ANNUAL REPORT

2012-13

DEPARTMENT OF SCIENCE & TECHNOLOGY AND CLIMATE CHANGE
Government of Sikkim
Development Area, Gangtok, Sikkim - 737101

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FOREWORD BY SECRETARY

It is my privilege to reflect the activities of Department of Science & Technology and Climate Change in the form of annual report for the year 2012-13. Having joined as Secretary, Department of Science & Technology and Climate Change recently, I must agree that the activities taken up by this Council which is the working arm of Department of Science & Technology and Climate Change, is worth appreciating as it encompasses the areas and activities which are need based and require focused attention for sustainable development of the State.

The mandate of the Department and the Council presents vast areas and opportunities of interventions and investment that suits the local developmental needs without compromising the overall goal of sustainable development, research and development, poverty alleviation as mandated in the bylaws of the Council. Diverse issues of paramount importance are being addressed such as biodiversity and biotechnology, remote sensing technology, transfer of appropriate technology for the benefit of rural as well as urban population and communication and popularization of science. Thus, we must acknowledge the Council's role of serving as a bridge between Science & Technology in one hand and society and state on the other working hand in hand with line departments, NGOs, VOs, and individuals.

Recent initiatives on issues of climate change with the goal of strengthening adaptive capacities of the target (rural) communities to reduce their vulnerability to climate change through sustainable Climate Change Adaptation (CCA) measures will strengthen our outreach with diversity of stakeholders which includes NGOs, farmers, line departments, research institutes, students and teachers. The Council is concurrently working with GIZ (German Development Cooperation) and Kfw (Germen Development Bank) for technical cooperation and financial cooperation respectively to realize the above goals of climate change adaptation measures. While taking up various project and programmes, we have tried to incorporate, wherever possible, time tested vast indigenous knowledge base, so that technologies are easily accepted, adapted and appreciated by the beneficiaries.

All activities of the Department and the Council are in harmony with the science & technology related policies of the state government as well as government of India concurrently ensuring that we stay within the mandate. Any comments and critiques on the work presented in this report would be gratefully received.

19/07/2013

T. B. GURUNG
SECRETARY

SECRETARIAT OF DST & CLIMATE CHANGE DEPARTMENT
GOVERNMENT OF SIKKIM

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5.	Dr. S.R. Lepcha	Deputy Director
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20.	Shri Hem Raj Chettri	Peon
21.	Shri Suresh Rai	Peon
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STATE REMOTE SENSING APPLICATION CENTRE

REMOTE SENSING CENTRE

The Sikkim State Remote Sensing Applications Centre has started with the Department of Science and Technology in the year 1996. At present, the Centre has Seven Workstations and two PC along with 5Kv UPS. The Centre has one photogrammetry LPS-11, two Arc Info-10 and one ERDAS-9 software. The Centre also has A0 size plotter and A0 Size Scanner.

The SSRSAC has trained manpower in the field of Remote Sensing and GIS. The Centre has provided training to the Student of Sikkim Government College, Harkamaya college in the field of RS and GIS. The centre has been undertaking various project funded by Central Government as well as State Government. The Centre also provides the necessary data to the user department for various developmental activities in the state.

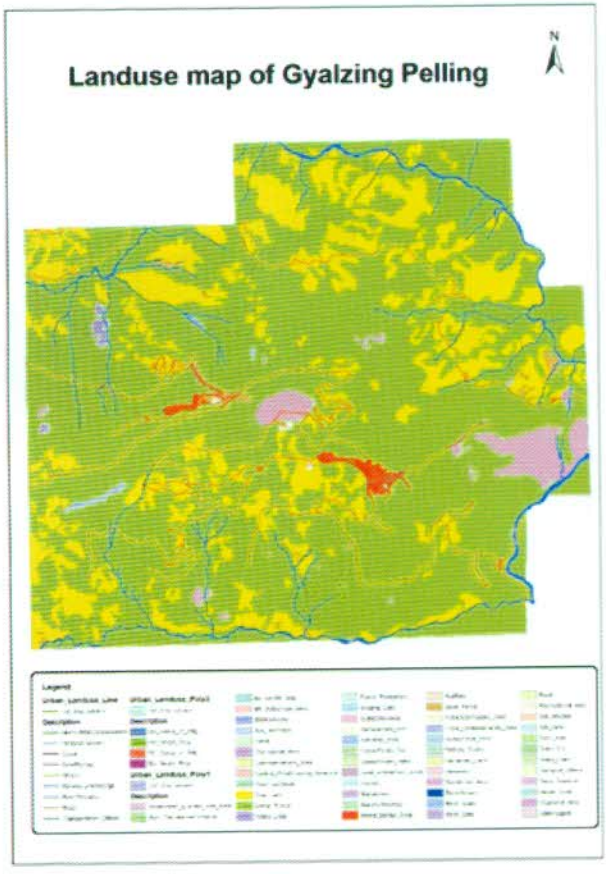
On Going Project

1. NUIS (National Urban Information System)

The major objective of NUIS project is to design, organize and establish a comprehensive information system in the urban local bodies for planning, management and decentralized governance listed in the 12th schedule in the context of implementation of the 74th Constitution Amendment Act (CAA).The creation of database of towns Sikkim state on various themes using remote sensing and GIS has been done.

For Sikkim state 10 towns were identified, for different thematic mapping, namely, Pakyong, Rabong, Rangpo, Singtam, Mangan, Jorethang, Rongli, Geyzing-Pelling, Soreng and Namchi.

Finding: The required thematic layers (Landuse landcover, Soil, Geology, Structure, Physiography, Geomorphology, Lithology, Drainage, Road, administration boundary, etc) under NUIS project has been prepared and submitted to the North East Space Applications Centre, Shillong for further submission to the Ministry of Urban Development Government of India.



