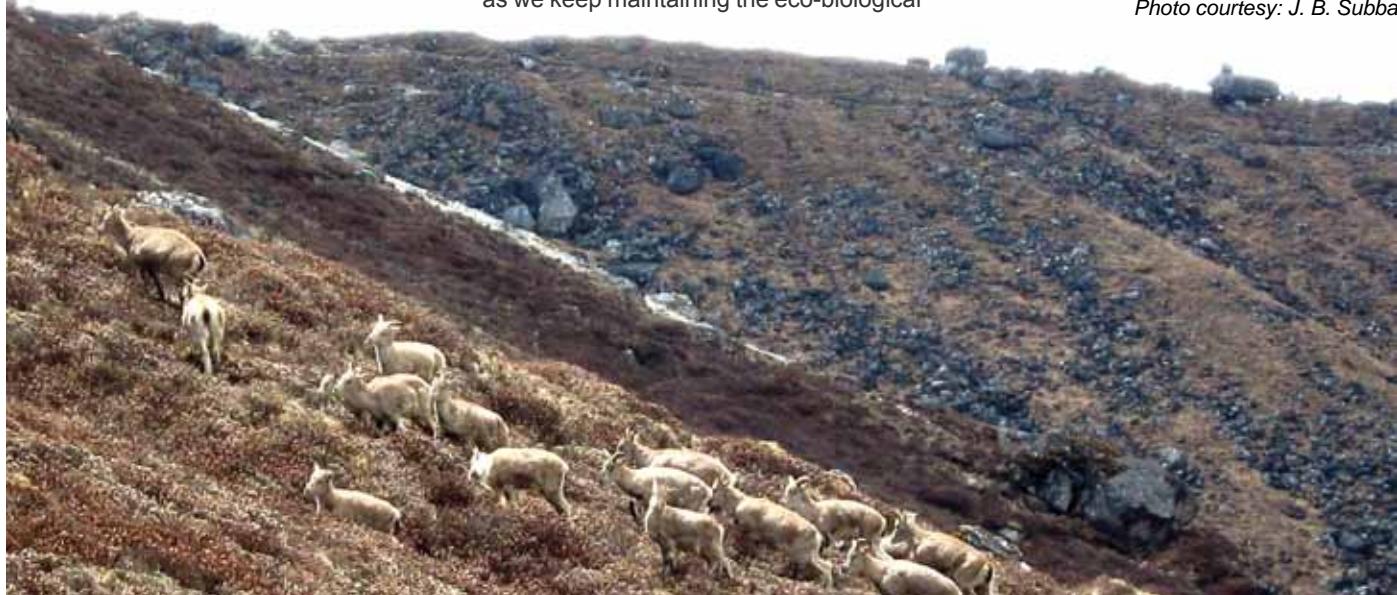
operators and general public have great role in conserving the nature eco-system by guiding their guests and briefing them about the delicate ecosystem region wise prevailing in the state.

In this context, last but not least, as long as we keep maintaining the eco-biological

system in a proper manner, Mother Nature will nurture us, if not, we can well imagine the consequences. So, protect Forest, Environment and Wildlife, even if for our own sake.

Blue Sheep

Photo courtesy: J. B. Subba



SIGHTING OF RED PANDA AT PANGOLAKHA WILDLIFE SANCTUARY

By

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WWF-India, Khangchendzonga Landscape Programme Office, in collaboration with Forest Environment and Wildlife Management Department has been working in Sikkim to estimate the status of Red Pandas in the wild since 2005. In connection to this study we have surveyed several protected areas of Sikkim including Barsey Rhododendron Sanctuary, Kyongnosla Alpine Sanctuary, Fambong Iho Wildlife Sanctuary, and Pangolakha Wildlife Sanctuary where we came across red panda evidences on number of occasions. However, sighting of the "State Animal" kept eluding for quite some time, until we stumbled upon one for the first time on 3rd of January 2009 at Dzongchen area of Pangolakha WLS. Our Field Officer, Mr Basant Kumar Sharma, along with EDC member Mr Pasang Chenga Sherpa was present at the time of sighting. Since then we have sighted red panda on four more occasions – two of them were sighted at Dzongchen, one at Chowkidara and the other one at Pangolakha.



Red Panda sighted at Dzongchen



Red Panda sighted at
Pangolakha



Red Panda sighted at
Chowkidara

Exotic Holidays



ADVENTURE TOUR TO MUGUTHANG, NORTH SIKKIM

Monalisha Dash, Divisional Forest Officer (Territorial), North Sikkim



North Sikkim is the largest and beautiful district of Sikkim. The natural beauty of the place is vast and beyond any explanation. North Sikkim is like a stupendous stairway leading from Western Border of the Tibetan Plateau down to the low lying area of Dikchu. Because of its location, it is decorated with the salubrious forest. Thus North Sikkim is endowed with nature's bounty.

The drive, on 8th September 2008 from Mangan to Muguthang with a team constituting of myself, ACF (T) Mangan, Ms Katherine Lepcha; RO(T) Lachen, Mr. Norden Lepcha; BO (T) Lachen, Mr. Pradeep Subba; FG (T) Thangu, Mr. Sonam Lachenpa DFO (T) ventured as a routine patrolling duty witnessed the mighty untamed River Teesta cascading through mountains and valleys. Series of waterfalls, rivulets join the river to make



its volume many fold. As we moved up towards Thangu, we encountered steepest rise in altitude over the shortest distance. Along the river one can feel diverse climatic zones, starting from Tropical to Temperate to Alpine ones. In and around Mangan, the Tropical Forests of *Alnus*, *Terminellia*, *Michaelia*, etc. lead

us further to Temperate Forest (around Lachen) of *Quercus*, *Castronopsis*, *Abies*, *Tsuga*, etc. Ultimately just below and beyond the Lonak La we came across the Alpine forest of *Juniper*, *Rhododendron*, *Saxifraga*, *Sussuria*, *Rhuem* and many more heavenly flowering plants.

Area beyond Thangu falls under the rain shadow of the mighty Himalayas, thus this plateau region does not permit habitation due to unfavourable physiographic and climatic conditions. Except few settlements of Army, ITBP and other paramilitary organizations, no other human settlement is seen. The complex terrain allows only the trekkers to access the area. The landscape of this area is devoid of big trees, rather rich in medicinal herbs, juniper & rhododendron thickets





and many more beautiful alpine flowering herbs. Early morning on 10th September, the group with basic amenities proceeded for Muguthang. From Thangu there is a jeep-able road of approximately 5 km stretch that culminates at Kala Pather. On the left side of the road the spectacular Chopta Valley is viewed. Here the river gracefully meanders to beautify itself. From Kala Pather there is a steep uphill climb of approximately three hours to reach Lugnak –La (18183 feet).

The view of Lugnak-La and the adjacent mountains is simply magnificent and breath taking.

The steep downhill view of Muguthang

valley from the pass makes speechless. A cautious move can only make an adventurer successful in crossing this. The fear of losing balance and rolling down to unrecoverable gorge gives the thrill. But after successful descend one can feel a sense of confidence in himself. Further as someone proceeds amongst the picturesque serenity, with the vibrancy of the boundless spread of the valley and the lake, one may feel one of the most compelling sites of his lifetime.

