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PANDA

A BI-LINGUAL ENVIS NEWSLETTER ON FORESTS, ENVIRONMENT & WILDLIFE

PANDA Volume IV Issue No.1 [2011-12] Registration No. 61685/93

An ENVIS-Sikkim Publication On Status of Environment & its related issues

Environmental Information System INDIA

Celebrating the Year of Innovation 2011

100% Environment Conscious Citizen in Sikkim State by 2015

Chief Minister's Green School Rolling Trophy Launched with cash prizes upto ₹ 5 lakhs

High Altitude Himalayan Lakes | Potential Ramsar Sites in Sikkim

New Strains of Edible Mushrooms in the Prairie Himalayas of Sikkim

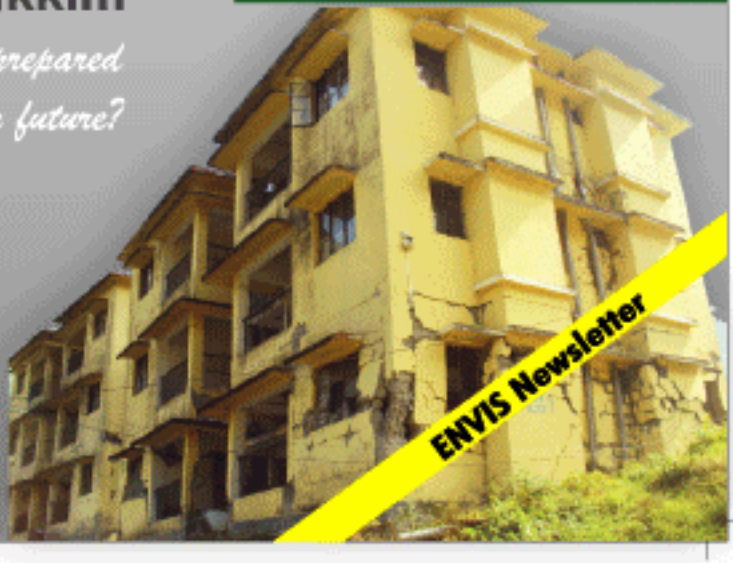
Study on Impact of Grazing Exclusion Policy

Look in for more .....

September 18, 2011

6.8M Earthquake jolted Sikkim

Lessons learnt and how prepared are we for future?



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यहाँ है खुशहाली ।।

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

PANDA
Newsletter

Volume IV Issue No. 1 [2011-12]
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PANDA is a bi-lingual newsletter published by ENVIS Centre, Forests, Environment & Wildlife Management Department, 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 ENVIS Centre.

ENVIS CENTRE SIKKIM
On Status of Environment & its Related Issues
Forest Secretariat Annex II,
Room No 1101, Ground Floor
Forest, Environment & Wildlife Management Department,
Government of Sikkim,
Deorali -737102, Gangtok

Email us at: sik@envis.nic.in
Visit us at : www.sikenvis.nic.in

Tel (O) : 03592-280381
Fax: 03592-281778

ENVIS TEAM

Coordinator
Mr. Y. P. Gurung, IFS
Conservator of Forests (LU&E)

Sr. Programme Officer
Mr. Rajen Pradhan

Programme Officer
Ms. Sandhya Pradhan

Programme Assistant
Mr. Laxuman Darnal

Data Entry Operator
Ms. Renu Gurung

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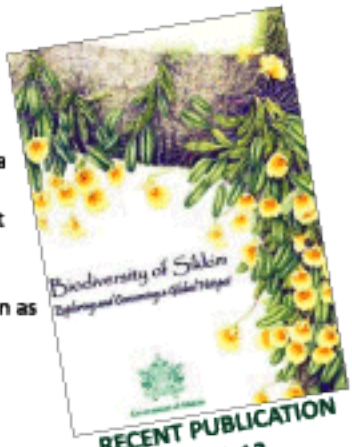

RECENT PUBLICATION
2011-12

Published by:
Information & Public Relations Department
Government of Sikkim

Biodiversity of Sikkim
"Exploring and Conserving a Global Hotspot"
- **M. L. Arrawatia, IFS**
- **Sandeep Tambe, IFS**

Electronic version available.
Check our website
http://www.sikenvis.nic.in/Biodiversity-of-Sikkim.htm

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MoEF, GoI

Inside

PANDA Volume IV Issue No.1 [2011-12] Registration No. 61685/93

COVER PAGE

8

Green Schools State Award

The most prestigious Chief Minister's Green School Rolling Trophy cum State Green Schools Award notified and launched | June 5, 2011

12

High altitude Himalayan lakes

Sikkim has total 534 lakes with 3325 ha area *Excerpts from the National Wetland Inventory and Assessment by ISRO, Ahmedabad* | January, 2011

18

6.8M Earthquake jolted Sikkim

Lessons learnt and how prepared are we for future *by Santosh Sharma, GB Pant institute of Himalayan Environment and Development, Sikkim* | September 18, 2011

22

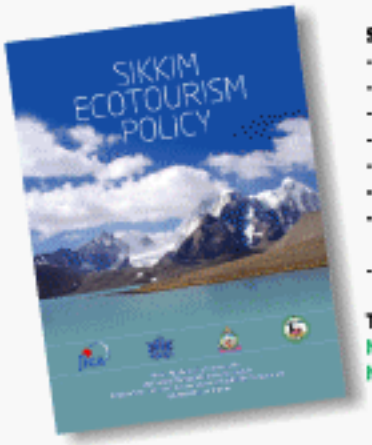
Study on Impact of Grazing Exclusion Policy

Case Studies from West Sikkim by CDF, Chennai

24

Overview on New Strains of Edible Mushroom in the Prairie Himalayas of Sikkim

- *Dr D. K Pradhan*



Sikkim Ecotourism Policy

- Preamble
- Policy Vision
- Policy Objectives
- Key Principles of Sikkim Ecotourism
- Definition related to Sikkim Ecotourism
- Sikkim Ecotourism Council
- Strategies of Sikkim Ecotourism Development
- Guidelines for Sikkim Ecotourism

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WHAT'S MORE.....

LEST WE FORGET

Career Profile Series on Fore Foresters

CHEZUNG LACHUNGPA

(October 1958 April 2011)

Forester par excellence

By H. P. Pradhan IFS (Retd)

Born in Bichu, Lachung North Sikkim, a small and beautiful hamlet situated in the pristine Lachung valley amidst snow-clad mountains, lush green sub-alpine forests, above the meandering crystal clear Lachung Chu, Late Shri Chezung Lachungpa was born in a typical Lachungpa family on 15th October, 1958, the son of Late Shri Kunga Bhutia. After spending his early days with his parents and family in his native village, he travelled from Lachung to Gangtok for this primary and secondary education in 1964 from Enchey monastic school Gangtok which he completed in 1975. He did his graduation from Sikkim Government College, Gangtok under North Bengal University, Siliguri, West Bengal in 1978. Initially he joined as a teacher in July 1975 in Enchey Sr. Sec School.

Deeply passionate about Sikkim's environment and biodiversity (both plant and animal life) and its conservation, protection and management, he opted to join the Forest Service in the rank of Wildlife Warden in the Department of Forests on 5th August, 1977. In those days, Forest Service was regarded as Royal Service, a very challenging, arduous and adventurous profession.

By virtue of his tremendous zeal, aptitude and meritorious service in the field of forestry and wildlife management, he had been deputed for various professional trainings on different occasions in forestry and wildlife viz:

- Diploma in advanced Wildlife Management from Forest Research Institute, Dehradun in 1979-80
- Higher Forestry (M.Sc in Forestry) from State Forest Training College, Burnihat Assam during 1983-85.
- Trained in Eco-development Project in 1982 from Wildlife Institute of India, Dehradun.
- Zoo Management from Delhi Zoo and Nehru Zoological Park, Hyderabad.
- Fur Farming Training in 1983 under Indo-USSR Protocal-Naichik and Moscow.
- Exposure visit to Kenya Nairobi for Land Use Management and Extension in October November, 1995
- Zoo Management captive breeding of Red Panda in Marwell Zoological park in U.K. in September October 1997.
- Recipient of India's first National Kailash Shankhla Wildlife Fellowship Award in 1996 to study ecology and its habitat of the Himalayan Thar 'Shapi' (Hemitragus jemlahicus schaeferi) in north-west part of Khangchendzonga habitat of this rare species.

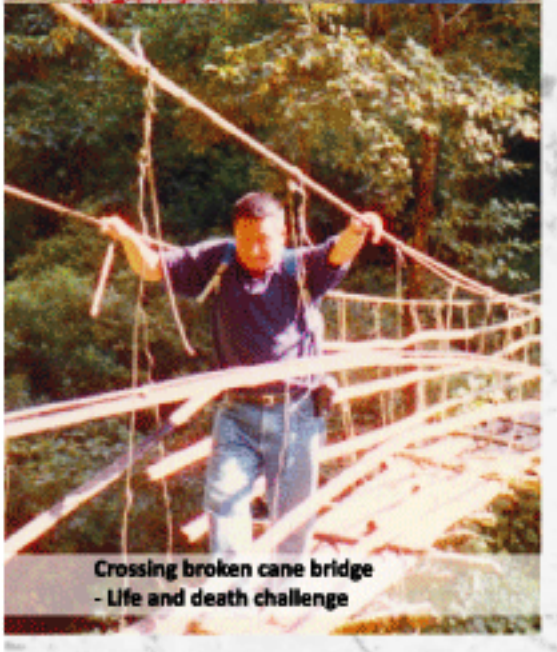
Beside that he had attended numberless workshop and seminars in the field of environment, forestry and wildlife resulting into greater exposures and gained immense knowledge on the subject.

During the tenure of his service in the Forest Department for almost 34 years, he held different ranks and posts dedicated to his service with enthusiasm and zeal.

We were at the equator Kenya

Hills, Mountains and Rivers make you Strong

Greetings with Chief of Masaimara Community Kenya



Crossing broken cane bridge - Life and death challenge

- He was initially appointed as Wildlife Warden in August 1977; promoted to post of Assistant Wildlife Officer in October 1980, and posted in North-East District, he was inducted into State Forest Service in July,1980 and posted as ACF (Territorial) South in October,1985.
- He was promoted to the post of DFO in July 1986 and posted as DFO (RVP) till 1991, DFO Wildlife East & South from 1991-1995. In between he was DFO Land Use North for a short period and again continued to be DFO Wildlife East till February 2000.
- He was inducted into Indian Forest Service (IFS) in March 2000 with 1992 year of allotment in Sikkim Cadre.
- In February 2000 he was posted as DFO Land Use North till 2004.
- In December, 2004 he was elevated to the post of Conservator of Forests and posted as CF Land Use and Nodal Officer FCA.
- Elevated to the post of Chief Conservator of Forests in February 2009 and in charge of Land Use Circle and Nodal Officer FCA till 18th of April, 2011. Till recently, he also held the post of Member Secretary of:
  - Sikkim Ecology Fund & Environmental Cess.
  - State Land Use Board.
  - State Environment Impact, Assessment Authority.
  - State-Level Export Appraisal Committee-Secretary.
  - State-Level Steering Committee for Wetland Conservation

He was a true visionary and hardworking personality, much ahead of his time in the history of the Forest Department and was instrumental in innovation a number of new initiative and implementation of different schemes, project and management systems which will live with us as management tools and footsteps to follow.

He was instrumental in conducting baseline surveys, study of environmental and ecological aspects for protecting, propagating, developing and declaring most of the Wildlife Protection Areas (WLPAs) in Sikkim as a pioneering Wildlife Expert.

During the first lap of his service even as untrained Wildlife Warden he had tremendous contribution in conducting base line survey of the habitat and wild biodiversity of proposed Khangchendzonga National Park (KNP), first of its kind in the tiny Himalayan state declared in 1977.

"Operation Trap Demolition" expedition was the first initiative and mission undertaken by him in KNP under his team leadership covering vast areas of Sakyong, Tsingnok, Kuthang, Rionthang, Zoupatham-Gochela Tholung, Kishongla-Thepala, in order to check the rampant, indiscriminate poaching, trapping, snaring and killing of very rare and threatened species of Musk Deer (Kasturi mirga) practiced by professional poachers from time immemorial for highly prized musk pod which are found in male musk deer. It was indeed the first time a mission was achieved successfully in the history of Sikkim Forestry conservation movement and became instrumental in conservation and protection of dwindling populations of such rare species.

His dedication was such that Late Shri Lachungpa as Wildlife Warden apprehended poachers during this expedition who happened to be his own maternal uncle named Mr. Samba and Mr. Ninden Lachungpa from his own village Lachung. Both of them were booked and punished under Wildlife Protection Act, 1972. This was one of the shining examples to gauge his sincerity, loyalty, honesty and integrity rendered for the cause of public service in general.

Late Shri Lachungpa had extensively taken adventurous expeditions and field tours in different parts of the State. He explored a cave above Thosa Lake and was the second person after British explorers in 1900s which falls in a stretch of Tamze-Tsola-Gumne-Chakung-Ravom-Khedum. The cave was named as "CHEZUNG CAVE".

He undertook adventurous expeditions and field tours in different parts of the State as Wildlife Expert and he was the first to photograph the national animal of Bhutan, the rare Mushmi Takin (Budorcas taxicolor) in Menla RF fringes of Kyongnosla Alpine Sanctuary, East Sikkim in 1996. Besides that his series of wildlife photographs of rare and threatened species of Himalayan fauna taken during his tours and expeditions area left behind as contributions for future foresters.