2. SIS-DP (Spatial Information Support System for Decentralization Planning)

The Space Based Information Support for Decentralized Planning project started in Sikkim from July 2011. The main objective of the project is mapping of various thematic layers of Sikkim in 1:10,000 scale for decentralized planning.

In the first phase of the following layer generation is under progress

Land use and land cover (LULC), Roads, Drainage, etc

3. Ground Water Prospects Mapping for Rajiv Gandhi National Drinking Water Mission Phase-IV

Under the Rajiv Gandhi National Drinking Water Mission (PH-IV), ground water prospect and quality mapping using Remote Sensing and Geographic Information System techniques in 1:50,000 scales needs to be undertaken. The Ministry of Rural Development (MORD) Govt. of India has sanctioned the project with an objective to prepare the database to be used by the engineers and hydro geologist of the line departments in respective states for identifying ground water sources covering all the habitations. The IRS 1C/1D satellite data with UTM WGS 84 projection have been used as the input.

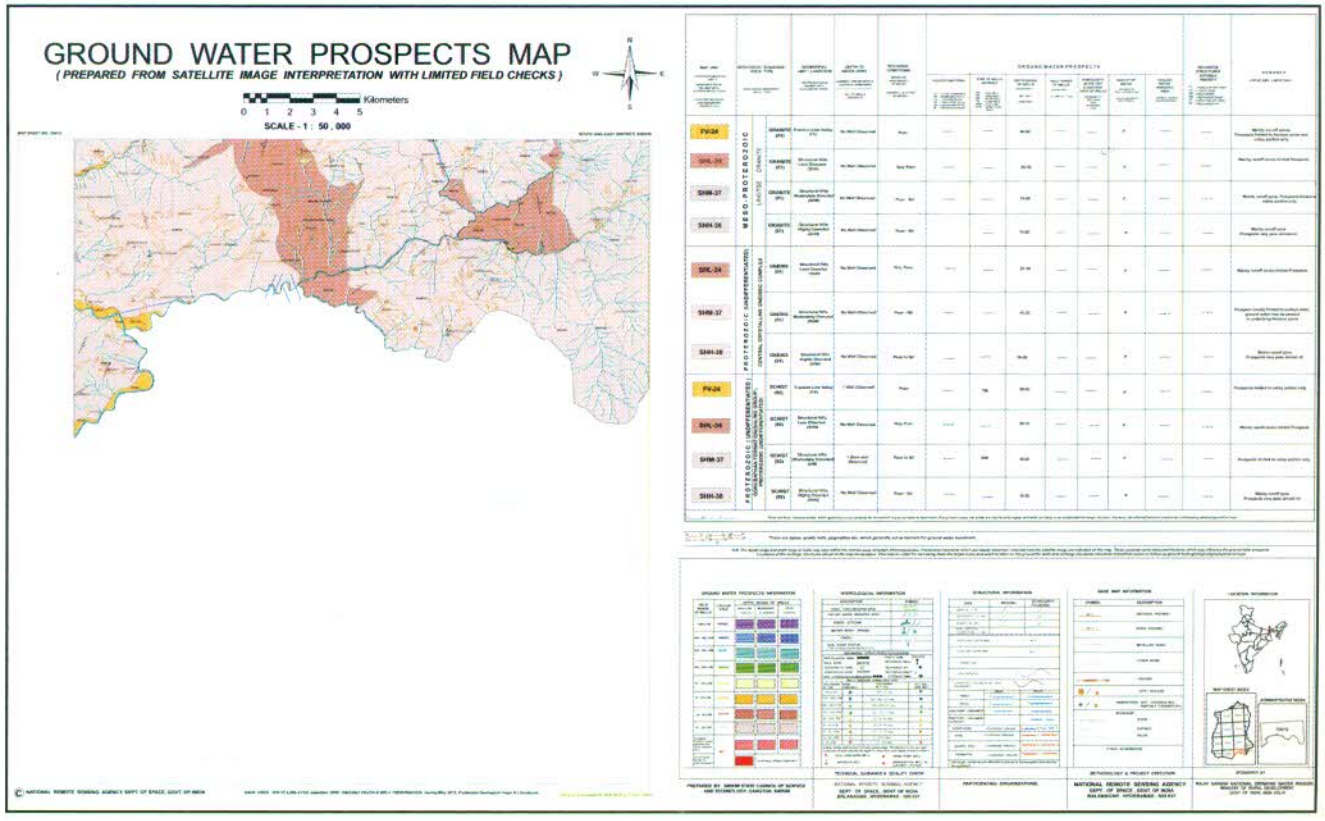
The ground Water Prospects Map includes the generation of:

i. Base map layers (Administrative Layer, Settlement, Road layer)

ii. Hydrological Layer (Drainage, Water bodies, Spring, Rainfall , Recharge structure and Irrigated area layers)

iii. Geology Layer (Lithology, Structure and Geomorphology).

In Sikkim, the work under this project was initiated from the 2011. The different layers required for the mapping has been generated by using LISS III image dated 17 December 2008. The geology layers (Lithology, Structure and Geomorphology) has been generated with the support of Geological Survey of India. Finally, all this layers are integrated according to the procedure given in the project manuals. Altogether, total number of 19 Survey of India