Muguthang is a small hamlet on the bank of River Naku Chhu. While venturing the countryside we met one Dokpa named Mr. Nedup Lachenpa. He helped us in getting an insight about the lifestyle of Dokpas at Muguthang. Presently nine families of Dokpas are residing there. They are the nomadic tribes. Mostly the head of the family stays in Muguthang while the children study in Gangtok and other urban areas. Yaks are the fundamental part of their lives. The benefits of products like hard cheese (churpi), meat and butter gives them some earnings. Yak dung is used as fuel for cooking food and fodder and also heating their homes. They also cultivate potatoes and locally called 'Rai Saag' for self consumption during the summer times. They then store the potatoes inside pits dug on the ground to consume during winters. When there is scarcity of grass due to snowfall the nettles that grow there are cut, collected and dried during the summer to feed the yaks by mixing it with flour during the winters.

There is an ITBP force deputed at

Muguthang to safeguard the International boundary. After reaching Muguthang on 10th of September 2008, around 14:00 hrs we took a round around the ITBP camp. The premise was well maintained but we observed that area lying in-between the ITBP habitation and Dokpas huts was meshed up with garbage thrown here and there by ITBP people for years together. This matter was taken up with the Assistant Commandant (AC) of ITBP posted at Muguthang. In response to the Forest Department's observation regarding garbage accumulation at Muguthang, AC promptly took action and next day i.e. on 11th of September 2008, one Eco-clean Drive were taken up.



The non-degradable and degradable were segregated. The degradable were put inside the pit and covered for natural decomposition. The non-degradable were put together and asked to transport it back to urban area for recycling.

On 11th of September 2008, after successful completion of Eco-Clean Drive with the help of ITBP, the patrolling group headed back to Thangu crossing through Lugnak-La again. This venture gave us an insight to the awesome topographical as well as biological diversity that makes North Sikkim a treasurer of natural wealth of flora and fauna.



Exotic Holidays

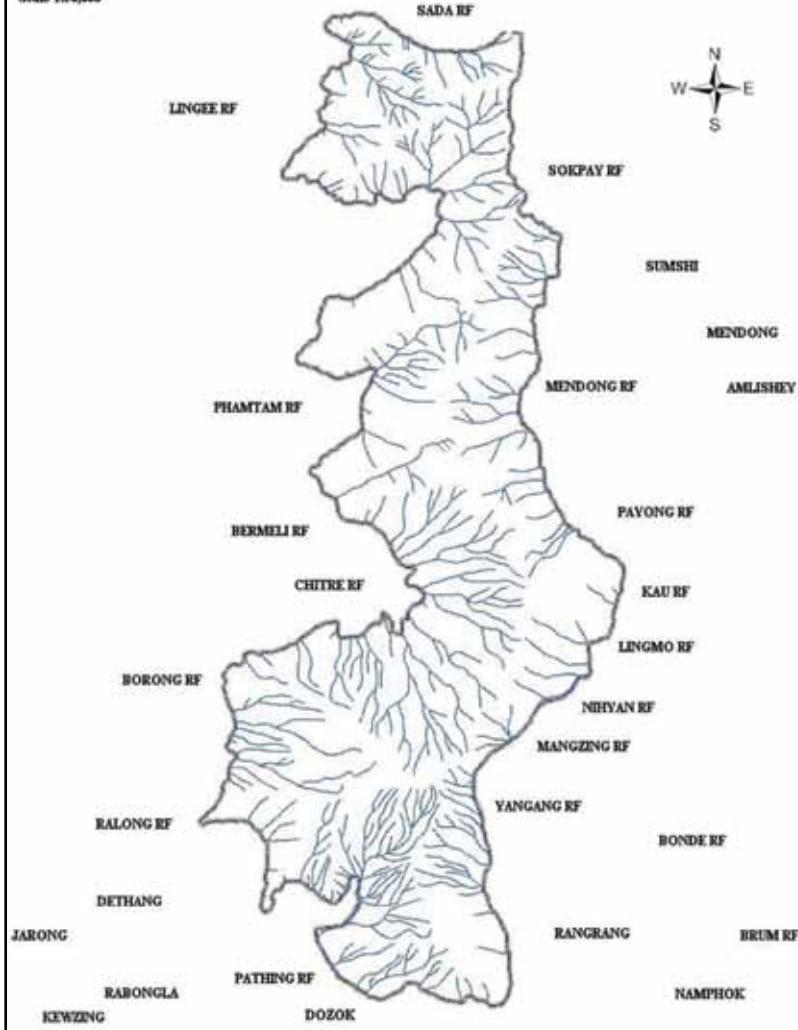
MAENAM WILDLIFE SANCTUARY

- Compiled by ENVIS

Name	Maenam Wildlife Sanctuary
Declaration No	63/WL/F/86
Declaration Date	09/03/1987
Area	35.34 sq. km
Altitude	2300 m – 3263 m
Nearest Town	Ravangla (2 km)
Road Head	Ravangla
Rail Head	New Jalpaiguri (NJP), West Bengal
Air Port	Bagdogra, West Bengal
Range	Ravangla
Division	South Sikkim
Revenue Sub Division	Ravangla
District	South Sikkim
District HQ	Namchi
Co-ordinates	Longitude 88° 21' to 88° to 25' Latitude 27° 21' to 27° to 25'

MAP OF MAENAM WILDLIFE SANCTUARY, SOUTH SIKKIM

Scale 1:50,000



Approach and Access:

The Maenam Wildlife Sanctuary lies in the northern corner of South district. The main entry points being, Ravangla, Lingmoo and Ralang. Tourists generally prefer Ravangla since it is easily approachable by road and private tourist lodges exist. Ravangla is 26 km by road from Namchi, South Sikkim and 65 km from Gangtok via Singtam.

Statement of Significance:

The Maenam Wildlife Sanctuary belongs to the bio-geographical zone 2C (Central Himalayas) as recognized by Rodgers and Panwar, 1988 (Wildlife Institute of India, Dehradun). Major significance of this sanctuary being the number of Schedule I animals it harbors which are given maximum protection in the national level as well as having the main inhabitant in the form of Red Panda and various pheasants.

Some of the animals belonging to schedule I of the Wildlife (Protection) Act, 1972 found in this sanctuary include

1. Red Panda *Ailurus fulgens*
2. Musk Deer *Moschus chrysogaster*
3. Leopard *Panthera pardus*
4. Serow *Nemorhaeus sumatraensis*
5. Chinese Pangolin *Manis pentadactyla*
6. Goral *Naemorhaedus goral*
7. Himalayan Black Bear *Selenarctos thibetanus* (Schedule II, Part II)
8. Leopard Cat *Felis bengalensis*
9. Monal Pheasant *Lophophorus impejanus*
10. Satyr Tragopan *Tragopan satyra*

The Sanctuary has tremendous significance for its watershed value, being the only source of perennial water in this ridge. The South District headquarter, Namchi, situated 26 km due South is totally dependent on the piped water originating from the Barmeli stream within the precincts of this sanctuary. The adjoining town of Ravangla is also dependant for potable water on the sanctuary.



There is a historic Buddhist Monastery – Maenam Gumpa, at the top of the ridge, constructed in 1969. There is also a prominent ridge called *Bhaleydunga* that has a height of 3202m with a drop of almost 5000 feet. The name *Bhaley* translates to cock in Nepali, and may have gotten its name from the incessant breeding calls of male pheasants perched on this vantage point. People living in the adjoining villages, come to worship Lord Shiva on the top of this rock.