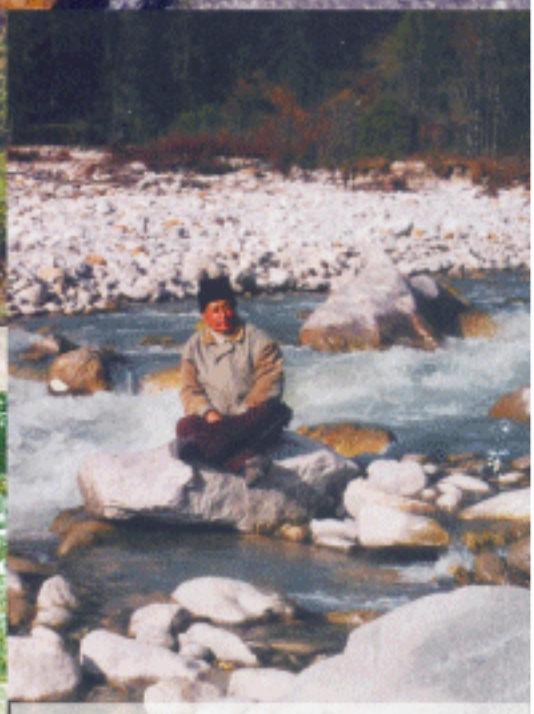
He had been immensely involved in designing and developing Himalayan Zoological Park, Bulbulay Gangtok by adopting modern concept of creation and management of zoos. He had his own concept in designing roofless enclosures for Snow leopard and lesser cats in order to provide natural habitats widely utilized by Zoo inmates.

He had hugely contributed innovative techniques and management practices for land use and management through suitable preventive and remedial measures for treatment of catchments and landslides areas in different parts of the state. He was fully involved in preparing Environmental Management Plan (EMP) of different Hydro-electric Projects (HEP) in the state. He felt strongly about poor management practices and improper planning for protection and conservation of environment and ecology and endeavored to save them from degradation.

He played a major role in organizing the International Rhododendron Festival in 2010, which gave Sikkim a major boost for promoting eco-tourism in Sikkim

After a day's walk resting on natural cardet gives relief

First record discovery of the TAKIN in Sikkim by C. Lachungpa

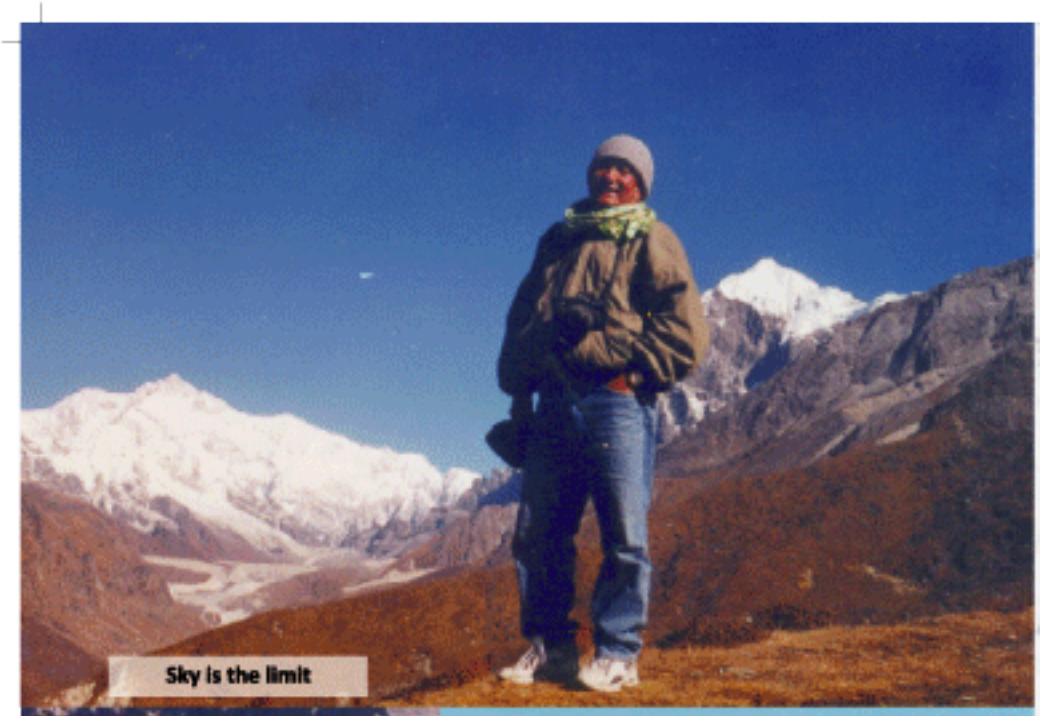


Clean river indicates sound Catchment

Walking thorough boulderly Forest gives strength in knee joints

Late Shri Lachungpa had contributed tireless efforts for bringing success in implementing 'State Green Mission' and 'Ten Minutes to Earth' since their inception.

He always realized the importance of knowledge and information sharing. He conceived the centrally sponsored ENVIS scheme as one of the major pioneer projects to reach out the message of high environment alertness to each citizen. As a Coordinator of the Environmental Information System since its inception in the department in 2002, he always encouraged stakeholders to emulate his untiring youthfulness with innovative ideas and new challenges. He strengthened the ENVIS scheme with modern facelift with support from the Sikkim Ecology Fund. He was probably the most determined personality to have made ENVIS a permanent functioning system today.



Sky is the limit

Amongst the silence rocks

In search of snow Leopard at Patala-dombang Traet

After an ardous trekking, Hungry, Thirsty, waiting fire to boil water

He strengthened the school oriented environment eco-clubs programmes. His tireless efforts and contributions still finds a place in several ENVIS reports like State of Environment 2007, Treatment of Landslides and Erosion Control, Nursery Management and many more as important ENVIS resources. He was the pioneer forester to have conceptualized the need for baseline studies of grazing ban in Sikkim.

Undoubtedly, he is also to be credited for the State's national recognition as Best State in Conservation of Natural Resources and Performance in Land Use in 2008 and Best in State's Response to maintain their Environment and Reducing Pressure on Environment in 2009.

Of late he was not only dedicated to his service as professional forester and wildlife expert but he was committed and dedicated to the service of the society as a true social worker. During his life time he held leading position in different social and Non Government organization (NGOs).

To mention a few,

- Despite residing at Gangtok he was tirelessly dedicated to the welfare and development of people of North Sikkim till his last breath.
- As the President of "SICHEY KIDUK ASSOCIATION" Gangtok, he initiated construction and establishment of "MANILHAKAHNG" at Sichey.
- He was General Secretary of ALUMINI ASSOCIATION of Enchey Senior Secondary School, Chandmari, Gangtok. Credit goes to him for successful organization and arrangement of School's centenary celebration in 2009. We could easily gauge the love and affection paid to departed soul by the students of Enchey School on the day of funeral.
- He was the Founder Member and Chairman of the "GREEN CIRLCE" (a NGO established in November, 1994 based in Gangtok) who had been working with utmost passion to promote awareness amongst the public in general in the field of environment conservation, preservation of the natural and cultural heritage of Sikkim. Under his able guidance Green Circle achieved successfully in its own quite way many environmentally sensitive programmes especially involving youth of Sikkim.

He was very modest, kind, humble, cordial and lively with his fellow colleagues, youth and children.

Today, we stand in great grief and pray for his departed soul. His innumerable contributions towards forestry, environment, wildlife and biodiversity to this Mother Earth are a triumph of his goodwill. We hope to continue in these footsteps. The passing away of such an Officer is an irretrievable loss not only for us but the entire nation. We the Forest family, fellow colleagues, member of society and NGOs as a whole, deeply mourn the passing on of this good soul and pray for succor for the folk and family left behind.

(All photographs and captions by Late Shri Chezung Lachungpa)

Chief Minister's Forestry and Environment Mission "100 percent Environment Conscious Citizen in Sikkim State by 2015"

The Government of Sikkim in its Forestry and Environment Mission 2015 has envisaged achieving 100% Environmentally Conscious Citizens in Sikkim State by the year 2015.

Under the visionary leadership of the nation's greenest Chief Minister Mr. Pawan Chamling, the year 2011 was declared as the 'Year of Innovation' in Sikkim to inculcate both the people's and government's action towards sustainable environment friendly development. The vision aims to instill green thoughts in every citizen and relate green thoughts into action.

Amongst several other initiatives prior to the year 2011 like State's flagship programmes viz. State Green Mission, Ten Minutes to Earth, Smritivan, etc., the environment sector has been geared with more rigorous action to develop Sikkim into a Clean and Green State with much support from State Ecology Fund.

➡ 2011 being the pioneer year to strive toward the vision, the Government of Sikkim has come up with an innovative state-level award scheme **"Chief Minister's Green School Rolling Trophy"**, the first of its kind in the country. Launched on the occasion of the World Environment Day on 5th June at Chintan Bhawan by the Hon'ble Chief Minister himself, this award scheme aims to acknowledge the school's action towards conservation and efficient environment management system at the school and local community level.

➡ To instill sound environment consciousness in every citizen, school children have been targeted. Changing the attitudes of such huge population is not going to happen overnight. The best attempt to bring about a change in the attitudes in the society is through children. School eco-clubs have been strengthened with adequate trainings and provision of environment kits like permanent banner to celebrate eleven environment calendar days with meaningful commitments; biodiversity registers; awareness posters; green caps and badges; green school manuals; green funds and many more.

➡ At the local community level, 111 environmental NGOs throughout the State have been provided financial grant-in-aid up to Rs. 15,000/- each for carrying out various action-based environment awareness drives like street plays, banner/ rally campaign, and cleanliness drives, etc.

➡ For daily commuters, tourists and drivers, GO GREEN stickers with DO's and DON'T's message have been provided in all tourist and passenger vehicles.

➡ 'Lets Talk Environment' FM media show launched to interact with general public and spread message.

➡ Besides number of programmes for environmental amelioration, the department of Forests, Environment & Wildlife Management has set up study teams in collaboration with Chennai based Centre for Development Finance to assess the level of environment consciousness at the present stage so as to identify gap areas/ section of the society to further deploy suitable measures. The study will relay the baseline information that will be helpful toward achieving the vision.

Go Green Campaign

Hon'ble Chief Minister Mr. Pawan Chamling releasing the Go Green Sticker

Green Funds and Green Awards

First Chief Minister's Green School Rolling Trophy being awarded to Middle Camp Govt Sec. School

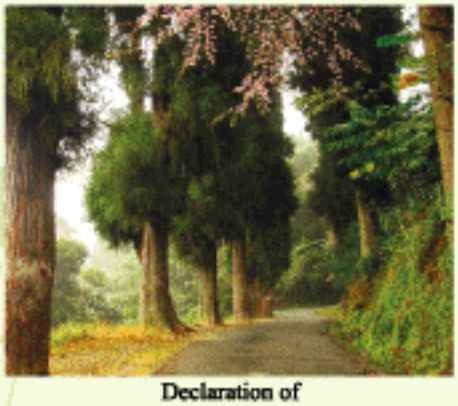
Green thoughts and Green Action

Paryavaran Mitra Oath by students, teachers, politicians, government officers and staff, NGOs and general public

Go Green stickers being pasted on passenger vehicles

Release of Green funds to Environmental NGOs

Go Green Sticker



Declaration of Green Roads and Eco-highways

FM media based environment awareness programme 'Let's Talk Environment' being broadcasted [Sunday 4-6 pm, 91.9FM]

Change in the mindset of public towards Greener Sikkim

GreenSchools State Awards 2011

The most prestigious award - **Chief Minister's Green School Rolling Trophy cum- State Green School Award** was presented to the top five Green Schools of Sikkim State for their meritorious and rigorous action in school's environment management system.

The award scheme based on the Green School Programme as conceptualized by New Delhi based Centre for Science & Environment and coordinated in the State by ENVIS, Forest Environment & Wildlife Management Department aims to acknowledge the school's Eco-clubs action towards environment.

Government of Sikkim with its green policies under the strong political will of the nation's greenest Chief Minister Mr. Pawan Chamling during the celebration of World Environment Day on June 5, 2011announced the cash prizes of rupees five lakh to the top school and rupees one lakh each to the remaining four green schools of the State. The award scheme has now been notified in the official gazette vide notification no. 627 dated 2/12/2011.

The winning schools under this award scheme for the year 2011 (2010-11 session) were as under;

1st Middle Camp Govt. Sec. School, East Sikkim (Rolling Trophy and cash of Rs 5.0 lakh)

2nd Reshi Govt. Sec. School, West Sikkim (Green leaf trophy and cash of Rs. 1.0 lakh)

3rd Lower Samdong Govt. Sec. School, East Sikkim (Green leaf trophy and cash of Rs. 1.0 lakh)

4th Lingchom Govt. Sec. School, West Sikkim (Green leaf trophy and cash of Rs. 1.0 lakh)

5th Linkey Govt. Sec. School, East Sikkim (Green leaf trophy and cash of Rs. 1.0 lakh)

Amongst the State awardees, two schools namely, Middle Camp and Lower Samdong Govt Sec. Schools later made into the national CSE's Green School Award at New Delhi on July 15, 2011. From about 15,000 schools from across 18 states and two Union territories, the above two schools from this tiny Himalayan state were amongst the top 10 green schools of India.

Sunita Narian, Director General (Centre for Science & Environment) and members of the Indian Ocean, the contemporary rock band presented leaf trophies and certificates to Sikkim Schools.