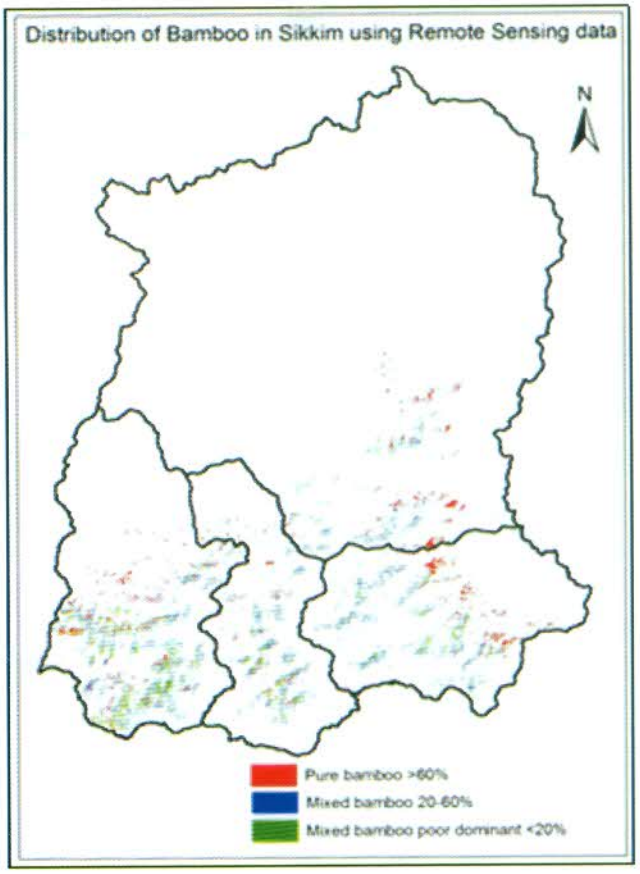


(SOI) sheet will cover the entire district of Sikkim in which 14 number of sheet are active sheets. The quality checking of the work has been done in National Remote Sensing Centre (NRSC) Hyderabad in December 2012. Further, quality checking of the work is carried out by NESAC scientist in March 2013. So far we have completed the generation of the layers for this project. The final Ground water prospect mapping will be completed by the end of next month.

The water quality testing is an important part of this project. The water quality testing of few different drinking water sources of all the district of Sikkim has also been undertaken. The testing was carried in both pre-monsoon period and post monsoon period. In Pre-monsoon period the testing was done in the month of May-June 2012 and in the month of September-November 2012 in post monsoon period.

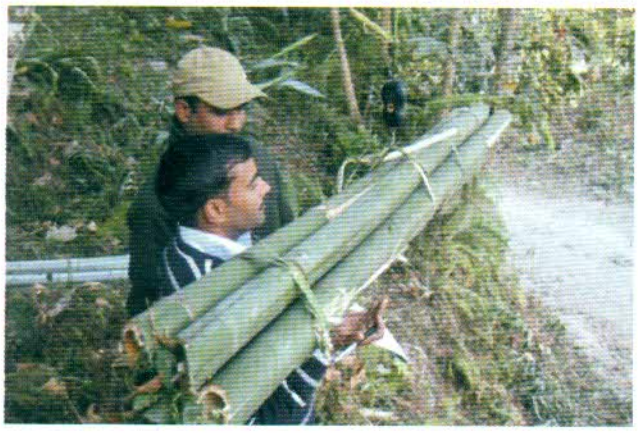
4. Identification of Bamboos in Sikkim Using RS and GIS Technique

The Bamboos are classified into three categories depending on its coverage. Pure bamboo (bamboo covers more than 60%), Mixed Bamboo (Bamboo covers in between 30-60%) and Mixed Bamboo poor dominant (Bamboo cover less than 30%). Depending upon the Culm diameter pure bamboo is further divided into three groups. Small Bamboo with Culm diameter less then equal to 10 cm, Medium Bamboo with Culm Diameter 10-20 cm and Great Bamboo with Culm diameter greater than 20 cm. The area of bamboo available in the forest and non-forest areas of Sikkim is estimated through remote sensing technique and field visits. Multi- spectral images from IRS P6 with 23.5 m resolution was used for mapping the areal extent of bamboos in Sikkim. However, the species wise differentiation on the available dataset was not possible.



The West district has the maximum bamboo coverage, 14.41% of total geographical area of Sikkim. Most of the bamboo in this district are in south-west regions including Hilley and Barsey. This is followed by East district where bamboo coverage is about 8.76% of total geographical area, bamboo covers center and southern region of this district. The South district comes third with bamboo coverage about 8.37% of the total geographical area and North district rank forth in terms of bamboo availability with the coverage about 1.42% of total geographical area.

Area wise the West district has 9856.4 ha. East district has 5592.27 ha. South district has 3651.9 ha and North district has 2395.64 ha of bamboo covered area Bamboo in the state are generally used only for domestic and social uses.



5. Land Use Land Cover 2nd Cycle

The Land use classification for 2nd cycle has been simplified from 79 classes to 54 classes based on the experience gained in 1st cycle of mapping. Onscreen visual interpretation technique is being used for land use mapping. The LISS III imagery of 2011-12 is being used for LULC classification and change detection over the previous cycle data. The LULC codes designed as per the manual will be used for codification of polygons and ground verification will be carried out for the areas where changes are observed. The finalization of the database is subject to quality assessment both at internal and external levels.

Objectives:

- To generate spatial database on land use / land cover for 2011-12
- To generate land use / land cover change database along with change matrix with respect to 2005-06 and
- To identify areas of major change.

End benefit to user

The potential users of LULC database include the, State Planning departments, Ministry of Rural Development, Environment and Forests, Earth Sciences, Central Water Commissions, Urban Development etc. Besides, it is also useful for various scientific research programmes like climate change studies, weather forecasting, growth trend analysis etc.

Finding: The change interpretation of north district and East District has been completed and submitted for final quality check to NRSC Hyderabad, and the change interpretation of other district is under progress.