On a clear day, the view of the snow-laden peaks of Mt. Khangchendzonga, Mt. Siniolchu, Mt. Pandim and Mt. Narsing from the ridge top is breath-taking. All the major towns of Sikkim including Siliguri are visible on a clear night.

"Maenam-la" translates to the "Treasure-house of Medicines", the sanctuary being a rich trove of medicinal plants.

Birds under Schedule-I

1) Jerdon's Baza	<i>Aviceda Jerdoni</i>
3) Blood Pheasant	<i>Ithaginis cruentus</i>
4) Crested Goshawk	<i>Accipiter trivirgatus</i>
5) Shikra	<i>Accipiter badius</i>
6) Eurasian sparrow hawk	<i>Accipiter nisus</i>
7) Peregrine Falcon	<i>Falco peregrinus</i>
8) Satyr Tragopan	<i>Tragopan satyra</i>
9) Hill Myna	<i>Gracula religiosa</i>
10) Kalij Pheasant	<i>Lophura leucomelana</i>

Maenam Wildlife Sanctuary is definitely a treat for the wildlife lovers. Covered by thick forests, Maenam Sanctuary

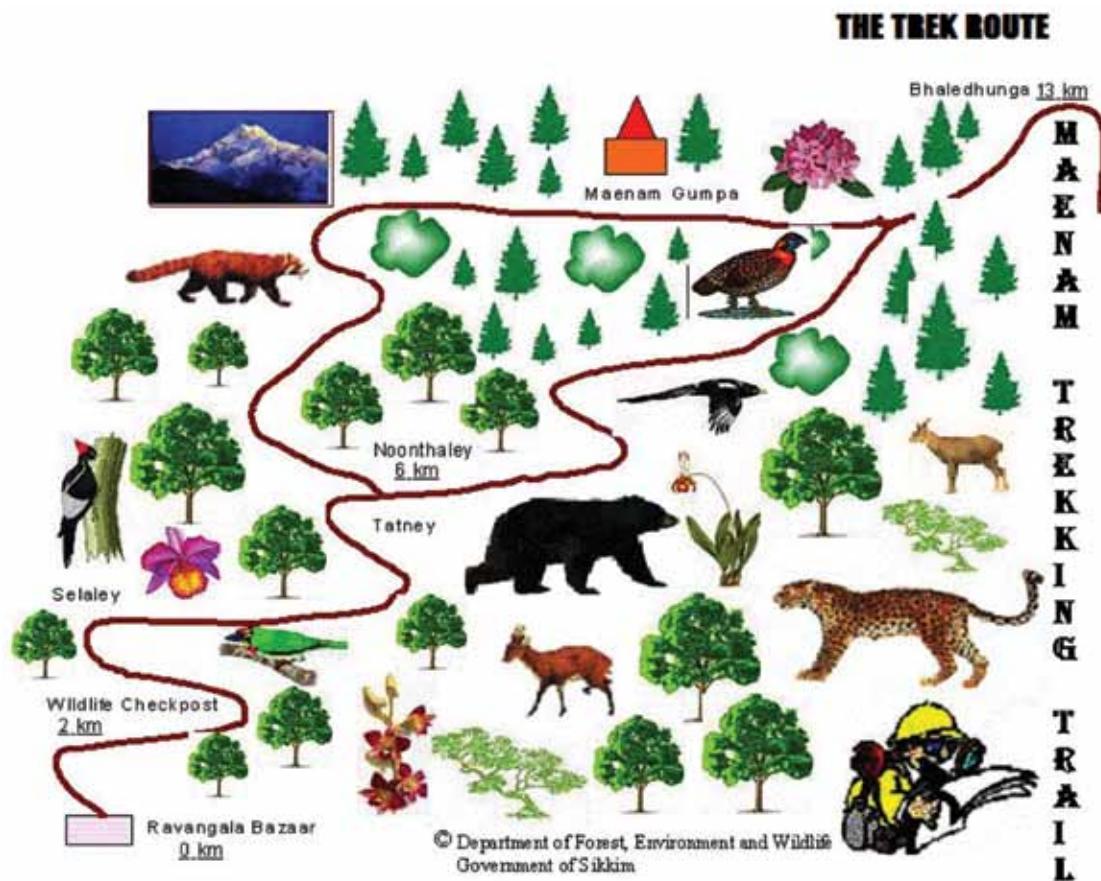
encompasses a vast range of fauna. Apart from its rich fauna, Maenam is famous for being a great trekking destination for trekkers. At a distance of 12 kms, Ravangla is the nearest town to Maenam. The trek route to Maenam starts from Ravangla, transiting through trails of alpine forests in the company of striking vistas of Mt. Kanchenjunga. This trekking expedition takes around 4 hours. On the apex of this sanctuary, one can trace Maenam Monastery. Tourists come to the sanctuary while enjoying the adventure of trekking.

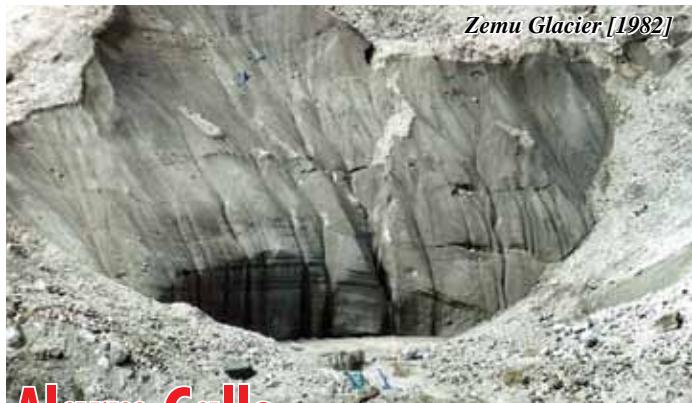
ENTRY PERMIT

[Vide Notification No: 124/KNP/-96/20 Dated 03/05/2001]

Entry permits for visitors can be obtained from the wildlife check post at Ravangla. The rates are as follow::

Indians	Rs 25/head/day
Foreigners	Rs 50/head/day
Students	
Indians	Rs 15/head/day
Foreigners	Rs 25/head/day
Local Guides and	
Porters with the Team	Rs 10/head/day
Pack Animals	Rs 5/head/day
Tents Pitching Charges	Rs 25/tent/day
Still Camera	Rs 10/camera/day
Video Camera	Rs 500/camera/day
Movie Camera	Rs 2000/camera/day





Zemu Glacier [1982]

Alarm Calls

Photo Courtesy: C. Lachungpa, CCF (LU&E)



Fragmentation of Zemu Glacier [2004]

Photo Courtesy: S. T. Lachungpa, RO (W/L), North

Changing Himalayan Environment & its Impact on Development

Compiled by
ENVIS CENTRE SIKKIM
On Status of Environment & Related Issues
Forests, Environment & Wildlife Management
Department, Government of Sikkim,

Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Although climate change has been a salient issue for the scientific community for several decades, it exploded upon the world stage in full force only in 2007.

It is evident that the effects of globalization and climate change are being felt at even the most remote Himalayan Environments. Sikkim, a tiny Himalayan state situated in the north-eastern part of the country is subjected to immense pressure. Sikkim covering just 0.2% of the geographical area of the country has tremendous biodiversity and has been identified as one of the 34 global biodiversity hot-spots. With the advent of ill-effects of changing Himalayan

Environment, diminishing of natural resources and threat of biodiversity loss is imposed.