Lower Samdong Govt. Sec School receiving the 2nd best award in the New School Category

GreenSchools Activities

Students with the scout teacher measuring the water tank of the school (Water Audit)

Waste audit team in action

Students recording school's faunal and floral wealth in Biodiversity Register (Land audit)

Quantifying waste generated in school

Only CFLs (a part of Energy audit)

Vermin composting organic waste

Hugging the oldest tree *Paryavaran Mitra*

Do Not Waste WASTE
Wasted paper to paper bags (*thunga*)

My green service to the local community

Gobar Times Green Schools National Award 2011-12

Sikkim schools shine again

From over 30,000 participating schools across the country, three Sikkim schools namely; Dentam SSS (West Sikkim), Deorali Girls SSS (East Sikkim) and Tingley SS (South Sikkim) have been conferred 1st, 2nd and 4th position respectively in the top 10 Gobar Times Green Schools National Award 2011-12 by Centre for Science and Environment on the 28th of March 2012 at New Delhi. Based on the performance in the Green School's Programme (GSP), the above schools have brought about positive change in the schools environment in terms of practices followed to improve the quality/usage/sustainability of Land, Air, Water, Energy and Waste Resources. The above schools were presented certificates and green leaf trophies by the Honorable Chief Minister of New Delhi Mrs. Sheila Dikshit.

National Rank in the Change makers Category

1st **Govt. Sr. Sec. School, Dentam, West Sikkim**
1st GGSS School, Palampur, Himachal Pradesh
2nd **Govt. Girls Sr. Sec. School, Deorali, East Sikkim**
3rd Pragyan School, Greater Noida, Uttar Pradesh
4th Puranchandra Vidya Niketan, Kanpur, UP
5th Allens Public School, Durg, Chattisgarh
6th BCM Senior Secondary School, Ludhiana, Punjab
7th St. Stephens School, Togan, Chandigarh
8th Vidya Niketan English Medium School, Pune
9th JUSCO school, Kadma, Jharkhand
10th Kendriy Vidyalaya No. 1, Uppal, Hyderabad

National Rank in the New Schools Category

1st Govt. High School, Dasgrain, Ropar, Punjab
2nd KV Air Force School, Begumpet, Hyderabad, AP
3rd Sri Venkateshwar International School, Dwurka, Delhi
4th **Govt. Sr. Sec. School, Tingley, South Sikkim**
5th DRV DAV Centenary Public School, Phillaur, Punjab
6th GSS School, Khalet, District - Kangra, HP
7th Govt. Girls High School, Cuttack, Orissa
8th Assam Valley School, Balipara, Assam
9th GAIL DAV Public School, Dibiyapur, UP
10th Govt. High School, Baloh, HP

Green Teacher's Training Aug 1-2 & 4-5, 2011| 182 Green Teachers appointed and trained to strengthen school eco-club activities of all Sr. Secondary and Secondary level schools of the state.

Green Fencing of 80 Schools of the State

Hon'ble Chief Minister Shri. Pawan Chamling during the village bhraman in 2011 had met up with the public demand for green fencing of schools. In compliance, State Forests Environment & Wildlife Management Department will be supplying necessary seedlings/ saplings/ cutting etc. of duranta, jatropha, agave and other species for live hedge fencing free of cost to about 80 schools of all districts.

Paryavaran Mitra National Event at Goa

Sikkim NGC participated in the 5 days National Paryavaran Mitra event held at Goa from December 11 to 15, 2011.

A four member team led by Arun Kumar Rai, GT cum Green Teacher of Rong Secondary School, Ashish Rai Class X student of Rong SS, Khabi Chettri Class X student of Yuksam SS and Samir Pradhan Class X student of Dentam SSS demonstrated a model of solid waste management with the title "Do not waste Waste" which was appreciated by visitors, scientists, students and teachers from other states. The event was also an opportunity for Sikkim participants to visit Bondla wildlife sanctuary, spice garden, beaches, mangrove, estuaries etc. and also interact with students of other states.

B. K. Tiwari, IFS
Conservator of Forests

Forest provides oxygen, water, fruits, flowers, timber, fuel wood, shade, manure, medicine, habitat for animals, birds and maintains ecological balance. Besides these, forest also provide sustainable livelihood to the people living in the fringes of the forests.

Forest Based Community and Sustainable Livelihood

In June 1996, that State Government notified the formation of Joint Forest Management Committee (JFMC) of the villagers living in the fringes of forest. As on date there are 160 JFMCs constituted in the state. Similarly, 59 Eco-development committees (EDCs) have been constituted in the fringe village of the wildlife protected areas like Wildlife Sanctuaries and National Park. The JFMCs and EDCs help in the protection and management of the forests adjoining to the villages and buffer forests of the protected area. In view of the protection and management of the forests, the JFMCS share produce like wild vegetables such as fern shoots (*ningro),* bamboo shoots, cane shoots, wild edible mushrooms, Thotne (*Polygonium)* edible roots and tubers found in the forests and also dry twigs as fuel wood and dry leaf as manure for cultivation of vegetables and flowers. The JFMCs also implement the afforestation activities in their allotted forest land under the National Afforestation Programme.

Sikkim has diverse biodiversity, medicinal plants and non-timber forest produce in its forests. Therefore, regulated extraction of the needed items without damaging the parent growing stock can provide sustainable livelihood to the forest fringe dwellers. With the increase in the number of educated unemployed youth in the state, the jobs in the government sector are limited and one has to face tough competition to get a decent job. There are many school dropouts having school education ranging from Std V to Std X. These people can be streamlined to function as Self Help Groups (SHGs) in each Gram Panchayat Unit (GPU) with some financial support through the entry point activities of the on-going schemes such as Forest Development Agency, Integrated Watershed Management programme or from Biodiversity Conservation and Forest Management project.

The unorganized and unemployed youths of the state under the guidance of the JFMCs /EDCs or the Watershed Management Committees can begin something of their own. In a centrally located place in the Gram Panchayat unit a work place can be created by constructing a low cost shed which can accommodate 20-30 people to work for their livelihood. The boys can take up the job of collection of raw materials from the adjoining forests/village and the girls can do the job of value addition.

Lively hood activities the unemployed youths can carry out:

Broom making:

Broom grass is found in abundance in Sikkim. There could be a division of labour between the boys and girls; where boys can collect the broom flowers from the forests as well as from the villages in prefixed cost and bring it to the work place. The girls can then do the value addition by making the broom.

Collection of wild edible mushrooms:

There are edible wild mushrooms available in the forests which can be collected and brought to the work place. The mushrooms can be sorted, dried and packed and sent to the market.

Collection of Bamboo shoots/cane shoots:

Sikkim has a variety of bamboo and bamboo shoots which are delicious. The bamboo shoots can be collected in the work place dried properly packaged which can fetch a good price in the market.

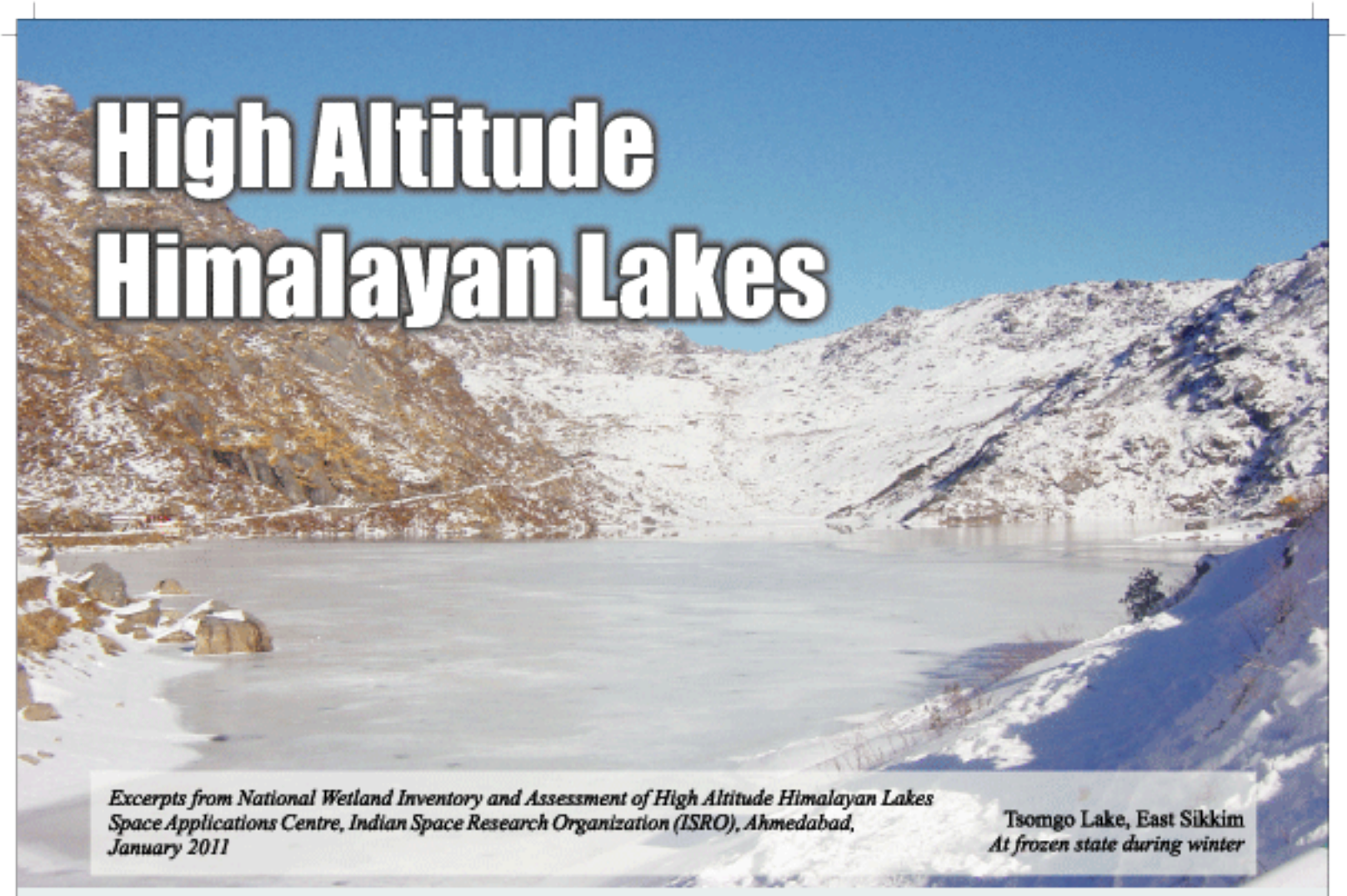
There are several food items which do not require skilled labour for preparation and value addition. Some of the likely products are fermented mustard (Gundruk), and radish leaves, fermented root of radish (sinki) and fermented bamboo shoots.

Proper drying and packaging of these items and marketing tie up with co-operative institution like SIMFED can fetch good remuneration to the unemployed and unorganized youths in the state. The production of large cardamom has been very low in the state. The price of cardamom has shot up to more than Rs. 50,000 per quintal due to its scarce availability. Good quality packaging of cardamom fruits in pouches of 100 grams can be sold to the tourists by opening outlets in prominent tourist points can also add to the income of the self help groups.

There is also heavy consumption of vegetables by the civilians and army in the state. The self help groups can collect vegetables from their own village and from adjoining villages and can transport them to Gangtok. Marketing of the products can be supported by SIMFED with partial support from Forest Development Agency.

An organized group of young people who have not been employed either in the government sector or private sector nor could come up with entrepreneurship of their own can take up the activities as mentioned above for their sustainable livelihood. To being with the nearest JFMC, EDC or WMC can play the role of facilitator and guide.

High Altitude Himalayan Lakes



Excerpts from National Wetland Inventory and Assessment of High Altitude Himalayan Lakes Space Applications Centre, Indian Space Research Organization (ISRO), Ahmedabad, January 2011

Tsomgo Lake, East Sikkim
At frozen state during winter

The Himalayan region is dotted with hundreds of lakes from low elevation to the high elevations. Many of the lakes of Himalaya are fresh water ones, with or without inflow and out flow. The Himalayan lakes show varying chemistry in terms of solutes, bio-geochemistry, and mineralogy vis-à-vis eco-hydrology of the lakes. These are primarily related to enormous altitude variation governing the climate, vegetation, lithology, tectonics and type and intensity of erosion/ weathering at source.

The high altitude lakes are fed by snow-melt, precipitation and springs whereas lakes of lower altitudes receive water from local rains, through streams, Nalas and springs. High altitude lakes, apart from their ecological significance, play crucial role in biodiversity, wildlife habitat and socio-economic aspects. Some lakes are regarded as sacred and are revered by thousands of pilgrims each year.

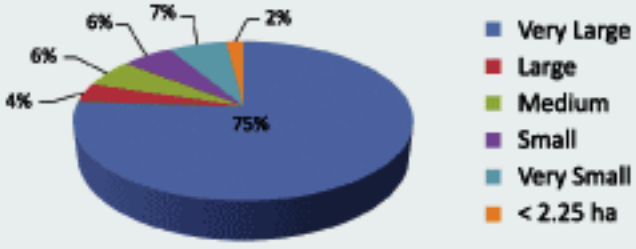
The Indian Himalayas cover approximately 591,000 km^2 or 18 per cent of India's land surface and spread over six Himalayan States viz Jammu and Kashmir, Himachal Pradesh, Uttrakhand, Sikkim, Arunachal Pradesh and some parts of West Bengal. Total 4703 lakes are mapped which lie above 3000 m elevation. This includes 1996 small lakes (<2.25 ha area). The total area of high altitude lakes is 126249 ha.