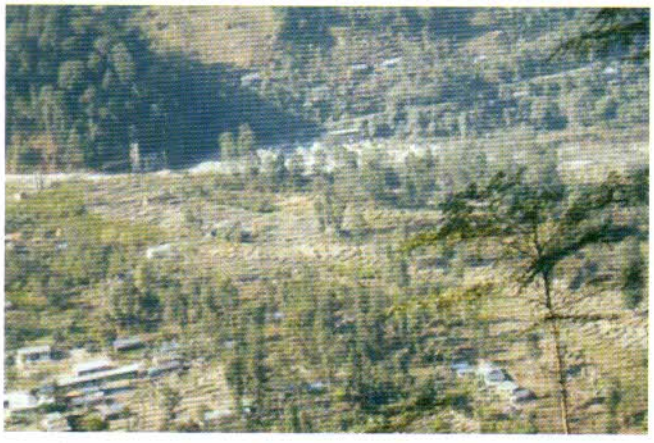


Fig. 1- Agriculture Land with Tree Clad Area

Fig. 2-Agricultural land to Build Up and Scrub Land

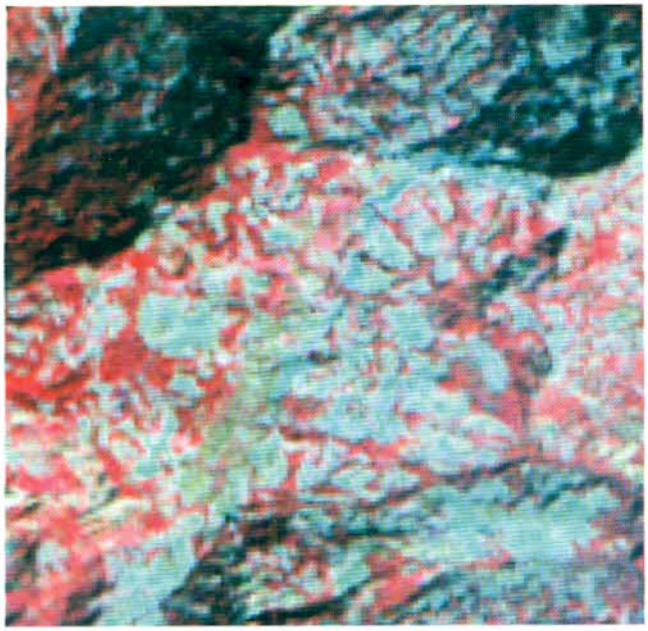


Fig. 3- Pakyong Airport area in IRS LISS III 2006

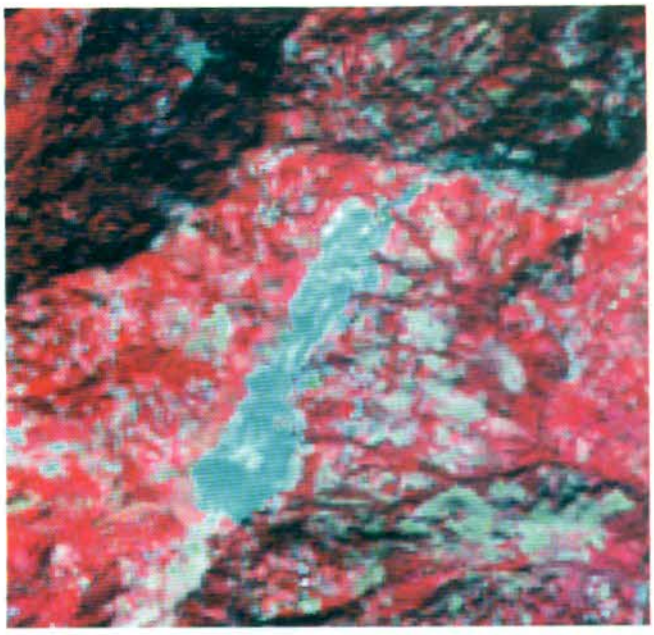


Fig. 4- - Pakyong Airport area in IRS P6 2011

6. Study of Glacier Dynamic of East Rathong Glacier of Sikkim Himalayas

The World has witnessed increase in global temperature with the dawn of industrial revolution in the twentieth century. With the rapid growth and development of industrial sector in the later period has accelerated the complex process of global warming which has created serious impact in the environment. Ice melting and glacial retreat is one of the main impact of global warming and climate change.

The Glaciers are the complex dynamic systems sensitive to their surrounding environment. They constantly change their shape and form to adopt the changes in the surrounding environment. Prolonged changes in the mean annual summer temperature of even less than 1 degree centigrade can change in glacier mass balance resulting in glacier advances or retreat hundreds of meters. In mountainous regions, glaciers forms an important source of perennial water that fed the mighty rivers that supports life in various forms. So the study of Glacier is one of great importance in the present scenario.

Sikkim being a Himalayan state of India, is one of the glacier rich areas of India and the world. It has 84 glaciers feeding two mighty glacial river system including Tista and Rangit river basin with numerous streams. Likewise in other glaciers, the glacier of Sikkim is also facing severe threat from the effect of global warming and climate change. Considering the fact, Sikkim State Council of Science and Technology with the support of the Department of Science and Technology, Government of India and with technical collaboration of the national experts in Glaciology, is undertaking the study of glacier dynamic of East Rathong Glacier of Sikkim Himalayas.

East Rathong Glacier, (Lat 27^0 34'E to 27^0 33'E and Long $88^0$07'E to $88^0$10'N) located in the West Sikkim covers a basin area of 35.95 sq.km and total ice cover area of 8.49 sq.km. The snout is located at 4674mts (June 2008). It has length of 4.5km and breadth of 1.5km. The study is in its initial phase and it covers the following objectives in its phase wise studies:

- Glacier mass balance studies: Glacier Budget
- Glacier secular movement studies: snout monitoring and glacial movement
- Sub glacial studies: including internal structures of glacier ice/depth.
- Ice core studies and Dating: to study the age of the ice and study the trapped elements and gases for past and present environmental study.
- Glacial ecology: glacier are the main indicators of climate change so the study of their long ecology is paramount.
- Meteorology: snow precipitation pattern, rainfall, evaporation rate etc. are important meteorological parameters.
- Energy balance studies: albedo phenomena , sun inclination studies, illumination, light intensity etc.
- Glacier inventory of Sikkim in every five years using satellite imageries.
- Yearly snow cover monitoring of Sikkim Himalayas using AWiFS data.
- Snow ice physics: study of old/fresh snow, firn, ice crystal, reflectance, and wavelength fluctuations etc.
- Glacial chemistry: glacial chemistry study characterizes the water quality and the rate of chemical weathering of glaciated terrain. Hydro chemical characteristics of glacial melt water help in identifying the hydrological pathway within the glacier and its changes during an ablation period by using the variation in the chemical signatures of different run off components.
- Glacier geomorphology: study of glacier and landform orientation.