In context to the impact in our geographical area, Sikkim can be evaluated by the rate of glaciers melting in the state. Sikkim has large number of glaciers; the most important ones are Zemu Glacier, Rathong Glacier and Lonak Glacier in North Sikkim. These glaciers act as natural reservoirs for supply of water to major river systems in the State. Zemu glacier is the largest and the most famous glacier of the eastern Himalayas. It is 26 km in length and is situated in a large U-shaped valley at the base of the Kangchendzonga massif in northwestern Sikkim. The Teesta river rises from the snout of this glacier.

This decade has witnessed Sikkim at its peak state of economic development. The tiny state with varied topography and rich wetlands has been the attraction for several hydro power projects. These projects may prove to be better income resources to the people of Sikkim. However, at the same time, it could be disastrous for the local inhabitants, where during rainy season due to heavy rains, the protective walls of the dams might not be able to stand the pressure of the volume of water and the fury of the rains leading to havoc in the surrounding sites of the dam areas. Also, at this rate of diminishing water resources, in decades to come, Sikkim may no longer hold any of these hydro projects at all.

Impact of Global Warming in Sikkim Himalaya:-

An evidence of increase in the temperature in the Himalayan regions can

be witnessed by the fact that there has been a marked change in the diversion of the glaciers. The meltdown of age-old glaciers in the north district of Sikkim may render environment hazards and warming impact on the hydrological regime of the region.

- An ocular observation of Zemu glacier in 1982, 2004 and 2008 shows that there has been a considerable enlargement of the snout.
- The height and the length of glaciers above Gurudongmar Lake also appear decreasing at an ocular estimation.
- The Tambao lake has been fragmented due to GLOF* formation and development of supra glacial ponds and clear view of terminal Moraine.
- The total area of hidden glacier is also reduced.
- The depth of snow fall and duration of snow fall along Nathula- Jelepla and Chola ranges has been practically reduced with no permanent snow.
- With the changes in snowfall and rainfall, there is a possible threat on availability of water resources.
- Springs, ponds and streams in the villages are drying up.
- A British expedition team comprising Colin Knowles (58), Jerzy Wieczorek (51) and Adrian O' Connor (46) on their 28-day expedition to Goechala-Green lake trek recently, observed that the landscapes of the glaciers like Zemu, Thongsong and Talung had changed irreversibly over past 80 years.



- The expedition team, which had a map of the trek route undertaken by a British army official in 1930, found to their dismay that the Talung glacier had shrunk by about 70 metres since 80 years.
- The trio discovered that they had to descend down to 70 metres from a hill and climb the steep slopes to navigate the stretch around Talung glacier, which they claimed, could be walked across in 1930.
- The British expedition team also found that Talung glacier was no longer connected to Thongsong glacier as was recorded in the photographs and the map which they had with them.
- Thongsong glacier has been separated from Talung glacier and the thicknesses of the snow cover of the two glaciers have receded over the years due to global warming.

Warming in the Himalayan region has been much greater than the global average. Weather patterns are becoming more unpredictable and extreme – dry seasons become dryer and wet seasons wetter. This phenomenon is causing concern over the long-term reduction in total water supply, affecting the lives and livelihoods of the Himalayan people, especially in agriculture practices and long-term food security. The increase in temperature and changes in rainfall pattern would directly affect the hydrological make-up and water flows. Added to the melting of the Himalayan glaciers, increased snow cover melting could also be expected to change water flows in the rivers originating in the Sikkim Himalayan.

Climate change is a slow and a gradual process generally taking place over a long span. Climate change in Sikkim Himalaya can also be witnessed by the changes in season:-

- The sowing seasons are changing.
- Rain-fed cereal yield is reduced.
- Failure of Cardamom due to heat affecting eco-system.
- The availability of green leafy vegetables in winter months is gradually dwindling.
- Due to the increase in the temperature in the mountains, there is an availability of new crops in the mountains too. About 20 years ago, no crops were grown during winter. Radish, turnip were stored in deep pit underground for winter, but there has been marked changes with crops growing in winter months too.

- Vegetation of crops like Maize, Squash is also moving up mountain site at an altitude of 2,400 meters.
- There is less use of woolen clothes these days as compared to earlier days.
- Migration of people during the winter months from the higher region to lower region has reduced.

The impact of climate change in the Himalayan region at present is just preliminary and the worst is yet to come. At this rate of rise in global temperature, by the end of 21st century as predicted by the best scientific consensus, the global mean temperature would be from 1°C to 4°C. This will be accompanied by much greater variability in both temperature and precipitation. This means that variable temperature would result in more frequent heat waves and cold snaps. Variance in precipitation would result in more frequent droughts as well as deluges. Over the Indian subcontinent, the projected increase in temperature in terms of both magnitude and variability is greater for the north than the south, in part because of the buffering influence of the ocean on the peninsula. This explains the intensity of threats that the Sikkim Himalayan would have to encompass.

Sikkim Himalaya has been exposed to the bigger challenge of this alarming issue of global warming owing to its bountiful natural resources. The most possible threats yet to come are:

- Increased water stress.
- Reduced cereal yield.
- Decrease in quality, increase in scarcity.
- Increase in stresses among poor households.
- Developmental activities in agriculture, forestry policies to add pressures on the poor, such as increase in conflict over land and natural resources.
- Changes in rainfall pattern would add to the basket of woes regarding the ongoing crisis in agriculture. Heavy and unexpected rains are more likely.
- Increase in frequency of major flooding due to swollen rivers, alternatively resulting in an increase in the frequency of lean flows due to droughts.
- Change in the water flows in rivers originating in the Himalayan region would adversely affect the ongoing hydel power stations. The state's own economy is under serious threat.
- Spatial changes in the climate would result in enhanced degradation and

fragmentation of the forest resources due to enormous human pressures on them.

- The fate of most of our wildlife species in the face of rapidly changing climate is vulnerable to massive loss. Currently, Sikkim is a part of hot spot zone and is enriched with 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 28 species of bamboos, 550 species of Orchids and 36 species of Rhododendrons. In fauna, the state is also very rich, 144+ species of Mammals, 550 species of birds, over 600 species of butterflies and many times more of moths. Imagine the state of our biodiversity in decades to come; the above figures would then be only history. The diminishing trend and loss of biodiversity would only anguish the mere existence of human life.
- The impact of changing Himalayan environment would make the Sikkim Himalaya vulnerable to short-term shocks and long-term stresses. The topography of Sikkim is such that prolonged heavy downpour may result in alteration of the landscape resulting in mass devastation of infrastructure and human life as well. We have seen that in recent years, Sikkim has been adversely hit by landslides creating unusual chaos in several aspects. These calamities are more likely to happen in greater scale which may lead to serious lifestyle changes in the Himalayas.
- There will be immense pressure on the adaptive capacity of both human and wildlife to withstand the depredations due to climate change. Frequent interference of human activities is more likely which could result in degradation of wildlife protected areas.

Combating the Impacts of Climate Change in the Himalayas

Sikkim state government led by the nation's greenest chief minister, Dr. Pawan Chamling has been very conscious about the impact of global warming on the glaciers in Sikkim. As such, Sikkim's Hon'ble CM has set up a commission under Prof. S. I. Hasnain to study the state of glaciers in 2007. Several officials from the department of Science and Technology and Forests, Environment & Wildlife Management Department have been keeping close tab on the condition of glaciers through satellite mapping and remote sensing.