The lakes categorised under various sizes, show that there are only 12 lakes belonging to the very large size category having more than 500 ha area. However, they contribute to highest share of lake area (75.61%). Number wise, the smallest size lakes (<2.25 ha) have the largest share (42.44%), followed by very small ones (<10 ha) with 42.33% share.

Size-wise distribution of high altitude lakes

SN.	Class	Range	No. of lakes	Area (ha)
1	Very Large	> 500 ha	12	95462
2	Large	100-500 ha	30	4861
3	Medium	25-100 ha	179	7434
4	Small	10-25 ha	495	7559
5	Very Small	< 10 ha	1991	8429
6	< 2.25 ha	< 2.25 ha	1996	2505
		Total	**4703**	**126249**

Distribution of lakes as per size

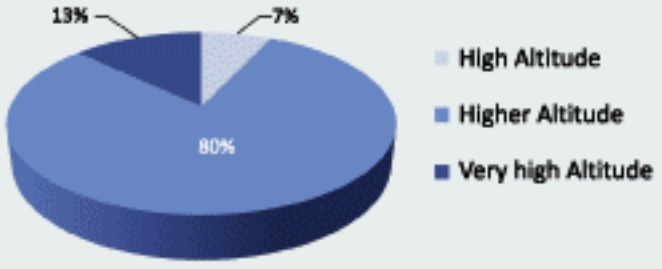


Altitude-wise, maximum numbers of lakes are observed in the elevation range of 4000-5000 m. There are 2642 lakes (56.2% of total number) mapped in this elevation range with 100817 ha area (79.9% area). Very large lakes are also observed in this elevation range. Only 761 lakes are mapped in the very high altitude range of >5000 m elevation.

Altitude-wise distribution of high altitude lakes in Himalaya

SN.	Category	Altitude range (m)	No. of lakes	Area (ha)
1.	High Altitude	3000-4000	1300	8460
2.	Higher Altitude	4000-5000	2642	100817
3.	Very high Altitude	>5000	761	16972
		Total	**4703**	**126249**

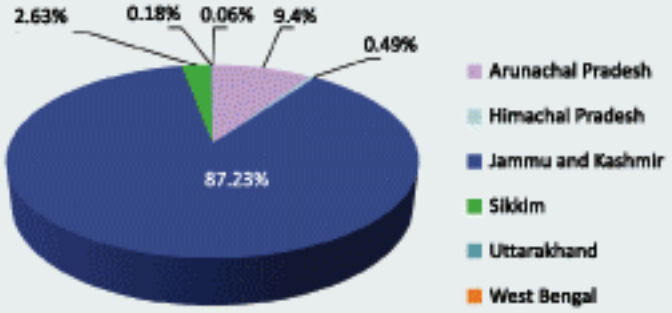
Distribution of lake area as per altitudinal range in Himalaya (high: 3000-4000m, higher: 4000-5000m and very high: >5000 m).



State-wise distribution of high altitude lakes in Himalaya

SN.	State	No. of lakes	Lake area (ha)	Lake Area (%)
1	Arunachal Pradesh	1672	11863	9.40
2	Himachal Pradesh	272	617	0.49
3	Jammu and Kashmir	2104	110131	87.23
4	Sikkim	534	3325	2.63
5	Uttarakhand	118	231	0.18
6	West Bengal	3	82	0.06
	Total	**4703**	**126249**	**100.00**

Distribution of high altitude lakes in Himalayan states, India



SIKKIM

The total geographical area of the state is 7,096 km^2. Total 534 lakes are identified with 3325 ha area. Total lakes mapped as polygons are 259 with 3050 ha area. In addition 275 small lakes (<2.25 ha) are mapped as point features. Maximum number of lakes are of very small size (<10 ha). Large size lakes (>500 ha) are not observed in Sikkim.

Size-wise statistics of high altitude lakes in Sikkim

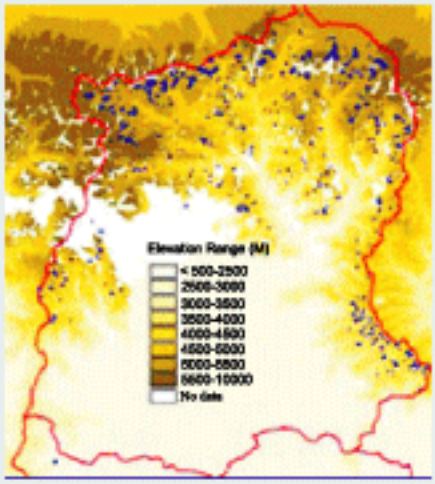
SN.	Class	Range	No. of lakes	Area (ha)
1	Very Large	> 500 ha	-	-
2	Large	100-500 ha	4	511
3	Medium	25-100 ha	20	885
4	Small	10-25 ha	55	823
5	Very Small	< 10 ha	180	830
6	< 2.25 ha	< 2.25 ha	275	275
		Total	**534**	**3325**

Distribution of high altitude lakes in relation to elevation gradient in Sikkim

SN.	Category	Altitude range (m)	No. of lakes	Area (ha)
1.	High Altitude	3000-4000	6	19
2.	Higher Altitude	4000-5000	323	1209
3.	Very High Altitude	>5000	205	2097
		Total	**534**	**3325**

Altitudinal distribution shows that maximum numbers of lakes are found above 4000 m elevation. Distribution-wise, North Sikkim has the maximum number.

Gurudongmar Lake is a well known high altitude lake of the state. It is located in North Sikkim district at 5243 m elevation, and is considered a sacred lake.

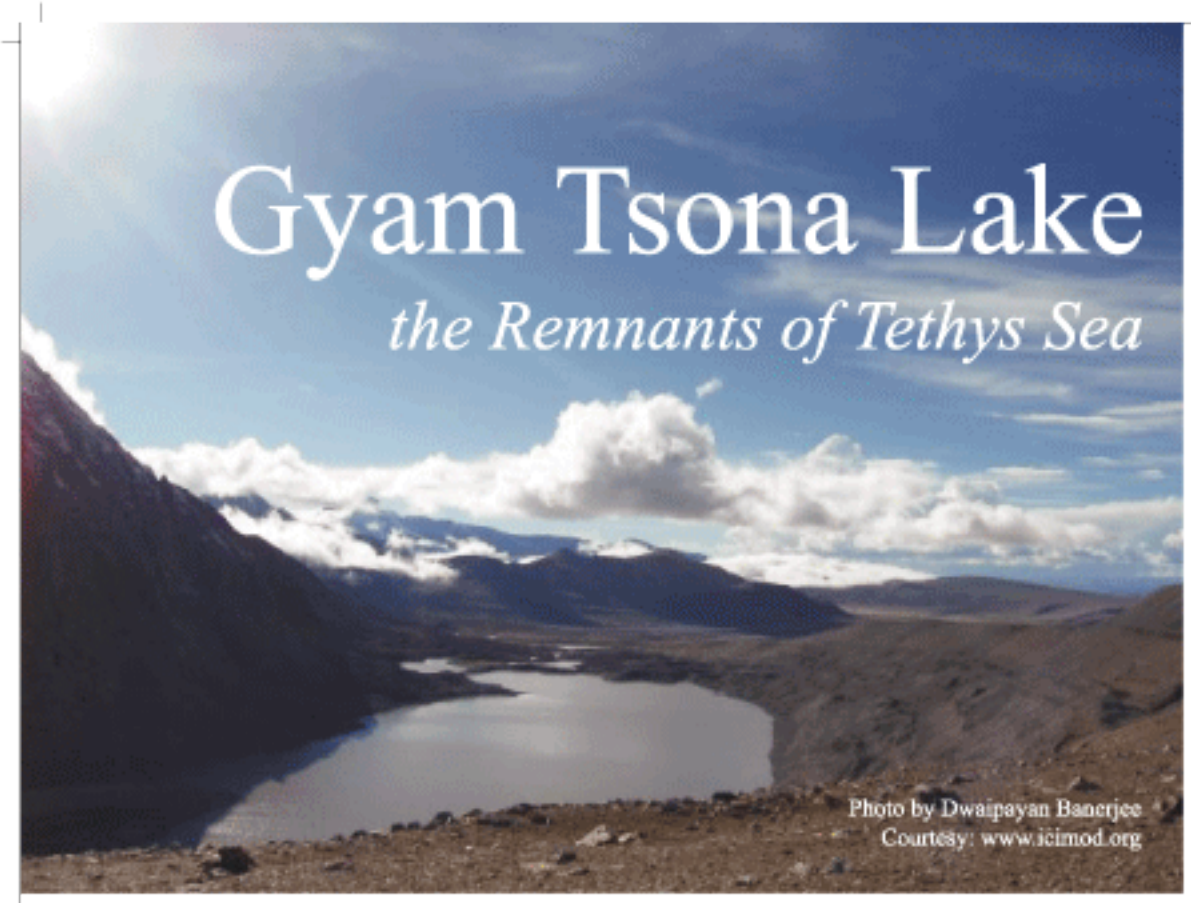


Map showing distribution of lakes in Sikkim in relation to elevation gradient (> 3000 m

Chholhamu Lake, also in North Sikkim district, at 5300 m elevation is the highest lake in India. The lake is located near Donkiala Pass. It is the source of the river Teesta (Tista). Tsomgo Lake is another important tourist destination in Sikkim

Gyam Tsona Lake

the Remnants of Tethys Sea



> *"Gyam Tsona as the remnants of Tethys Sea is evident in the form of marine sediments around this lake…"*

Monalisa Dash, IFS
Divisional Forest Officer
Working Plan

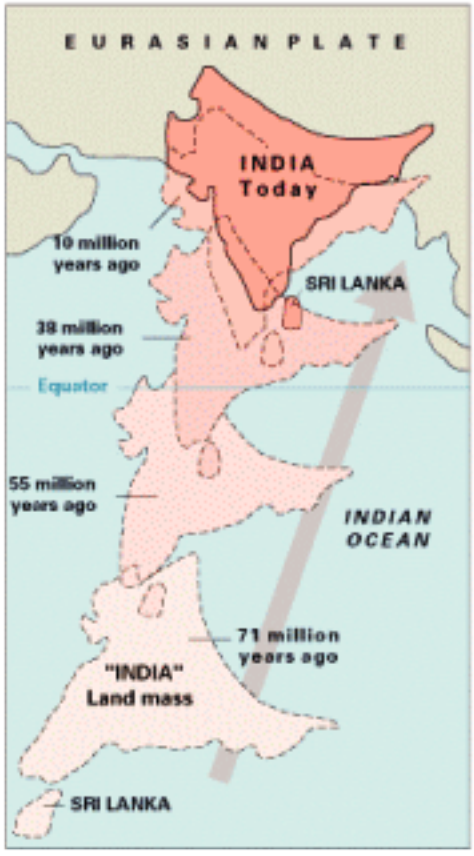
The Tethys Ocean named after Greek sea Goddess Tethys was an ocean that existed between the continents of Gondwana and Laurasia during the Mesozoic era before the opening of the Indian Ocean.

While the Cimmerian continent was drifting northward, a new ocean, the Neo-Tethys, was opening behind it and north of the Gondwanaland supercontinent. This new ocean began closing some 155 million years ago, shortly after the beginning of the major disintegration of Gondwanaland. Two fragments of Gondwanaland, India and Arabia collided with the rest of Asia during the Eocene. Much of the rock that now forms the Himalayas was deposited on the colliding zone between India and mainland Asia.

Laurasia and Gondwana began drifting apart, opening an extension of the Tethys Sea between them that today is the part of the Atlantic Ocean. Gondwana began breaking up, pushing Africa and India, across the Tethys and opened up the Indian Ocean. As these land masses pushed in on it from all sides, the Tethys Ocean continued to shrink, becoming the Tethys Seaway or *Tethys Sea*.

Tethys Sea, former tropical body of salt water was eventually eliminated due to the continental collisions. Secondly, volcanic activity was common, and some oceanic volcanoes grew tall enough for their peaks to emerge above the surface of the sea, creating new islands.

Geologists like Suess have found fossils of ocean creatures in rocks in the Himalayas indicating that those rocks were once underwater, before the Indian continental shelf began pushing upward as it smashed into Cimmeria.



The 6,000-km-plus journey of the India landmass (Indian Plate) before its collision with Asia (Eurasian Plate) about 40 to 50 million years ago. India was once situated well south of the Equator, near the continent of Australia.

Image Source:
pubs.usgs.gov/gip/dynamic/himalaya.html

Palentologists also find the Tethys Ocean particularly important because much of the world's sea shelves were found around its margins for such an extensive length. Evidence of the Tethys Sea is preserved in marine sediments now incorporated into mountain ranges that are stretched in the Tibet and India. Tethyan deposits can be found in Eurasia (especially in the Alpine and Himalayan regions) and in southern Asia (Myanmar and Indonesia). Limestones are a dominant sedimentary facies of Tethys. These sediments are often very rich in fossils, indicating an abundant and diverse tropical marine fauna. Reefs are common within Tethyan deposits.

Today, India and the Indian Ocean cover the area once occupied by the Tethys Ocean. The remnants of this Tethys Sea are still visible in the Trans Himalayan zone of India and Tibetan plateau of China. Sikkim State, the bordering area between India and China is distinguished for its natural scenery, which gets further enhanced by the picturesque lakes. It has many lakes in the glacial valleys.

Gyam Tsona Lake is one of the largest and highest lakes in Sikkim, India. This lake is situated at an elevation of 17,000 feet, rests on the northern side of the Khangchenga Range, in a high plateau area next to the Tibetan Plateau. This lake is found on the plateau that extends from Sikkim into Tibet. The lake is land locked from all sides by tall barren mountains.