In the month of October 2012 our team visited the East Rathong Glacier and fixed 13 stake in different elevation to study the glacier velocity of ERG. The team is expected to make such visits frequently to monitor the same.

7. Mapping of Glacier Lakes and development of GIS based Glacier Lake Management Information System (GLAMINFORS) for the State of Sikkim

The glaciers are nature's valuable source of fresh water for drinking water supply, agricultural, industrial and hydropower developments for present and future needs of millions of people living in the downstream. These frozen reservoirs release large amounts of ice melt water to many of the major rivers of this region. The Sikkim State Council of Science and Technology is currently engaged in monitoring of glaciers and glacier lakes of Sikkim. Jointly with

the Centre for Developing Advanced Computing (CDAC), Pune **Glacier Lake Management and Information System** for the state of Sikkim is being prepared. The information would be very useful whereby the users/decision makers would be able to get information on any glacier lake, their nature, origin, location and identify the area likely to be affected due to GLOFs (Glacial Lake Outburst Floods) etc.

Major objectives of the project are:

- Real time monitoring of the selected glacier/moraine dammed lakes in the Himalayan Region for developing preparedness and resilience in case of Glacier Lake Outburst Floods **(GLOFs).**
- Design and develop a system for identification of moraine dammed lakes, their classification, river channel profiling with the help of Digital Elevation Models, installation of field sensors at potential hazardous lakes and processing of sensor data along with remote sensing data for development of models under GIS environment for GLOFs/Flash floods, and deriving flood related information for damage assessment for the end user in real response time.
- Development of GIS based Glacier Lake Management Information System **(GLAMINFORS)** for the state of Sikkim.

Progress of the Project

Following tasks has been accomplished;

1. Preparation of following base map layers in GIS format at 1:50,000 scale:
   - Administrative boundaries (International, State, Districts, Taluka, and Available Village boundary).
   - Road/transportation network of entire state.
   - Settlement/Habitation Location (Rural and Urban areas).
   - Drainage/streams/water bodies.
   - Location of Hydel projects and industrial setup.
   - Forest Boundaries, Forest roads and Forest village locations.
2. Geo-referencing/Orthorectification, Edge Matching and mosaicking of Satellite Data
3. Preparation of various Thematic Maps such as Slope map and Glacier Inventory maps.
4. Intensive field data collection required for the project work.
5. Development of Sensor for its installation at vulnerable lakes by CDAC.

Figure 1. Lhonak lake (1976)

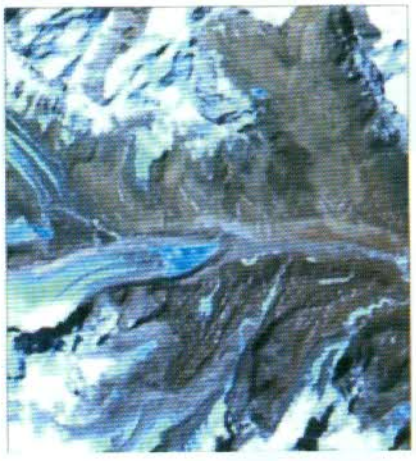


Figure 2. Lhonak Lake (1997)

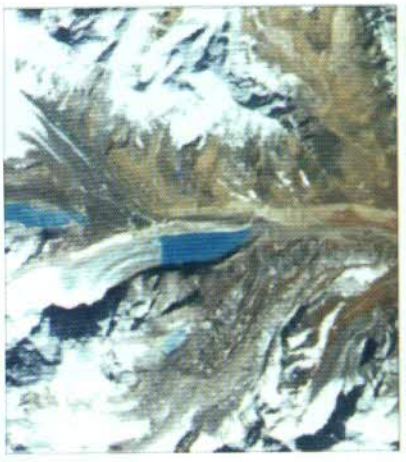
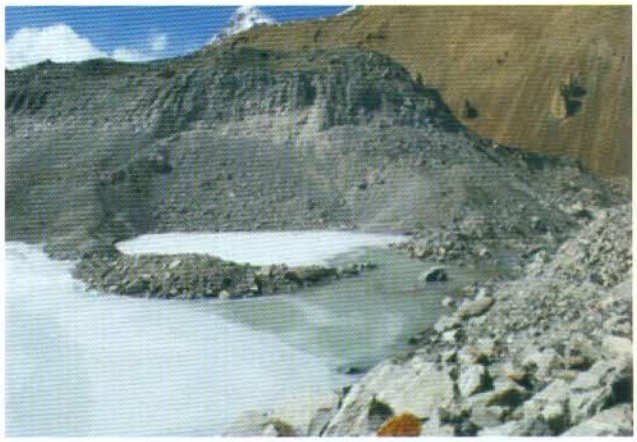


Figure 3. Lhonak Lake (2011)



Findings:

Based on the study using the time series satellite data and field visits there are 25 glacial lakes of Sikkim identified as the vulnerable lakes, out of which 8 glacial lake are identified as potential Hazardous lakes.