A high-level glaciologist's team led by Professor Hasnain and accompanied by officials and members of various project teams visited West Sikkim to study the state of Rathong glacier during their nine-day expedition. The team found that glaciers have been melting at an "alarming" rate over the years and may pose environmental hazards in the region. Teesta and Rangeet rivers are prone to dry due to the result of it. The team observed that the landscapes of the glaciers — Zemu, Thongsong and Talung — have changed irreversibly over past 80 years.

To combat the impact of climate change in the Himalayas, experts support transects approach for understanding biodiversity loss in the Himalayas. The remoteness of the Himalayan region and its endemic poverty has isolated it from the rest of the world, but they can't protect it from the global ravages of climate change. The rising temperatures are threatening a tremendous loss of biological diversity in this ecologically sensitive region, a loss that threatens mountain livelihoods and regional security.

Several biodiversity experts, global programme leaders and representatives of Himalayan countries have met to share, network and develop future strategies to understand climate change and to help preserve mountain biodiversity.

At present, the lack of basic environmental data for the Himalayan region is so serious that the region is still a 'white spot' for data. Without this data it is impossible to develop appropriate plans for avoiding or adapting to the worst problems. There is an urgent need for reliable data. There is a need to share and benefit from global programmes on climate change impacts and volunteer to collaborate as needed.

The Himalayas are too big for any group to study the whole area, but experts have proposed a solution: selecting representative 'transects' or north-south 'corridors' in different places from east to west, and encouraging everyone, from big global programmes to individual researchers, to focus their efforts in these sites under a coordinated arrangement that helps make all the information produced available for everyone to use. Many representatives of global programmes have enthusiastically expressed the willingness to support the transect approach for research and gathering data. This indeed would be a significant and tangible first step towards the long-term preservation of the Himalayan genetic heritage. There is a need of crucial link between international

technical support and the national institutions in Himalayan countries.

Typical test sites will make use of existing protected areas, national parks, bird sanctuaries, Ramsar sites, and World Heritage sites, covering critical eco-regions and transboundary areas. The transects stretch across national and international boundaries. Hence regional cooperation is needed to tackle the problems holistically and make the most of country's and organization's individual efforts.

Himalayan experts need to meet to discuss ways of systematically gathering and sharing the information needed, developing a reliable picture of the present situation, and formulating approaches to respond. There is a need of a forum where world-renowned experts and representatives of global programmes could discuss issues with the countries of the Himalayan region to develop a common future strategy for mountain biodiversity conservation.

Conclusion

While climate change is mostly caused by the highly industrialized parts of the world, the effects are taking their toll in the sensitive mountain areas. Scientific evidence shows that the effects of globalization and climate change are being felt in even the most remote Himalayan environments. The signs are visible, but the in-depth knowledge and data from the Himalayan region is largely missing. Global measures of scientific co-operation and regional collaboration are needed to reduce this information gap. What happens in this remote mountain

region is a serious concern for the whole world.

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Greenpeace team in the Himalayas documenting the impacts of climate change on the glaciers.

- Photo courtesy:
<http://weblog.greenpeace.org>



GEARING UP TO PREDICT THE IMPACT OF CLIMATE CHANGE ON THE BIODIVERSITY OF SIKKIM

- Pradeep Kumar IFS,
Conservator of Forests (WP)

Anthropogenic emissions of Green House Gases (GHGs) are the primary drivers of climate change. Climate is probably the most important determinant of vegetation pattern on a broad scale and exerts a significant influence on the structure and ecology of forests and other natural ecosystems. Given the rate of projected environmental change for the 21st century, urgent adaptation and mitigation measures are required to slow down the on-going erosion of biodiversity.

How serious is climate change compared with other factors affecting biodiversity?

Very — but it tends to act over a longer time scale. The ecological disruption wrought by climate change is generally slower than that caused by other factors. Such factors include habitat destruction through changes in land use; pollution, for example by nitrogen deposition; the invasion of ecosystems by non-native plant and animal species (biotic exchange); and the biological consequences of increased levels of carbon dioxide in the atmosphere. In the short to- medium term, human-induced fragmentation of natural habitat and invasive species are particular threats to biodiversity. But looking 50 years into the future and beyond, the effects of climate are likely to become increasingly prominent relative to the other factors.

Even though increasing evidence shows that recent human-induced environmental changes have already triggered species' range shifts, changes in phenology and species' extinctions, accurate projections of species' responses to future environmental changes are more difficult

to ascertain. One of the greatest concerns in ecological science today is the impact of climate change on ecosystems; this presents a particularly difficult challenge for foresters and ecologists. Fourth Assessment Report of IPCC concluded that resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g. flooding, drought, wildfire and insects) and other global change drivers (e.g. land use change, pollution, fragmentation of natural systems and over exploitation of resources). Over the course of this century, net carbon uptake by terrestrial ecosystems is likely to peak before mid-century and then weaken or even reverse, thus amplifying climate change. For increase in global average temperature exceeding 1.5-2.5 degree centigrade and the concomitant CO₂ concentration, there are projected major changes in the ecosystem structure and function, species ecological interactions and shifts in species' geographical ranges with predominantly negative consequences for biodiversity and ecosystem goods and services, e.g. water and food supply. The most predictable impact includes upward migration of several taxa leading to changes in species composition and competition at higher altitudes. Many alpine species in the process of edging uphill in Sikkim, may run over rarer species near mountain summits. Some species would not be able to migrate due to topographic and manmade barriers. The changed phenology would affect the process of pollination. It has been established that increase in atmospheric temperature by 1°C would cause 100-150 km shift in latitude and as much as 500

km shift in isotherm. Since Himalayan Mountains exhibit a great compression of climatic zones owing to sharp altitudinal gradients, one would expect a shift of 250-300 m in the distribution of species with increase in temperature by 1°C. Increased temperature will have a direct bearing on snowfall, snowmelt and rainfall regimes affecting soil moisture and habitat conditions which would affect species regeneration and establishment.

Modeling Species Distribution in Sikkim

Sikkim Himalayas are one of the unique storehouses of biodiversity including many indigenous, vulnerable and endangered species. Therefore, it becomes all the more important to assess the impact of climate change on biodiversity of Sikkim Himalayas. But before we do that let me give a brief as to how it can be done. Only way to know something about future is modeling. It is the most relevant approach to predicting range shifts under global change, but existing models have only coarse spatio-temporal resolution insufficient for the challenges of adaptive management of climate change impacts in Sikkim. Therefore, site specific and high resolution models will be needed for Sikkim. There are basically two methods by which modeling can be done. One is 'mechanistically' and the other is 'correlatively'. Mechanistic models aim to incorporate physiologically limiting mechanisms in a species' tolerance to environmental conditions. Such mechanistic models require detailed understanding of the physiological response of species to environmental factors. Mechanistic models work on the



basis of assessing parameters needed for plants physiological processes i.e. we would have to find out as to how much (or what range of) temperature, humidity or precipitation etc. is required for the optimal growth of the plants. Then if we can model future climatic conditions, we can model plants' response too. But it is not as easy as it looks, more so in Sikkim, where we have a poor understanding, in quantitative terms, of growth parameters of the plants found in Sikkim. For example one of the mechanistic equilibrium ecosystem model called biome-BGC simulates the storage and fluxes of water, Carbon and Nitrogen within the vegetation, litter and soil components of the terrestrial ecosystems. This model uses daily time step, driven by daily values for maximum and minimum temperatures, precipitation, solar radiation, air humidity and requires definitions of vegetation, climate and site characteristics. We do not have a comprehensive database of the growth parameters of even the main species found in Sikkim. So the mechanistic modeling is more or less ruled out for the time being.