In winters, the lake gets frozen. The chilly water of this lake, invites many migratory birds from Russia, China and other parts of India, to take a placid halt.

Gyam Tsona lake two decades ago

Gyam Tsona lake at present

The adjacent area is rich in endangered species and some of India's last surviving populations of wild ungulates Tibetan argali *Ovis ammon hodgsoni* , Tibetan gazelle *Procapra picticaudata*, and kiang *Equus kiang polyodon*.

Topography appears to have an important influence on ungulate distribution, and populations of these species are aggregated in a small region along the northern boundary of the plateau. Persistence of the wild ungulates in this area can be attributed to the non-hunting tradition of local residents.

This area is strategically very important from defence point of view. Indo-China border is hardly 5kms aerial distance from this location. Hence though this area falls under Thangu Reserve forest of Sikkim, yet it is inhabited by the personnel of Indian Army. Thus this locality is commonly called as "Bunker". One unit of army headed by one Commanding officer is located at the bank of this lake. This area is not accessible for civil population.

The above two photographs reveal that the lake has remarkably shrunk within two decades. As no scientific studies have been carried out, it is difficult to predict the cause. This area falls under the cold desert area where the rainfall precipitation is very low. So the water source to this lake is only due to melting of snow in the adjacent area. Gyam Tsona as the remnants of Tethys Sea is evidenced in the form of marine sediments around this lake. Tethyan deposits are found in this region. These sediments are often very rich in fossils, indicating an abundant and diverse tropical marine fauna. The water of this lake tastes slightly salty unlike other high altitude lakes situated in the adjacent area.

The reduction of its size is progressing very rapidly. Paleontologists fear the lake may vanish in the due course of time and million years old sea would vanish forever. To have a better understanding on this further scientific studies need to be carried out and accordingly measures can be taken towards rejuvenating the ancient sea.

POTENTIAL RAMSAR SITES IN SIKKIM

Usha Lachungpa
Principal Research Officer
ushaglachungpa@gmail.com

Sikkim lies along the important East-Asian-Australasian flyway for migratory birds. All migratory birds receive international protection under the Ramsar Convention to which India is signatory. As the whole of Sikkim lies directly along this migratory flyway, adjacent to the great Chumbi Valley of the Tibet Autonomous Region of China, all migratory birds use the numerous Himalayan mountain passes and high altitude wetlands along the northern and eastern parts of the State and along the different river valleys. They can be sighted here during the pre- and post-migration seasons in transit. Hence these areas need to be adequately protected and conserved through various trans-border initiatives and international cooperation. Safe haven for these international visitors translates into safe wetlands useful to the human beings dependent on them for sustenance, livelihood as well as eco-tourism.

Sikkim has 534 wetlands spread mostly in the higher altitude. These wetlands have important biodiversity values apart from direct consumptive use value for humans including tourism and have important regulatory role in soil and water conservation. Management and conservation of these lakes assumed importance under National Wetland Conservation Programme of the Ministry of Forests and Environment, Government of India. Therefore, in order to steer and guide the programmes on conservation of wetlands in Sikkim, the State Government constituted a State Level Steering Committee in February 2007.

Wetlands Identified for Conservation under National Wetland Conservation Programme

A list of 116 wetlands, mostly glacial and snow-melt lakes was given by the Sikkim Government for inclusion in the national list. However, most of the wetlands were very small in size ranging from one to five hectares. Six wetlands have been recently included under the National Wetland Conservation Programme, keeping in mind their urgent conservation priorities and ease of management:

1. Khecheopalri Wetland (West Sikkim)
2. Tsomgo Wetland (East Sikkim)
3. Phedang Tso (Bedang Tso) Wetland Complex (East Sikkim)
4. Tamzey Wetland Complex (East Sikkim)
5. Gurudongmar Lake (North Sikkim)
6. Tembao Lake and Glacier Complex (North Sikkim)

Department published the Sikkim chapter in the BNHS publication "Potential and Existing Ramsar Sites in India" in collaboration with Dr. Asad Rahmani, Director, BNHS and on MoEF's Expert Committee of Wetlands, member of NBWL, Wetland International, Chair Bird Life Asia Council and co-author of book on Important Bird Areas (IBAs) of Sikkim. This included our three most important wetland clusters, information which was compiled in the Ramsar Wetlands Information Sheets (RISs) so that a good case was made for their inclusion in the international Ramsar List.

THREE PROPOSED RAMSAR SITES IN SIKKIM

A. **Khecheopalri-Khangchendzonga-Lhonak Complex:** comprising
   a. Khecheopalri Lake and two IBAs
   b. Khangchendzonga Biosphere Reserve (KBR) (West and North Sikkim)
   c. Lhonak Valley (North Sikkim)

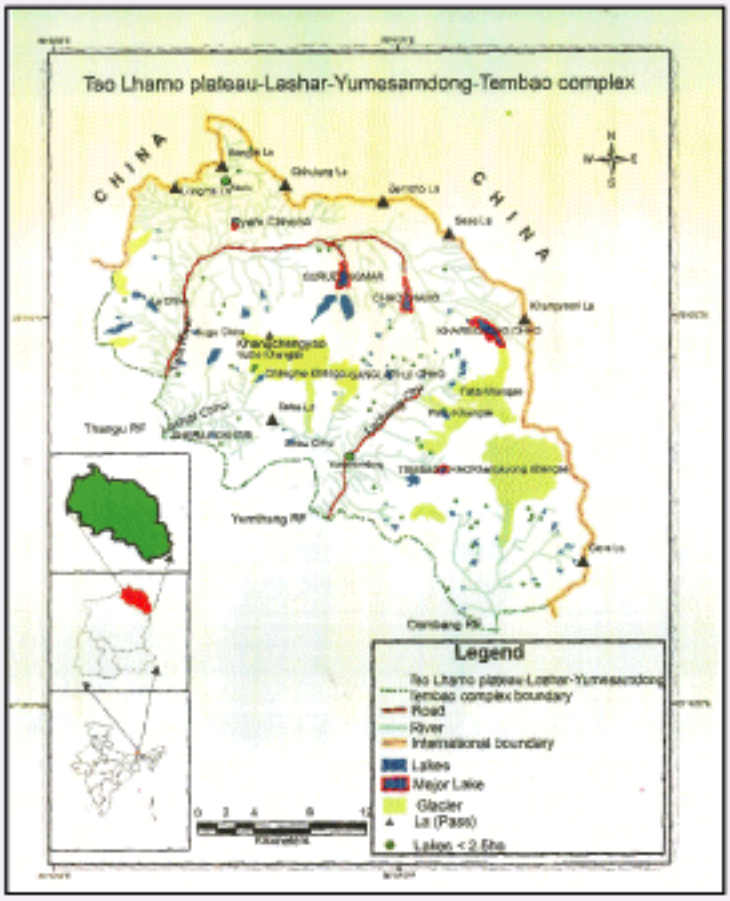
A wetland complex of the country's highest altitude National Park and Biosphere Reserve, with Khecheopalri on the southern fringe, Lhonak Valley on its northern fringe and the Tista River Valley along its right flank

B. **Tsomgo-Bedang Tso Complex:** comprising two IBAs
   a. Kyongnosla Alpine SanctuaryTsomgo- Tamze-Chola Complex (IBA: IN-SK-05)
   b. Pangolakha Wildlife SanctuaryZuluk-Bedang Tso Complex (part of IBA: IN-SK-09)

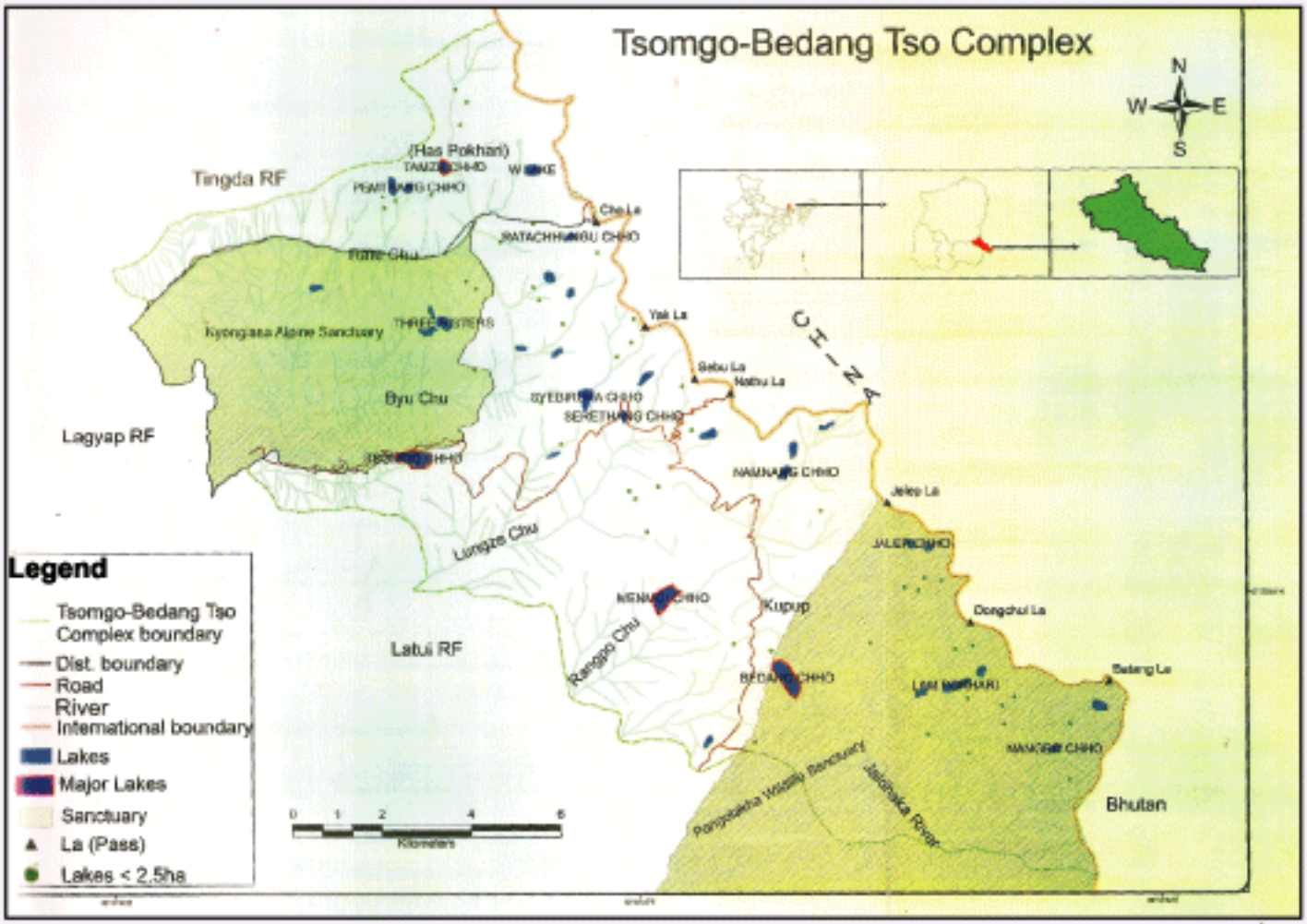
The only wetland-forest complex with its main water body in Sikkim draining out of the state into Bhutan instead of through it.

C. **Tso Lhamo Plateau-Lashar-Yumesamdong-Tembao Complex:** comprising
   a. Tso Lhamo-Lashar-Sebu La-Yumesamdong Complex (IBA: IN-SK-10)
   b. Tembao Lake and Glacier Complex

The largest wetland complex forming the sources of the principal river of Sikkim, the Tista, originating in the cold desert and trans-Himalayan facies in the north.


Tso Lhamo plateau-Lashar-Yumesamdong-Tembao complex
CHINA
CHINA
Thangu RF
Yumthang RF
Legend
Tso Lhamo plateau-Lashar-Yumesamdong-Tembao complex boundary
Road
River
International boundary
Lakes
Major Lake
Glacier
La (Pass)
Lakes < 2.5ha


Khacheodpalri-Khangchendzonga-Lhonak Complex
CHINA
NEPAL
Legend
Khacheodpalri-Khangchendzonga-Lhonak Complex boundary
Dist. boundary
Road
River
International boundary
Lakes
Major Lake
KNP boundary
Glacier
La (Pass)
Lakes < 2.5ha


Tsomgo-Bedang Tso Complex
Tingda RF
(Has Pokhari)
Che La
Kyongasa Alpine Sanctuary
Byu Chu
Lagyap RF
Yak La
Sebu La
Nathu La
Jelep La
Lungzu Chu
Latui RF
Kupup
Dongchui La
Ramgo Chu
Batang La
Pangolakha Wildlife Sanctuary
Jaldhaka River
Bhutan
Legend
Tsomgo-Bedang Tso Complex boundary
Dist. boundary
Road
River
International boundary
Lakes
Major Lakes
Sanctuary
La (Pass)
Lakes < 2.5ha
Kilometers

September 18, 2011

6.8M Earthquake jolted Sikkim

Lessons learnt and how prepared are we for future?

Santosh Sharma, SRF
G.B. Pant Institute of Himalayan Environment and Development, Sikkim Unit, East Sikkim

Damaged Moonlight Academy building in Chungthang town, North Sikkim

We in the Indian Himalayan Region always live with risks of various types and severity and are continuously at some stage of disasters and are also particularly exposed to natural disasters such as landslides and earthquakes. On 18th Sep. 2011 we were exposed to Earthquake disaster of 6.8M which clearly established the high level of seismic vulnerability of our state. The present article reports on the same and also draws lessons learnt for future earthquake disasters in Sikkim.