Sl. No	Potential Hazardous lakes
1	Lhonak Lake
2	Lake above the Lhasa Valley above Thangu village
3	Teesta Khangsey (Khangchung chho):
4	Unknown lake in West Sikkim
5	(Dod Pokhari): East Rathong Glacier
6	Gurudogmar Lake
7	Cholamu lake
8	Lake on North west of Lhonak valley

The immediate detailed study of these lakes is required and it is recommended to install the automatic sensor of the GLOF in these lakes

The Central Water Commission, Government of India has been communicated for regular monitoring of these lakes with the high resolution satellite data. A working group under the Chairmanship of Director, Snow and Avalanche Studies Establishment (SASE) Chandigarh has been constituted by DST, GoI. Field investigation by the experts is being planned for September 2013.

8. Programme on Climate change research in Terrestrial environment (PRACRITI):

The project has the following main objectives:

- Development of Models to access response of Himalayan snow and Glacier extent to Climate change.
- Development of snow and glacial melt runoff model and to assess future changes in stream runoff.
- Mapping and change detection of water spread of moraine- dammed lakes/Glacial lakes
- Updation of extent of selected glaciers of Tista basin using Remote sensing data and snout validation.

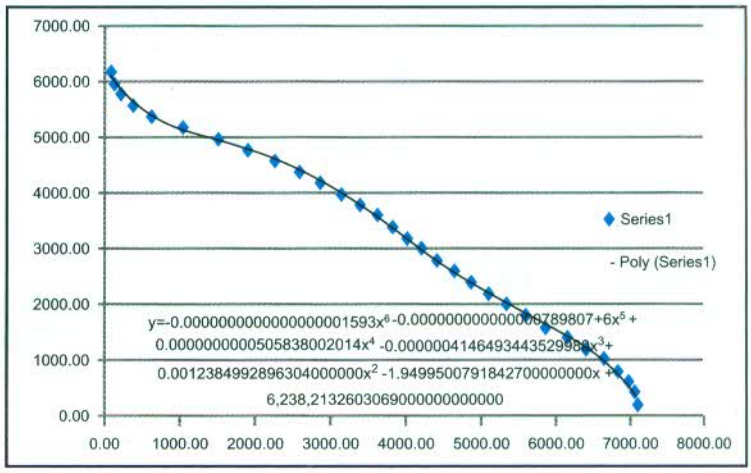
The work elements identified for the state RS Centre:

- Extraction of snow line altitude for 2005-2010 using 10 daily snow cover products.
- Collection of meteorological data and discharge data
- Validation of snout and ELA.
- Updation of the extent of selected glaciers of Tista Basin using RS data.
- Mapping and change detection of water spread of moraine dammed lakes using landsat Data.
- Development of model and report preparation.

Progress of the work

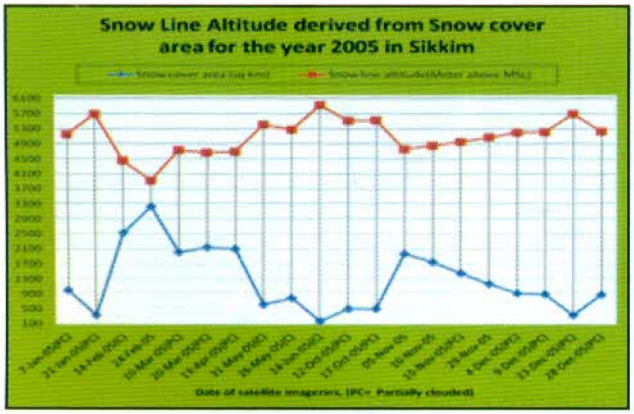
Generation of Regression Equations Models for Snow Line Altitude (SLA) for Tista and Rangit basins:

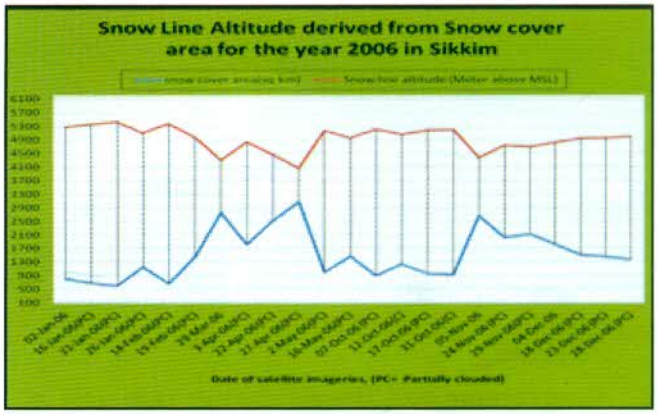
The regression equations for the both Tista and Rangit basins have been generated for the calculation of snow line altitude. For this, contour generation at the interval of 200m from ASTER DEM using ERDAS Software has been done. The error visible on the contour interval is rectified and generated the final contour interval for further work. The area of each of the contour interval has been calculated, and derived the equations for both Tista and Rangit basins.