Empirical methods commonly utilize associations between environmental variables and known species' occurrence records to identify environmental conditions within which populations can be maintained. Correlative models aim to estimate the environmental conditions that are suitable for a species by associating known species' occurrence records with suites of environmental variables that can reasonably be expected to affect the species' physiology and probability of persistence. This is basically a bio-climate envelope modeling. The central premise of this approach is that the observed distribution of a species provides useful information as to the environmental requirements of that species. For example, we may assume that the plant species 'bojo' favors wet soils because it has been observed growing in these soils. There are limitations of this approach but this method can yield valuable biogeographical information.

We are used to thinking about the occurrence of species in geographical space; that is, the species' distribution as plotted on a map. To understand species' distribution models it is important to also think about species occurring in environmental space, which is a conceptual space defined by

the environmental variables to which the species responds. The concept of environmental space has its foundations in ecological niche theory. The term 'niche' has a long and varied history of use in ecology. Fundamental niche of a species can be thought of as the set of environmental conditions within which a species can survive and persist. It may be thought of as an 'n-dimensional hyper volume', every point in which corresponds to a state of the environment that would permit the species to exist indefinitely. If the environmental conditions encapsulated within the fundamental niche are plotted in geographical space then we have the potential distribution. The species occurrence records and environmental variables can be entered into an algorithm that aims to identify environmental conditions that are associated with species occurrence. Depending on the method used, various decisions and tests will need to be made at this stage to ensure the algorithm gives optimal results. Having run the modeling algorithm, a map can be drawn showing the predicted species' distribution. The ability of the model to predict the known species' distribution should be tested at this stage. A set of species occurrence records that have not previously been used in the modeling should be used as independent test data. The ability of the model to predict the independent data can be assessed using a suitable test statistic.

Since spatially explicit occurrence records are available for a large number of species, the correlative seems more viable option for studying species' distribution models in Sikkim. With the recent initiatives of the Department of Forests on getting spatially referenced species data through sample plots in forests of Sikkim, this information has become readily available in easily

usable format. Having decided species' distribution model, it can be used to predict the likely redistribution of species under projected climate change over the coming years. In brief, the general approach would consist of calibrating the models based on current distributions of species in Sikkim and then predicting future distributions of those species across Sikkim for which the environmental input variables have been perturbed to reflect expected changes.

Due to complexity of Sikkim in terms of its topography and vegetation, an integrated modeling would be required which addresses more localized impacts and also addresses fine-scale processes including species' dispersal and local connectivity. At increasingly smaller scales, parameters like soil factors or land use become increasingly important. We, fortunately, have a good digital data base in Sikkim in this respect. However, one of the biggest drawbacks we face today in Sikkim is that of a regional high resolution climate model. Does that mean that we sit back and let the problems take over? Definitely not. We must try to develop the models on the basis of whatever meteorological data we have. We can create interpolated climate surfaces even by taking a cue from the meteorological data of nearby stations or develop climate models based on atmospheric processes. Not having sufficient points for modeling should not be an excuse for inaction.



Phenology

A Tool to Monitor Climate Change

A Need in Sikkim Himalaya

- Hemant K. Badola

The existing biodiversity and high use pressure on them often appear as a global debate. In present context, especially for the mountains, sustainability of resource availability not only depends upon the use pressure but also on the unprecedented climate changes, especially global warming. The mountains, for their greater verticality, provide short distance changes in temperature, moisture regime and sun-light exposure, directly influencing the type and dynamics of biodiversity and habitats. The resilience in biota and ecosystems to sustain adversities, within a wide range of eco-physiological regime, caused due to climatic change has a limiting point. Any flux in temperature beyond optimum requirement can disrupt the existing delicate web of ecosystem, resulting to aberration in adaptive dynamics of the species. However, the significant changes in global climate have now exerted a definite pressure on the same; the resilience has started showing breaking the thin line between existence and extinction, as natural ecosystems do not always offer immediate recoveries. The forests, as the carbon sink, have shown fragmentation worldwide; the abrupt variability in rainfall, loss of biodiversity and soil water storage, shifting in biological calendar of the plants and shrinking glaciers are some of visible indicators of climate change and desertification. In Himalayan viewpoint, the losses resulting from global warming could be multifold; and Sikkim being one of the smallest states in India (7096 Km² area), representing very rich biodiversity components within a short vertical distance is expected to be highly vulnerable, especially for its uniqueness, rich species diversity per unit area basis and high endemism, as per existing researches.

The impacts of global warming on physical and biological systems can earlier be examined identifying appropriate

indicators and using suitable scientific tools. The high sounded and quite visibly adopted indicators have been the glaciers for their unprecedented vulnerability towards global warming in recent years. However, biological diversity at terrestrial level depicts several apparent and pragmatic drifts and alteration owing to global warming. Amongst them, the earlier commencement of spring events in species and prolonged growing period in vegetation, resulting to alternation in plant life cycle and changing pattern in productivity. These alternations in seasonal cycle of species cause their rising vulnerability towards diseases and pest, etc; several high altitude medicinal herbs are found sensitive to high temperature. Often unnoticed events, such as altering adaptability and shifting biological rhythms in wild animals and plants, etc. are some of the examples of quiet processes. A wide range of organisms may be used detecting phenological changes as a response to global warming. Amongst top indicators of climate change, butterflies are highly popular groups, basically for their greater sensitivity towards minor temperature fluxes, and then for being the subject of long term monitoring programme in many countries. Such an altered adaptability in species caused due to global warming exerts adverse pressures on their existence particularly in case of endemic, rare and endangered biota and sensitive habitats. As a consequence the change in geographical distribution of species may be used in forecasting global warming, especially those growing in high altitudes of Himalaya. Recently, in 2009, ICIMOD, Nepal reviewed extensive reporting on the upward shifts in tree line and resultant invasion of woody taxa on alpine meadows, including the alarming rise of tree line at a rate of 5 to 10 m per decade in eastern Himalaya. In such cases, the perfect visible effect can be noticed by observing phenology of plants.

Understanding and recording of the timing of seasonal biological events, referred as phenology, include bud flushing and flowering dates and also faunal migration, can chronologically predict the on-going changes using their date wise records, is one of the ideal indicators of climate change, which has been gaining tremendous impetus in recent years, worldwide. The plant phenology, especially in buds, is a cheaper and convenient but a very potential tool to handle, fundamentally determined by species genetics and environmental factors, and to monitor climate change. Climatic changes corresponding with rising pattern in temperature, either at location specific or extensively across political boundaries can be observed by using a single taxa or a group of taxa. Any smallest amount of change in global warming may possibly be detected by recording periodical phenological events. By setting up of phenological gardens, scientists in many countries have been monitoring global warming for several decades. Huge amount of phenological network data are in place to simulate past and future trends in climate change. For example, a paper published in an international journal, Global Change Biology by Menzel and colleague in 2006, made enormous interpretation of phenological data sets from 21 European countries (1971 to 2000), revealed an average advancement of 2.5 day/decade of spring/summer in Europe between 1969 and 1976. This finding was significantly discernible in the Intergovernmental Panel on Climate Change, 4th Assessment Report (IPCC AR4). Under UK Phenology Network, the largest ever studies into the timing of the commencement of the seasons now involves over 50,000 people in England, appeared as significant effort monitoring climate change.