The quake rendered a loss and damage of over Rupees One lakh crore in Sikkim alone. The earthquake caused substantial damage to modern RCC buildings as well as heritage structures. The damage seen in Gangtok, Singtam, Mangan, Jorethang, were substantial. Chungthang, Lachen, Lachung and Dzongu were the worst affected regions. The earthquake claimed around 132 human lives in Sikkim, including 16 at the Teesta Stage III Hydroelectric power project site, 719 persons injured and also caused substantial loss to livestock and caused extensive damages to houses and infrastructures. The earthquake had badly shaken the flourishing business of tourism in the state and the tourism generated economy completely disappeared. All the developmental programmes were also arrested. Visit along 12 different road stretches of Darjeeling-Sikkim Himalayas revealed a total of 210 landslides proximal to the visited road sections. Out of which 195 are new and 15 are reactivated one.

Earthquake disaster like any other disasters erode away not only the resource base but also cause loss of human life and bring about unprecedented human insecurities. It further requires extraordinary post disaster non-productive expenses. Therefore, one pertinent question that we should ask to ourselves is "***How better prepared we are to future earthquake in Sikkim or adjoining areas?***"

Loss of lives during an earthquake is mostly due to damage or collapse of houses/structures. Due to paucity of flat land, buildings even upto 6-8 storeys are constructed in plenty with little or no breathing space for emergency operations mostly in the urban towns of Sikkim.

It is therefore suggested that appropriate steps may be taken to ensure that the dwellings and other structures are designed and constructed as per guidelines laid down by Bureau of Indian Standards (BIS) to minimize the losses caused by earthquakes. Detail geotechnical/geological studies should be conducted prior to construction of buildings, roads or any other infrastructures. Analysis, design and detailed engineering drawings should be as much part of the project as a plan and an estimate is at present. Important structures like hospitals, fire stations, government buildings should be made earthquake resistant. As far as poorly built structures are concerned, they should be retrofitted as it is not economical to demolish and reconstruct them. While granting permission to build Multi-storey buildings the relevant government department such as UD&HD, in Gangtok, a qualified structural engineer should be involved. The evaluation of "landslide potentials" across the State should be carried out before construction roads. To protect and conserve the monasteries, it is advised that the State government has a partnership with the Archaeological Survey of India. The safety check of all ongoing projects, including the 30 odd Hydel power projects should be made mandatory. Further, losses due to earthquakes can be considerably reduced through proper planning and implementation of pre- and post-disaster preparedness and management strategies by the government by working out the possible earthquake effects.

Building damaged at Baluwakhani Gangtok

Damaged Army vehicles on the way to Lachen

Damage caused by flashflood triggered by Earthquake, Lachung, North Sikkim

Land detachment between Chungthang and Lachen, North Sikkim

Damaged monastery in Chungthang on the way to Lachen, North Sikkim

Landslides on the way to North Sikkim triggered by earthquake

Eight plus storey buildings in Gangtok built on apparently non-ductile beam column frames with little or no breathing space in between calls for stringent norms for construction regulation and policy frame work, falling which debris demolition cost would surpass actual reconstruction demands.

Building damaged by earthquake, East Sikkim

All photographs by Santosh Sharma
Email: santosh_gbpihed@rediffmail.com

Excerpt of the 6.8M Earthquake Report Sikkim

Source: Seismic Monitoring Network Division, India Meteorological Department

Date : **18/09/2011**
Time : **18:11 hrs (IST)**
Magnitude : **6.8**
Focal depth : **10 Km**

Epicenter
Latitude : **27.7° N**
Longitude : **88.2° E**

The epicenter lies in a seismically known and active belt called *Alpide-Himalayan global seismic belt.*

Region : **Sikkim-Nepal Border region.**

The event, which comes under the category of "Moderate earthquake", was also reported widely felt in Sikkim, Assam, Meghalaya, northern parts of West Bengal, Bihar, parts of other eastern and northern regions of India.

Past seismicity of the region:

Sikkim and adjoining area lies in a region prone to be affected by moderate to great earthquakes in the past. Some noteworthy earthquakes that have affected the region are:

(i) Cachar earthquake 10.01.1869 (M: 7.5)

(ii) Shillong plateau earthquake 12.06.1897 (M: 8.7)

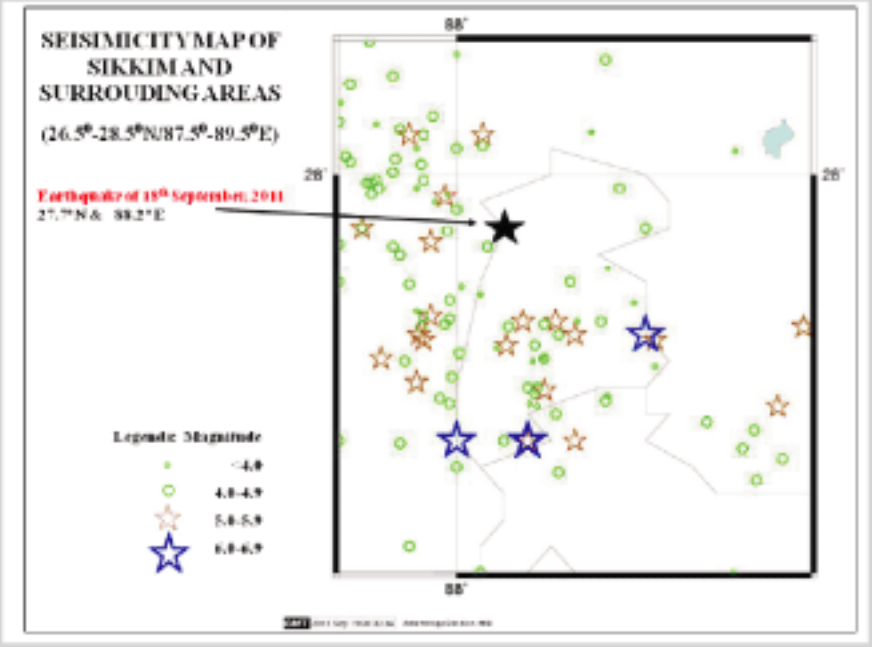
(iii) Dhubri earthquake 02.07.1930 7.1)

(iv) Bihar-Nepal Border earthquake 15.01.1934 (M: 8.3)

(v) Arunachal Pradesh China Border earthquake 15.08.1950 (M: 8.5)

(vi) Nepal-India Border earthquake 21.08.1988 (M: 6.4)

(vii) Sikkim earthquake 14.02.2006 (M: 5.7)



(viii) Bhutan earthquake 21.09.2009 (M: 6.2)

Based on magnitude (M), earthquakes may be classified as *Micro- (M < 3.0), Slight- (M: 3.0 - 4.9), Moderate- (M: 5.0 - 6.9), Great- (M: 7.0 - 8.0) and Very great- (M > 8.0)*

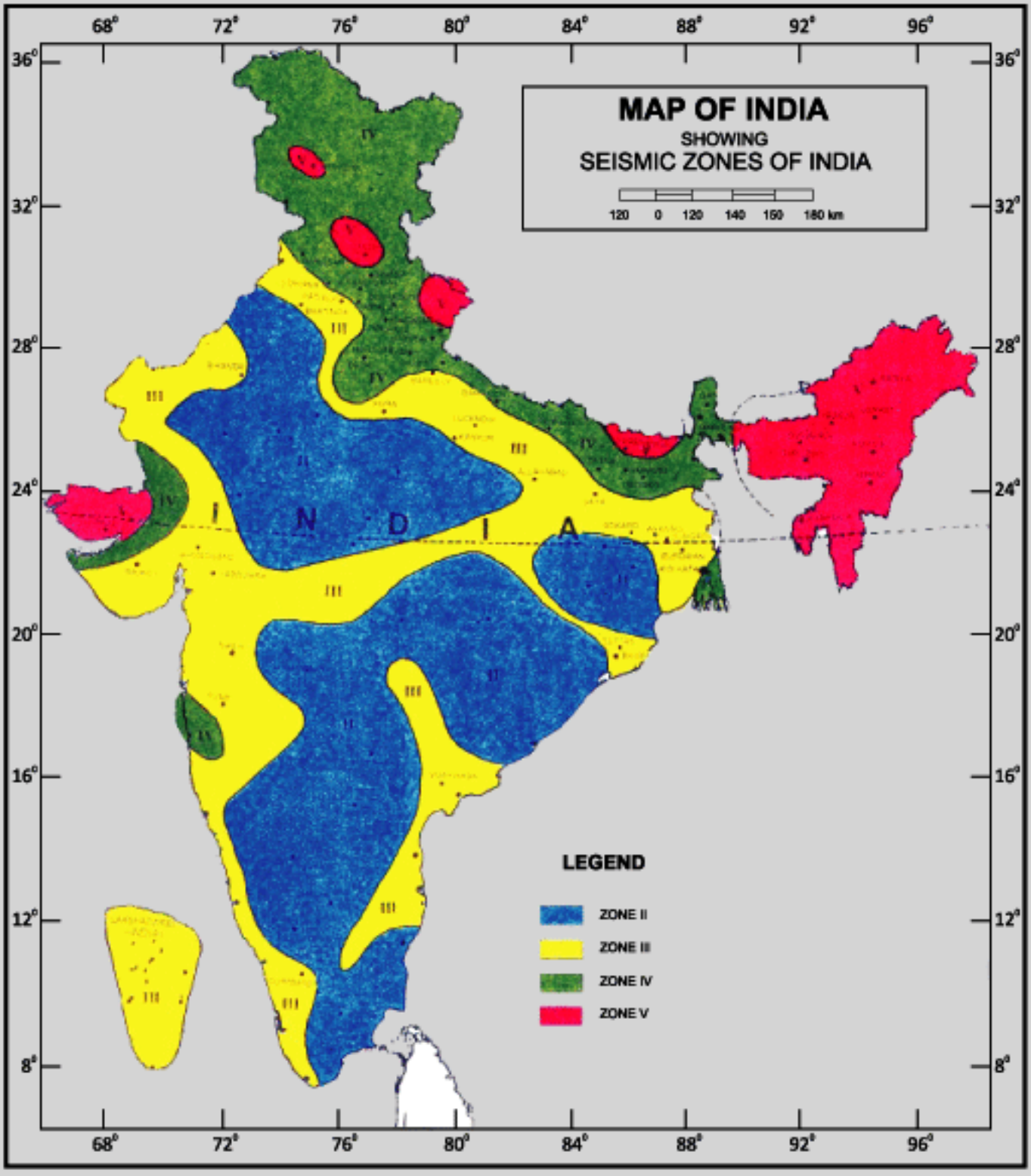
On an average, it is expected that; about 2 earthquakes of M~8.0; about 20 earthquakes of M~7.0; about 100 earthquakes of M~6.0; and about 3000 earthquakes of M~5.0 are likely to occur every year over the globe.

Presently, there is no scientific technique available anywhere in the world to predict occurrence of earthquakes with reasonable degree of accuracy with regard to space, time and magnitude. It is, therefore suggested that appropriate steps may be taken to ensure that the dwellings and other structures in the region are designed and constructed as per guidelines laid down by Bureau of Indian Standards (BIS) to minimize the losses caused by earthquakes.

Seismic Zoning of India:

In the seismic zoning map of India prepared under the auspices of Bureau of Indian Standards (BIS code IS: 1893: Part I 2002), by a committee of experts representing various scientific institutions including India Meteorological Department (IMD), the **entire area of Sikkim lies in Zone IV**. The seismic **Zone IV** is broadly associated with **seismic intensity VIII** on the Modified Mercalli Intensity (MMI) scale.

The MM intensity, which measures the impact of the earthquakes on the surface of the earth is broadly associated with various zones as shown in the seismic zonal map of India.



Note: Towns falling at the boundary of zones demarcation line between two zones shall be considered in High Zone.

Seismic Zones of India

Seismic Zone	MM Intensity	% Area of India
Zone II	VI - Low Intensity zone	43%
Zone III	VII - Moderate Intensity zone	27%
Zone IV	VIII - Severe Intensity Zone	18%
Zone V	IX - Very severe intensity zone	12%

Study on Impact of the Grazing Exclusion Policy

Case Studies from West Sikkim

By
Shweta Bhagwat, Manasi Diwan and Vivek Venkataramani

The study titled "Study of Ecological and Social Dimensions of Grazing Exclusion in Protected Forests of West Sikkim" was carried out by the Institute for Financial Management and Research (IFMR) in collaboration with the Forest, Environment and Wildlife Management Department, Sikkim (DFEWM). The objective of the study was twofold: First, to examine the effects of a *grazing exclusion* on local ecological and socio-economic conditions of the resource- dependent communities in the selected study sites. Second, to create a holistic framework for assessing the effects of a *grazing exclusion* that could be employed in future larger studies on evaluating *grazing exclusions* in the State.

The selected study sites were Barsey Rhododendron Sanctuary (BRS) and a part of the buffer zone of Kanchenjunga Biosphere Reserve (KBR) in the West District of Sikkim. The study adopted a comprehensive evaluation framework comprising two main components: ecological and socio-economic. The key aspects studied under ecology included vegetation parameters (forest structure and composition, regeneration, disturbance etc), soil parameters (soil chemical properties and soil erosion related information), hydrology (water sources flow & quality) and wildlife (trends in sighting). Quantitative data on vegetation and soil parameters were collected during the extensive field surveys, while, qualitative data was collected on hydrological and wildlife aspects. Change detection analysis of vegetation was done through ERDAS IMAGINE 8.5 software. The key parameters studied under socio-economic aspects include livelihood strategies, resource use, asset ownership and perceptions of the local communities towards the grazing ban.