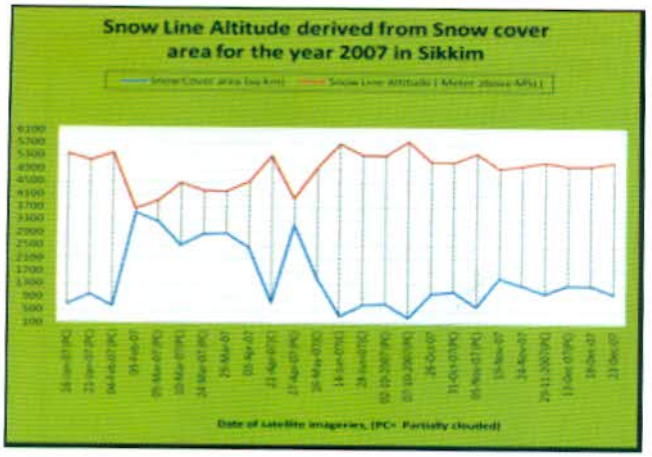


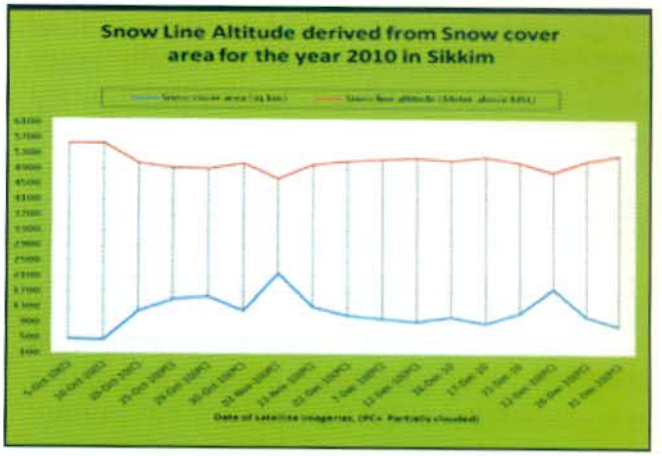
Regression Equation for Tista Basin

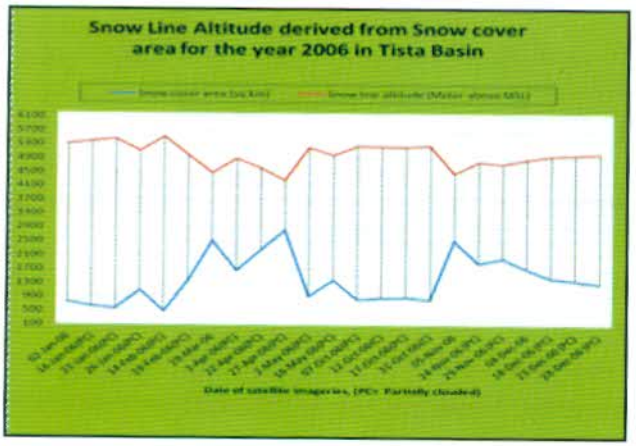
With the help of regression equations, the calculations of snow line altitude have been going on for both Tista and Rangit basins from 2005 to 2010. Since, there is a data gap between May 2008 to Oct 2010, SAC is exploring to make these data available for further classification. For the correlation of meteorological data with SLA, the IMD has been contacted.

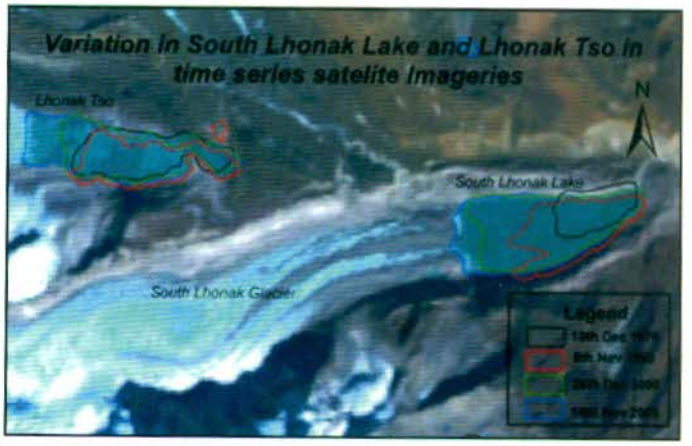












Mapping of Glaciers and Glacial lakes using time series satellite data

The data generation for the glacial lakes/ moraine dammed lakes has been done using the Earthsat images (5th November 1990). Also at the interval of 10 years, the Landsat data of year 2000 was used for the digitization of lakes. The objective was mainly the change detection in the water spread of moraine dammed lakes. The satellite images were downloaded from the Earth explorer (USGS). The digitization of glacial lakes from the recent satellite data is in progress.

Conclusion of the project

Using time series satellite data, the present study would be a great source of information in terms of change detection in the area of Glaciers and glacial lakes/ moraine dammed lakes. The study will provide the valuable information on the role of temperature when correlating with snow line altitude.

10. Snow monitoring of Sikkim Himalayas (Phase-II)

The Mapping and Monitoring of snow cover is an important part of snow and glacier studies. Its monitoring for a longer period helps in understanding the changes that takes place in our environment. The database created on the extent of snow cover also help in various studies to overcome the challenges posed by the global warming and climate change effects. At present monitoring of snow cover of entire Himalayas of India from Jammu and Kashmir to Arunachal Pradesh is going on under the Joint Project of Indian Space Research Organization and Ministry of Environment and Forests, Govt. of India. The Mapping and monitoring of seasonal snow cover using field methods are normally very difficult in a mountainous terrain, like the Himalayas. Therefore, remote sensing techniques have been extensively used for snow cover monitoring.

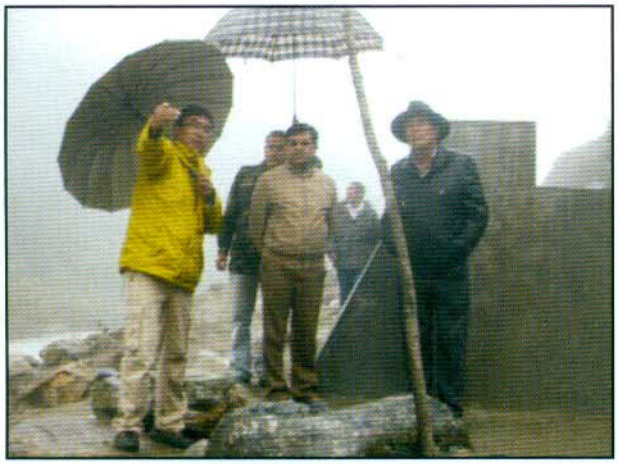
In context to Sikkim, the snow monitoring work is being carried out jointly with the Space Applications Centre (SAC), Ahmedabad from the year 2004-2005 onwards considering Tista and Rangit basin. At present the project is in its second phase. In its first phase snow monitoring of Sikkim has been completed upto the year 2007-2008. Remaining work for the year 2008-2009 and 2009-2010 is being carried out by SAC, Ahmedabad. The Snow monitoring of the year 2010-2011-2012 under second phase of project is being undertaken by the RS Centre.