The Himalayan plant species, including



those from Sikkim can be effectively used to monitor climate change and global warming, as potential tool. Amongst many, the *Rhododendron arboreum* (Gurans), widely distributed in Indian Himalayan belt and neighbouring countries, for its extended altitudinal distribution (sub-tropical to alpine) and very sensitive meristematic cells inside buds towards slight change in weather conditions, especially towards spring flushing and flowering, offers it as ideal taxa for monitoring climate change on long term basis by establishing phenological stations at various altitudes along the same transect, as per author's long years' research experience in Himalaya. Similarly, *R. grande*, very sensitive alpine herb of Sikkim, *Rheum*

nobile (for its temperature governed shifting distribution along altitudes), and other identified herbs, in Sikkim, can be used for phenological monitoring of global warming for their high sensitivity towards environmental factors.

In Himalaya, including Sikkim, the phenology, especially the buds as indicators of climate change have never been taken as a priority, as adopted in Europe in recent years; in spite of having immense potential of using bud phenology, this science is yet to receive adequate attention by the scientists, area managers and policy makers. In conclusion, the spring phenological signals, especially in buds need to be taken sensibly to monitor global warming as highly appropriate

indictor of climate change. In Sikkim, the need is to establish a network of plant phenological gardens or stations along different altitude zones taking suitable taxa for monitoring, such as, sensitive medicinal herbs and identified woody taxa. At the same time identification of a group of scientists and area managers for their coordinated efforts, would be vital for successful monitoring of climate change and global warming using phenology as a tool.

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Half blossomed bud of *Rhododendron arboreum* (Photo: H.K. Badola)



Government of Sikkim

Forest, Environment and Wildlife Management Department

LIST OF OFFICERS

IFS Officers		SFS Officers	
Sl. No.	Name	Sl. No.	Name
1.	Shri S.T.Lachungpa	1.	Shri S.Z.Lucksom
2.	Shri N.T.Bhutia	2.	Shri T.D.Rai
3.	Shri M.L.Arrawatia	3.	Shri C.S.Pradhan
4.	Shri Manjit Singh	4.	Shri B.K.Tewari
5.	Shri Anil Mainra	5.	Shri Gut Lepcha
6.	Shri Thomas Chandy	6.	Shri B.P.Pradhan
7.	Shri Arvind Kumar	7.	Shri B.S.Siktel
8.	Shri A.K.Ganeriwala	8.	Shri Y.P.Gurung
9.	Shri S.B.S Bhaduria	9.	Shri D.C.Nepal
10.	Shri M.L.Srivastava	10.	Shri N.W.Tamang
11.	Mrs. Bharati	11.	Shri J.B.Subba
12.	Shri A.K.Mohanty	12.	Shri T.R.Bhutia
13.	Shri C.S.Rao	13.	Shri T.Gyatso
14.	Shri H.P.Pradhan	14.	Shri B.S.Sharma
15.	Shri C.Lachungpa	15.	Shri S Wangyal
16.	Shri Pradeep Kumar	16.	Shri D.S.Chhetri
17.	Shri H.B.Sharma	17.	Shri Karma Legsey
18.	Shri Brijendra Swaroop	18.	Shri Uday Gurung
19.	Shri Sandeep Tambe	19.	Mrs. Sonam Choden
20.	Shri P.Senthil Kumar	20.	Shri B.B.Gurung
21.	Shri S.Anbalagan	21.	Shri S.K.Thatal
22.	Miss Monalisha Dash	22.	Shri V.K.Rai
23.	Shri D.Manjunatha	23.	Shri P.K.Yonzon
24.	Shri Karma Zimpa Bhutia	24.	Shri N.Sherpa
25.	Shri Abhay Bhaskar	25.	Shri C.B.Bhujel
Total IFS Officers = 25		(Male 23, Female 02)	14
In Forest Department		10	
On Central & State Deputation		01	
Probationer		01	



37. Shri Phurba Tamang
 38. Shri Nombi Bhutia
 39. Shri Lakpa Sherpa
 40. Shri M.K.Koirala
 41. Shri S.B.Prangden
 42. Shri Dazom Lachungpa
 43. Mrs. Rajani Bhandari
 44. Shri Tshering P. Bhutia
 45. Miss Urmila Thapa
 46. Shri Sangey G. Bhutia
 47. Miss Kathrine S. Lepcha
 48. Shri Blen Tsh. Targain
 49. Shri Sugen M. Saring
 50. Mrs. Kusum Gurung
 51. Shri Nischal Gautam
 52. Miss Dichen Lachungpa
 53. Shri Kharga Bdr. Gautam
 54. Shri Tashi Tsh. Bhutia
 55. Shri Sonam Pintso Bhutia
 56. Shri Kharga Bdr. Gurung
 57. Shri Sudhir Gurung
 58. Shri Prem Kumar Rai
 59. Shri Ganesh Kumar Rai
 60. Shri Sanula Bhutia
 61. Shri Lobzang Bhutia
 62. Shri Ongyal Tshering Bhutia
 63. Shri Ashok Kumar Pradhan
 64. Shri Devendra Chhetri
 65. Shri Krishna Kr. Basnet
 66. Shri Arjun Kr. Rai
 67. Shri Phurba Bhutia
 68. Shri Kiran Kumar Gurung
 69. Shri Dilliram Nirola
 70. Shri Bishnu Kumar Panth
 71. Shri Ben Singh Rai
 72. Shri Kharka Dhoj Subba
 73. Shri Prem Kumar Chhetri
 74. Shri Bir Bahadur Subba
 75. Shri Pralhad Pradhan
 76. Shri Narapati Gautam
 77. Shri Mahakal Gurung
 78. Shri Govind Pradhan
 79. Shri Nehru Prasad Dahal
 80. Shri Namgyal Tshering Bhutia
 81. Shri Ram Prasad Sharma
 82. Shri Sangey Kazi
 83. Shri Dhan Kumar Subba
 84. Shri Anguir Bhutia
 85. Shri Dhruba Lohagan
 86. Shri Dorjee Tamang
 87. Shri Man Bahadur Subba
 88. Shri Karsang Lama
 89. Shri Madan Kumar Rai
 90. Shri Kharga Bahadur Subedi
 91. Shri Abidal Chhetri
 92. Shri Arun Thapa
 93. Shri Mani Ram Subba