Positive impacts of the grazing ban were seen in terms of an increase in vegetation cover and consequent improvements in soil profile. The areas exposed to high grazing pressure with open canopy cover, were found to be regenerating adequately. Among species with

conservation importance, *Rhododendron* spp. was observed to be adequately regenerating whereas the regeneration of *Quercus spp.* was relatively inadequate. It was observed that the regeneration levels of the important fodder spp. such as *Litsea polyantha* (poinle), *Ilex dipyrena* (lissey), *Osmanthus suavis* (sirlinge), was found to be inadequate near the plot areas. Efforts need to be taken to promote ex-situ conservation of such species. The gregarious *Arundinaria maling* (malingo) and *Viburnum spp*. (asare) regeneration could be cause of concern in the long run.

The image change detection techniques complemented the findings of the field survey. The results of the change detection techniques pointed towards a change in the land cover: from barren land to the existence of vegetation. But this rate of change for restoration was low, as indicated by the total area that has increased, decreased or transformed. Higher rates of transformation were observed near lower elevations and fringe areas of sanctuary, while, a lower transformation trend was not observed at higher elevations. The pace of transformation was also indicated by the various images highlighting changes as per various threshold values.

Details from the household survey highlighted issues of change in the livelihoods of local communities, post imposition of the ban. It was observed that both herders and non-herders were impacted, albeit the latter to a lesser extent. Amongst the herder group, caretaker households and households with small and marginal land ownership were the most impacted. While, earlier most of these households were engaged in subsistence agriculture, now agricultural activities provide an important source of income. Of late, other livelihood options such as MNREGS and eco-tourism have been introduced. The local communities perceived that there has been an increase in the incidences of wildlife population causing damage to the area post the ban implementation. Thus strategies to tackle these problems have to be designed.

There was a consensus amongst local communities that the ban on grazing had brought about major lifestyle changes, giving them an opportunity to stay closer to their families' vis-à-vis the more rigorous lifestyle in the forests. Also they agreed that now their access to health and education services has improved. However they felt that their access to natural resources for fodder and fuel wood have reduced and a need for development of livestock management system in the region has been felt. To summarize, the perception and information captured from the socio-economic survey can be used as an input for further policy refinement in the region.

The impact of the grazing exclusion policy in terms of enhancement of the forest carbon stock on a relatively finer scale was assessed and found to be significant in nature. This conservation promoting policy has improved carbon sequestration, and can be considered as a low cost abatement option. An addition of 585 thousand tonnes to the stock of forest carbon was calculated as a result of the conservation policy.

The framework presented a feasible methodology for assessing impacts in the absence of detailed longitudinal ecological or socio-economic data. The scope of the current study was local in nature. To develop an understanding of the overall policy impacts across Sikkim a state-wide study is essential. It will help understand the policy effectiveness and influence across the region.

The authors of this article are researchers from the Environmentally Sustainable Finance (ESF) group within the Centre for Development Finance (CDF), a research think tank focused on improving government systems' and markets' capacity to channel finance into sustainable, holistic development. Centre for Development Finance (CDF) within the Institute for Financial Management and Research (IFMR) is an action oriented, non-profit research organization based out of Chennai. ESF is a group within CDF dedicated to research and action to inform policy making and implementation in the areas of Environment (Environmental Policy and Sustainability, Climate Change, Strengthening Environmental Regulations, Urban Sustainability and Planning)

Overview on new strains of edible mushroom in the Prairie Himalayas of Sikkim

Dr D. K Pradhan
Principal Scientist
High Altitude Research Centre

Background:

In 1763, the genus Cordyceps was described as 'vegetable fly' and stated, "*In the month of May it buries itself in the earth and begins to vegetate. By the latter end of July, the tree arrives at its full growth and resembles acoral branch, and is about three inches high, and bears severe little pods which dropping off, become worms and from thence flies, like the English Caterpillar*". (Watches, 1763)

Linnaeus (1753) includes species of this genus under Clavaria, a Basidomycetes and the latter was transferred to Sphaeria by Pansorin in 1801. Furthermore, the genus was reverted to Cordyceps by Link (1853). However, the genus Cordyceps of Link was divided into two genera by Tulasne (1857):

(i) Torrubia, because of the presence of two spore forms in the life cycle; and

(ii) Cordylia, embracing all forms growing on subterranean fungi.

The latter genus was not tenable, finally reverted to Cordyceps (Cunningham, 1920).

Inside of Cordyceps specimen

Cordyceps is an ascomycetes fungus which can mummify the insect larva or grow saprophyically on the dead log or humic acid rich soil or ants. Cordyceps is an entomophagous in the family Claviceptaceae. There are 300 to 400 species of Cordyceps (Sung, 2004; Cunningham, 1920) of which 68 species have been recorded in China (Wang, 1999). However, no other species is considered as powerful as C. sinensis or is as costly (Chen, Yin et al, 2002). Zang and Kinjo (1998) described several distinct species so far clustered under *C. sinensis*, *C. gansuensis*, *C kangdingensis* and *C nepalensis*. In TM (Traditional Medicine) *Cordyceps sinensis* is known as dongchong xiacao (Winter worm summer- grass). It was recorded in Wu Yiluo's "Ben cao cong xin" ["New compilation of Materia medica"] in 1757 (Zhu et al, 1998). Wayback to 15th century, the first mentioning of Yartsa Gompa was reported in Zurkhar Nyamnyi Dorje's text: Man ngag bYe Ba Ring bSrel (Oral Instructions on a Myriad of medicines). Thus, the practice of using *Cordyceps sinensis* was clearly documented in Tibetan Medicine as well. The TK (Traditional Knowledge) ideas and knowledge collected from the different ethic of Sikkimese origin by the TM Practitioners help to develop the modified knowledge of TM of Sikkimese Origin (White 1909; Sikkim Coronation; Foning, 1987). Reason thereof the knowledge of Sikkimese practice of TM is different than fundamental Tibetan medicine practitioners. Similar notes were also reflected in the work of Alexanda Dravid neel (Rastomgi, 1987; Lall, 1981, Pradhan, 2001) and other. Such marvelous contributions of the Traditional Medicine practitioner is noteworthy in Sikkim chapter for the development of TM of Sikkimese Origin . Herein, Cordyceps, a resource material of TM of Sikkimese type, reviewed with special emphasis to Sikkim type specimens which mummify the Grass Root boring Catepillers whose life cycle takes up to seven years; and most of the life cycle is lived as a caterpillar, the moth itself living for short time only(Chen et al, 2002). Nearly 40 species of Thitarodes (Hepailus) moths are recognized in the Tibetan Plateau region and 30 species was reported with infection of *Cordyceps sinensis* (Chen et al, 2002; Zang and Kinjo, 1998). Cordyceps's spore on coming in contact with a host, germinates and produces a germ tube which penetrates the cuticle and body wall. Inside the body cavity this germ tube branches, forming hyphae, which penetrate to all parts of the body. In the blood, gemmae are produced, these are cells asexually produced from the end of hyphae. They are exceedingly small and are rapidly carried in the blood stream to different parts of the body, where they in turn give rise to hyphae. In process rapidly spreads and quickly kills the host(Cunningham, 1920). Infection of the host occurs from the germ tube of ascospore, or from hyphae developed from conidia of Cordyceps. A conidium germinates and develops hyphae saprophytically on decaying wood or organic matter for some considerable time. In the host the hyphae continue to develop until the whole of the internal tissues are mummified by the mycelia of the fungus. This compact mycelial mass is known as sclerotium which usually after a period of rest develops stipe bearing the fructifications of the fungus. The stipe varies considerably in shape, size and number, according to the habitat and nature of the host. To complete the sexual reproduction of Cordyceps fungus, the perithecium may require the lower molecular compounds for the development of ascogonium Mother Cell which require further investigation.

Ascospores and Larva

The ascospores of Cordyceps are filliform, multicellular bodies borne in asci (cylindrical sacs), which in turn are enclosed in perithecia. The perithecia are densely packed on

the surface of or embedded in the substance of the stromata. Each provided with a definite opening (ostiole) through which the spores disseminate. Each ascus bears a small cap on its distal end, pierced by a minute pore. The filliform ascospores are closely packed in parallel fascicles, eight in each ascus; they are at first continuous , but when mature are divided by many transverse septa a hundred or more.

Nearly, hundred perithecia occur in Cordyceps which may vary depending on the species or varieties. Each prithecium contains 10 asci, and each ascospore breaks into 100 secondary spores.

The ascopores are liberated through the apex of asci in large numbers under moist conditions. The spores are scattered by wind over to considerable distances. On falling upon suitable substratum, each germinates by putting forth a germ tube and develops into a new hyphae. Generally, the mummified larvae of Hepialis armoricanus, Hepialus oblifurcus, Hepialus nepalensis, ants and other were observed in the Eastern Himalayas. The larva has an elongate body of soft integument, consisting of 13 segments. The head capsule is sclerotised, encases hard mandibles and bears a group of simple eyes known as ommatida or accelli. Near the base of the mandibles are very short antennae, which are important to the larva for distinguishing food. The root boring caterpillars feed on, to the species of Pedicularis, Bistorta, Geum, Primula, Gentiana, Rheum, Nardostachys and other. Behind and to the sides of the mandibles of larva, are the silk spinning glands known as spinnerets. The stipe of Cordyceps develops in between prothroax and head where silk spinning glands are available behind and to the sides of the mandibles. The body is divided into thoracic segments T1-T3, each bearing three pairs of legs. The abdominal segment A3 -A6 and A10 bear a pair of prolegs or sucker feet. The segments, claspers, carries a selerotized plate called surnal plate or button of silk. In some of the case, the stipe of Cordyceps develops at the terminal segment of larva too.

The remarkable point is that, moth can reproduce without mating, and, such reproduction produces females only (Haribal, 1992), which is very important for the biological management of Prairie Himalayas. During the study, it was observed that Cordyceps found in the specified area where larvae feed on closely associated plants of himalayas. As the larva eats greedily, it develops fat, its skin becomes too tight; so its stops feeding and attaches itself with the soil at the particular surface. After this stage, the hyphae produces the stipes from the larvae for the development of perithecia and ascospores. The produced stipes liberate ascospores into the soil during the month July- August in high altitude(5000-6000m) and June- July(4000-5000 m) in lower altitudes. However, it is recorded that the spore of Cordyceps requires the chilling cold treatment for the germination as per the seasonal chart of Hepialus (Table 1).

Table 1: Seasonal Chart of Hepialus

Month	Activities of Hepialus sp
March -April	Formation of Pupa
May-June -July	Lower Altitude (Pupa)
June -July-August	High Altitude (pupa)
August -September	Moth / Matting
September- October	Laying egg
November -March	Formation of larva which remain under the soil for several years (or 4-7 years depending on the species) and during this period larva get infected with ascopores of Cordyceps

Inside larvae, the anti-freezing compound and the reduced water content may help to sustain or resist the freezing temperature. In some of the high altitude species, the physiological activities may be halt and the hormones may control over the condition which require further investigation.

Table 2: Seasonal Calendar of Cordyceps

Name	Stipe period	Ascospore dispersal period	Collection period	Used part
Cordyceps sinensis	April - June	June-July July-August	April - May June-July	Whole part

Bioactivities of Cordyceps

Cordyceps sinensis plays an important role in the treatment of respiratory and cerebrovascular diseases, enhancement of body immunomodulatory function and regulation of liver and renal metabolism (Koh et al., 2002; Zhu et al., 1998a, 1998b). Moreover, it also has been used as an antioxidant (Li et al., 2001; Yamaguchi et al., 2000) and antitumor agent (Dai et al., 2000; Zhang et al., 2004; Rao et al., 2007; Russell et al., 2008, Kima et al.; 2008; Lin et al., 2008). *C. sinensis* is only found in the prairie soil at an elevation of 3600 - 5000 m. It is mostly distributed in Tibet, Qinghai, Sichuan, Yunnan and Gansu province in China (Zhou et al., 2009) and in Sikkim at Jorgan, Thapla, Panpokari, Singho Chu Range, Deythang, *Hass Pokari Thangsing Lamphokari Majorpokari Tigapla Bikhani Choka, Dzongri, Laxmipokari, Yakla, Kubuk and Gnathang at the elevation of 3500-5700 m.* Due to the limited distribution, high price and over-exploitation, the resource of *C. sinensis* has been endangered and requires scientific management for its development. The major bioactive components in *cordyceps* are adenosine and **cordycepin**

(Guo et al., 1998; Hsu et al., 2002; Fan et al., 2006). Hitherto, there are various HPLC methods that had been widely used in the determination of adenosine and **cordycepin** from *C. sinensis* (Guo et al., 2006; Li et al., 2006; Huang et al., 2003).

The strain that is known as CS-4 was one of the first commercial strains of *Cordyceps* isolated in 1982 at the Institute of Materia Medica, Chinese Academy of Medical Sciences. Known by the Latin name of *Paecilomyces hepiali* Chen, the aseptically fermented mycelium of this strain underwent extensive human testing and clinical trials during the 1980's and resulted in a commercial product with wide usage in China, known as JinShuiBao capsules. More than 2000 patients were involved in the clinical trials with CS-4 and the chemical composition, therapeutic activity and toxicity are very well known for this strain. (Bau, 1995). The different strains isolated from wild *Cordyceps sinensis* were reported by Yin and Tang 1995; Zhao, Wang, Chen, Li and Qu, 1999. The production of particular secondary metabolites (or target medicinal compounds) is depend on the nature and composition of the substrate itself.(Zhang, Zhao, Wu, Bai 1992; Gu et al., 2007; Shih et al., 2007; Holliday et al 2004). Similar measures can be taken in the state of Sikkim for the quality yield and may reveal a new source of market too, despite certain constraints, if overcomes.

Cordyceps sinensis has been shown to possess potent antioxidant effects (Wang et al., 2004; Wang et al., 2005) and has good anti-aging properties (Wang et al., 2004). *Cordyceps sinensis* has also been shown to exhibit potent anti-tumour activity (Shin et al., 2003; Wang et al., 2005; Yalin et al., 2005; Zhang et al., 2005) and may help to inhibit the spread of tumours cells to the lungs and liver (Zhang et al., 2005). *Cordyceps sinensis* is also believed to have an immune stimulating effect (Shin et al., 2003). Koh et al., (2003b) found that *Cordyceps sinensis* increased the level of good cholesterol (HDL), whilst simultaneously decreasing the bad (LDL) cholesterol. *Cordyceps sinensis* has also been shown to inhibit LDL oxidation by free radicals and therefore may help to inhibit the formation of artherosclerotic lesions (Yamaguchi et al., 2000). *Cordyceps sinensis* also possess anti-hypoglycaemic activity and therefore may prove to be beneficial to diabetics (Lo et al., 2004). As Cordyceps has always been highly revered in traditional medicine resulting in the wide demand. This has lead to over-harvesting of the wild stocks and a subsequent shortage of wild collected varieties of Cordyceps . (Chen et al, 2000).

There are number of other interesting deoxy-nucleosides produced by *Cordyceps sinensis*, such as the compound 2',3' deoxyadenosine as a drug for the treatment of AIDS under the trade name "Didanosine" and several varieties of deoxy-uridines. The HEAA (Hydroxy Ethyl Adenosine Analogs) content is a much more reliable indicator of *Cordyceps* quality determination. *Cordyceps sinensis* could produce many kinds of bioactive compounds such as cordycepin, ophiocordin and some polysaccharides (Cunningham et al, 1951; Suhadolnik and Cory , 1964; Kneifel et al , 1977; Kiho et al, 1995) .Cordycepin (3 -deoxyadenosine) is a nucleoside analogue, which has a broad spectrum of biological activity. It has been reported that cordycepin is intracellularly converted into its 5 -mono-, di- and triphosphates. Furthermore, the phosphate esterified cordycepin inhibits the synthesis of nucleic acids, the polyadenylation of mRNA and the release of mRNA from nuclei to cytoplasm (Cory et al , 1965; Rich et al , 1965; Siev et al, 1969; Rizzo et al, 1972; Penman et al, 1970; Rose et al, 1977; Kletzien, 1980), Many studies based on these reports have shown the significant promise of cordycepin and its analogues as anti-fungal, anti-tumor and anti-viral agents (Suga and Mccaffrey , 1998; Ahn et al , 2000; Koc et al , 1996; Kodama et al, 2000; Richardson et al , 1975; Chapekar and Glazer, 1983; Muller et al, 1991). More recently, cordycepin has also been shown to regulate the production of interleukins in T lymphocytes (Zhou et al, 2002). Eventually, the principle active compound, cordycepin, and Cordyceps sinensis as a whole exhibited well for the reduction of growth of human promyelocytic leukaemia cells (Ohmori, 1989; Klenow, 1963; HARC, 2010).

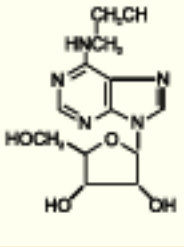
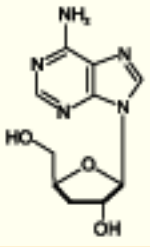
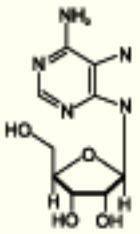
Cordyceps sinensis culture activities were undertaken with the different media for the commercial utilization in the different part of world. (Ling et al, 2002; Frederiksen et al , 1965; Furuya et al , 1983;Mao and Zhong, 2004). The study on the effect of the medium depth on the citric acid production by a surface culture has been reported by Sakurai et al.(1991) and method for propagating fungi using solid state fermentation(SSF) was performed by Li et al (2000).

As Cordyceps species was found to produce red naphthoqinones, which possess anti-malarial activity (Madia, 2008). In the line of such activities, the effect of oxygen supply on cordycepin production was also investigated in submerged cultivation of *Cordyceps (***Xian-Bing Mao and Jian-Jiang Zhong** ,2004).

STANDARDS OF QUALITY:

Based on reviews, it is reported that the nucleosides, and specifically the deoxy-nucleosides were determined to be the most reliable indicators of potency. The compound N^6-(2- hydroxyethyl)-Adenosine as indicator compound, found in all specimens of *Cordyceps* and have not found it in any other organism. This compound, along with Adenosine and 3'deoxyadenosine (Cordycepin) were used in summation as the quality indicator to compare different strains and production methods of *Cordyceps*. That is, the quantities of the three compounds were added together to come up with a numerical quality index for *Cordyceps*. (Furuya, Hirotani and Matsuzawa, 1983). Structures for these three compounds are shown in Table 3.

Table 3: Structures of Compounds found in Cordyceps

		
N^6-(2-hydroxyethyl) Adenosine	Cordycepin (3'deoxyadenosine)	Adenosine

This detail review briefed that there are many areas to be studied, eventually, in the area of easy methodology of cordycepin estimation, host specific activities of Cordyceps for the quality standardization, induced cultivation/ in situ cultivation, scientific planning on sustainable management, quality standardization with Criteria and Indicators, micro and chemotaxonomic differences with the strains and such other.

Type Specimens of Cordyceps

The new report of Cordyceps from Sikkim Himalayas with their latin diagnosis are placed to resolve the taxonomic problems in the region as the substantial work. Such identification is a benchmark for the quality standardization of Cordyceps in global market as well.

I. Cordyceps sinensis var pawanii var nov.

Stromata simple singula, Stromata hospite insidentia, in chrysalidibus Lepidopsterarum, a distincta griseo stipes tenacia fibrosus 22-25 mm longi, 5-6 mm validum , pars fertilis clavata 20-25 mm longi, 6-7 mm validum , pars fertilis alba, greseo vel dilute lutea, perithecia superficialia, dense aggregata, partim immersa, brunneo-lutea, dilute brunnea, oblique inserta, fusiformia vel clavata, asci apice conspicue inspissata, 8 spori, filiformes, ascoporae cylindricae, multiseptatae, maturae in cellulas diffrangentes.

Habitatio : In herbidis subalpinis humidis, apricis, 3600-4400 m

II. Cordyceps sinensis var dhugraii var nov.

Stromata simple singula, Stromata hospite insidentia, in chrysalidibus Lepidopsterarum, a distincta griseo stipes tenacia fibrosus 63-72 mm longi, 6-7 mm validum , pars fertilis clavata 14-16 mm longi, 3-5 mm validum , pars fertilis alba, greseo vel dilute lutea, perithecia superficialia, dense aggregata, partim immersa, brunneo-lutea, dilute brunnea, oblique inserta, fusiformia vel clavata, asci apice conspicue inspissata, 8 spori, filiformes, ascoporae cylindricae, multiseptatae, maturae in cellulas diffrangentes.

Habitatio : In herbidis subalpinis humidis, apricis, 4000-4800m

III. Cordyceps sinensis var dzongensis var nov.

Bi-Stromata, Stromata hospite insidentia, in chrysalidibus Lepidopsterarum, a distincta griseo stipes tenacia fibrosus 14-16 mm longi, 3-5 mm validum , pars fertilis clavata 30-35 mm longi, 5-6 mm validum , pars fertilis alba, greseo vel dilute lutea, perithecia superficialia, dense aggregata, partim immersa, brunneo-lutea, dilute brunnea, oblique inserta, fusiformia vel clavata, asci apice conspicue inspissata, 8 spori, filiformes, ascoporae cylindricae, multiseptatae, maturae in cellulas diffrangentes.

Habitatio : In herbidis subalpinis humidis, apricis, 3600-4200m

IV. Cordyceps sinensis var sighalensis var nov.

Stromata simple singula, Stromata hospite insidentia, in chrysalidibus Lepidopsterarum, a distincta griseo stipes tenacia fibrosus 63-72 mm longi, 3-4 mm validum , pars fertilis clavata 25-30 mm longi, 4-4.5 mm validum , pars fertilis alba, greseo vel dilute lutea, perithecia superficialia, dense aggregata, partim immersa, brunneo-lutea, dilute brunnea, oblique inserta, fusiformia vel clavata, asci apice conspicue inspissata, 8 spori, filiformes, ascoporae cylindricae, multiseptatae, maturae in cellulas diffrangentes.

Habitatio : In herbidis subalpinis humidis, apricis, 4500-6000m

V. Cordyceps sinensis var deythangensis var nov.

Stromata simple singula, Stromata hospite insidentia, in chrysalidibus Lepidopsterarum, a distincta griseo stipes tenacia fibrosus 25-30 mm longi, 6-7 mm validum , pars fertilis clavata 30-35 mm longi, 5-6 mm validum , pars fertilis alba, greseo vel dilute lutea, perithecia superficialia, dense aggregata, partim immersa, brunneo-lutea, dilute brunnea, oblique inserta, fusiformia vel clavata, asci apice conspicue inspissata, 8 spori, filiformes, ascoporae cylindricae, multiseptatae, maturae in cellulas diffrangentes.

Habitatio : In herbidis subalpinis humidis, apricis, 4500-5500 m

PROTEINS, NITROGENOUS AND OTHER BIOACTIVE COMPOUNDS

Cordyceps contains proteins, peptides, poly-amines, and all essential amino acids. In addition, *Cordyceps* contains some uncommon cyclic dipeptides, including cyclo-[Gly-Pro], cyclo-[Leu-Pro], cyclo-[Val-Pro], cyclo-[Ala-Leu], cyclo-[Ala-Val], and cyclo-[Thr-Leu]. Small amounts of polyamines, such as 1,3-diamino propane, cadaverine, spermidine, spermine, and putrescine, have also been identified (Mizuno 1999). A number of sterol-type compounds such as ergosterol, Delta-3 ergos-terol, ergosterol peroxide, 3-sitosterol, daucosterol, and

campesterol were reported from Cordyceps species (Zhou et.al 1998).

Table 5: Chemical constituents of Cordyceps

Cordycepin	7%
Cordycepic acid	5%
Protein	20.32%
Fibre	13.53%
Carbohydrate	26.90%
Adenosine	4%
Ergosterol	2%
Calcium	4.10%
Serevisterol	7%
Mycosporin	-
Fat	8.40%
Water	10.84%
Quinic acid	-

Although the spore is possibly an "infectious" agent that attacks the Himalayan ghost Moth still it is worth noting that the entomo-pathogenicity of the *Cordyceps* spp. is disputed (Zhou et. al.1998). This stands to a logical reason, considering the remote and inhospitable environment in which the *Cordyceps*/moth pairing occurs (Dai et.al. 2001). Further investigation is necessary to setup the logical framework of entomo-relationship of host specific Cordyceps for the quality and taxonomic parameters. In nature, *Cordyceps* often exhibits a single-celled, yeast-like anamorphic growth stage (Suh et. al 2001). Globally many species of *Cordyceps* being harvested for medicinal purposes includes *C. sinensis, C. militaris, C. sobolifera, C. subssesilus, C. ophioglossoides*, and others (Hobbs 1995 and Mizuno 1999). In the context of Sikkim Himalayas, the sustainable scientific planning shall address and resolve many issues of sustainable livelihood activities by utilizing approximately 1710 Hectares of suitable land.

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Ruppi with a Blue Wing

Ongden Lepcha
Range Officer (Biodiversity)
sfongden@gmail.com

It was May 24, 2009 my diary entry updates me, that I was awaken just before a fine dawn by a persistent bird's call to be gifted with a surprise. For the first time ever, I had seen a 'Ruppi' (the common Myna) with a blue wing on the right. The left wing was white as usual. Moreover, the feather tips of its tail were sky blue in V shape.

This unusual variation of wings struck me very odd. I enquired many people. None had seen a Ruppi with different coloured wings. My obsession had become the topic of constant jokes amongst my colleagues and friends. Some said that the bird might have dipped its wings in paint while others speculated that I had been misled by some tricky reflection. Others commented that the colour might have come from an egg during hatching. All of these speculations could have been true but I knew that Ruppis are territorial and soon I would get an opportunity to watch the bird again.

My anxiety did not let me down. For the next fortnight, I sighted the blue winged Ruppi sometimes on a roadside Malata tree (*Macaranga pustulata*) for its greenish fruit, sometimes avidly collecting dried plant materials, pieces of torn clothes and even our potted plant leaves. I watched and admired its beautiful coloured wings more clearly visible at flight.

To capture the sight, I had even engaged my unprofessional video camera. During the course of filming at one occasion, this blue winged Ruppi did a complete 180 degree turn facing me and again started flapping its wings. Just underneath the right wing I also noticed a sky blue blotch. It was amazing and gorgeous.

Ever since then, the blue winged Ruppi has completely gone out of my sight. I haven't heard of any such sighting from my friends as well. But I am pretty optimistic that such opportunities would come in time nearby.

Snapshot of a Blue Winged *Ruppi* (Common Myna) taken from a video by Ongden Lepcha