- DFO, FCA
 DFO, KNP, Gangtok
 ACF, BAC, Yuksom
 ACF, (T) Ravangla, South
 ACF, Utilization
 ACF, IWDP, North
 ACF, Pakyong (T)
 ACF, (T), Namchi
 ACF, Wildlife, North
 ACF, (T) Rongli
 ACF, (T) Mangan
 ACF, KNP, West
 ACF, Wildlife, West
 ACF, LU&E East
 ACF, (T) Soreng
 ACF, (T) East
 ACF, RVP, Samdong
 ACF, BAC, Kabi-Tingda
 ACF, SF/BAC Dzongu
 ACF, LU&E, West
 ACF, Barsey WLS
 ACF, BAC, Regu
 ACF, NTFP
 ACF, KNP, North
 ACF, WP, North
 ACF, LU&E & (T) Chungthang
 ACF, Kyongnosla WLS
 ACF, BAC, Rhenock
 ACF, BAC, Yangang
 ACF, BAC, Rinchenpong
 ACF, BAC, Pakyong
 ACF, BAC, Wok
 ACF, RVP, Bermiok.
 ACF, Ravangla WL
 ACF, BAC, Soreng
 ACF, SF, West
 ACF, SF, South
 ACF, BAC, Melli-Sumbuk
 ACF, Pangolakha WLS
 ACF, LU&E, South
 ACF, BAC, Dentam
 ACF, Wildlife, Namchi
 ACF, HZP
 ACF, BAC, Temi-Tarku
 ACF, LU&E, North
 ACF, BAC, Duga
 ACF, BAC, Ranka
 ACF, Silviculture
 ACF, BAC, Mangan
 ACF, FCA, South
 ACF, BAC, Daramdin
 ACF, BAC, Pakyong
 ACF, Parks & Gardens
 ACF, SF, East
 ACF, BAC, Gyalshing
 ACF, Working Plan, WL
 ACF, Fambonglho WLS

Directors	:	2
Addl. Directors	:	3
Joint Directors	:	6
DFOs	:	27
ACFs	:	55
Total	:	93

(Male 87, Female 6)

Officers of Other Services		
1. Shri D.R. Sharma	Director, Sericulture	
2. Mr. B.P. Gautam	Joint Secretary, Under Suspension	
3. Shri H.P. Sharma	Addl. Director, Accounts	
4. Shri H.P. Rai	Joint Director, Sericulture	
5. Mrs. Madhu Pradhan	Joint Director, Statistics	
6. Mrs. Usha Lachungpa	Sr. Research Officer, WL	
7. Dr. Gopal Pradhan	Chief Scientist, SPCB.	
8. Shri T.Shenga	Chief Accounts Officer	
9. Shri G.N. Pradhan	Deputy Director, Statistics	
10. Dr. M.K. Shivashankar	Deputy Director, WL & Zoo	
11. Mrs. Laden Bhutia	Senior Private Secretary	
12. Mrs. Kamala Gurung	Under Secretary	
13. Ms. Sharmista Rai	Under Secretary	
14. Mrs. Lakpa Doma	OSD, SMPB	
15. Shri K.D. Subedi	Accounts Officer	
16. Mrs. Lakpa Doma Bhutia	Accounts Officer	
17. Mrs. Manu H. Subba	Asst. Director, Statistics	
18. Mr. Nirmal Kr. Rai	Asst. Director, Statistics	
19. Mr. Pem Gyatso Bhutia	Asst. Director, Statistics	
20. Shri B.K. Chhetri	Asst. Scientific Officer, SPCB	
21. Shri I.B.. Acharya	Asst. Director, Sericulture	
22. Mrs. Purnima Karki	Private Secretary	
23. Mr. Ranjan Rai	Asst Env. Engineer	
24. Mr. Kamal Gurung	Asst. Engineer	
25. Mr. Rajiv Rai	Scientist 'B'	
26. Miss Geeta Lama	Private Secretary	
27. Mr. Chandra Prakash Rai	Private Secretary	
28. Mrs. Sarita Subba	Private Secretary	

Total Officers from other Services = 28
(Male 16, Female 12)

	Male	Female	Total
IFS (in Forest dept.)	13	1	14
SFS	87	6	93
Other Cadres	16	12	28
Total	116	19	135





ENVIRONMENTAL INFORMATION SYSTEM

Introduction

Established in 2002 and fully operational by 2006, Environmental Information System (ENVIS) is a plan programme under the Ministry of Environment & Forests, Government of India.

ENVIS is a distributed environmental information network with the mandate of collection, collation, storage, retrieval and dissemination to varying users, which include decision-makers, researchers, academicians, policy planners, research scientists, etc. The Focal Point of ENVIS is located in the Ministry that coordinates the activities of all the ENVIS network partners to make ENVIS a web-enabled comprehensive information system.

Objectives of ENVIS

Long Term Objectives:

- To build up a repository and dissemination centre in Environmental Science and Engineering
- To gear up the modern technologies of information acquisition, processing, storage, retrieval and dissemination of environmental nature;
- To support and promote research, development and innovation in environmental information technology.

Short Term objectives:

- To provide national environmental information service relevant to present needs and capable of development to meet the future needs of the users originators processors and disseminators of information.
- To build up storage, retrieval and dissemination capabilities, with the ultimate objective of disseminating information speedily to the users.
- To promote national and international cooperation and liaison for exchange of environment related information.
- To promote, support and assist education and personnel training programmes designed to enhance environmental information processing and utilizing capabilities.
- To promote and exchange of information amongst developing countries.

Subject Area

"On Status of Environment & Related Issues"

Administration

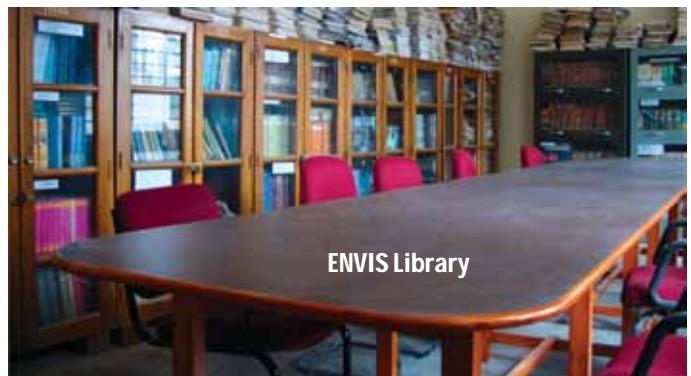
This Centre is under the overall administrative control of the PCCF-cum-Secretary with the support of Addl. PCCF and Chief Conservator of Forests of Land Use and Environment Circle. The day to day affairs of the ENVIS centre are being managed by one Sr. Programme Officer, one Programme Officer and one Programme Assistant.

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- >> Monthly e-Newsletters
- >> State of Environment Report
- >> Library Facility
- >> Online/ In-person Query Services
- >> Environment Awareness Programmes
- >> Other Publications/Reports

ENVIS Team:

- | | |
|-------------------------|--------------------------|
| 1. Mr. C. Lachungpa, | Programme Coordinator |
| 2. Mr. Rajen Pradhan, | Senior Programme Officer |
| 3. Ms. Sandhya Pradhan, | Programme Officer |
| 4. Mr. Laxuman Darnal, | Programme Assistant |



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LIST OF ENVIS PUBLICATIONS

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Vol 1, No 2

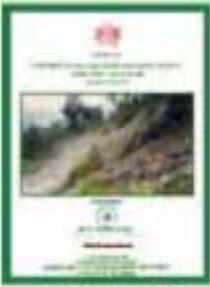


Vol 2 No 1

Reports



SaE Report



*Treatment of
Landslide and Erosion
Control in South
Sikkim*



*Treatment of
 Landslide and Erosion
 Control in West
 Sikkim*



National Green Corps Programme in North Sikkim



**Compilation of
Gazette Notifications
on forest, env. &
wildlife**



National Environment Awareness Campaign on Solid Waste Management

Snapshot of ENVIS Website Homepage: www.sikenvis.nic.in



ENVIS Pamphlet



State Green Mission
Pamphlet



Climate Change
Permittee



Solid Waste
Management Booklet



Cobra cited at Tumlabung RF
Picture by: Karma Zimpa Bhutia (IFS), DFO (WP)

Please send your suggestions/ feedback or your queries to:

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