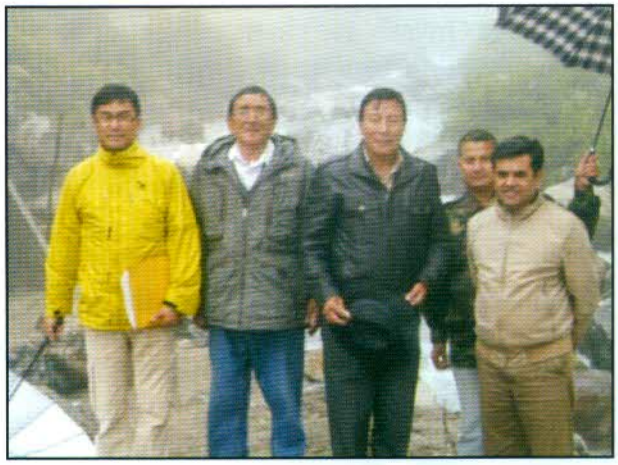
Recently, the final Report for the year 2011-2012 has been submitted to SAC, Ahmedabad. It is observed that the maximum areal extent of 50% of total area of state in the month of March 2012 for Sikkim. The highest snow areal extent of 61% observed in Tista and 21% in Rangit basins, respectively in the same month. The lowest snow recorded in the month of September, October and December in 2011. In 2012, April and May are the months with least snow cover in Sikkim. In Tista basin, the least snow cover found in the same months.

Due to the unavailability of the cloud free images for the months of June to September the mapping of snow cover is possible only for the remaining months. The year wise snow cover atlas is being prepared on each monitoring dates of images. The snow monitoring for the year 2012-2013 would be started as soon as the data is made available from SAC, Ahmadabad.

9. Thangu Microhydel project

The 2X100 KW microhydel project is being setup at Thangu village of North Sikkim. The project project work has resumed w.e.f May 2012. It is targeted to complete the project by August 2013.





Visit of Minister, Secretary DST at project site in August 2012.

11. Seismic Hazard and Risk Assessment of Darjeeling-Sikkim Himalaya (HRA)

Earthquake is major menace to the mankind killing thousands of people every year in different part of the globe. An estimated of 17,000 persons per year has been killed in the 20th century.

The State of Sikkim lies at the eastern edge of the rupture zone of the 1934 M = 8.4 Bihar Nepal earthquake which claimed about 11,000 lives and caused an intensity of VIII in the Sikkim Himalaya (GSI, 1939). It was severely shaken again, more recently by the 1988 MS= 6.6 earthquake which ruptured a deeper part of the same zone, the isoseismic VII passing through its capital town of Gangtok in an approximately NE-SW direction. Several houses in the town were badly damaged, whilst power and other communication system installations suffered subsidence, besides a series of disrupting landslides.

The Department of Science and Technology & Climate Change in collaboration with IIT Kharagpur have set up eight Seismic Monitoring Station in different part of Sikkim. The construction of Seismic Monitoring Station at Darjeeling and Siliguri is under progress.

Sl. No	Name of Station	Machine model Installed
1	Marchak (Science Center)	ETINA
2	Singtam	ETINA
3	Padamchen	ETINA
4	Melli	ETINA
5	Utteray	ETINA
6	Pelling	ETINA
7	Mangan	ETINA
8	Chungthang	ETINA

Support to the user Agencies

- GPS data collection and mapping of the polling station of Sikkim for the Election Department.
- Post earthquake relief activities mapping for Land Revenue and Disaster Management Department.
- Catchment area mapping for various projects of Irrigation and Flood Control Department
- Hands on training on RS and GIS to the students of Sikkim University.

Sikkim State Remote Sensing Applications Centre
Department of Science and Technology and Climate Change

The Sikkim State Remote Sensing Applications Centre under the Department of Science and Technology was established in the year 1996. At present, the Centre has Seven Workstations and two PC along with 5Kv UPS. The Centre has one photogrammetry LPS-11, two Arc Info-10 and one ERDAS-9 software. The Centre also has A0 size plotter and A0 Size Scanner.

The SSRSAC has well trained manpower in the field of Remote Sensing and GIS. The Centre has provided training to the Student of Sikkim Government College, Harkamaya college in the field of RS and GIS. The centre has been undertaking various project funded by Central Government as well as State Government. The Centre also provides the necessary data to the user department for various developmental activities in the state.

The following projects has been completed during the 11th five year plan period.

1. **Integrated Missions on Horticulture Development Funding Agency:** Ministry of Agriculture, Govt. of India
   Collaborating Agency: Space Applications Centre, ISRO & Department of Horticulture, Government of Sikkim

2. **National (Natural) Resources Information System**
   Funding Agency: Department of Space, GoI
   Collaborating Agency: Regional Remote Sensing Service Centre (RRSSC), Kharagpur

3. **Land Degradation mapping in Sikkim (First Phase)**
   Funding Agency: Department of Space, GoI
   Collaborating Agency: National Remote Sensing Agency (NRSA), ISRO

4. **Land Use Land Cover mapping of Sikkim (First Phase)**
   Funding Agency: Department of Space, GoI
   Collaborating Agency: National Remote Sensing Agency (NRSA), ISRO

5. **Forest Fire Mapping of Sikkim**
   Collaborating Agency: NRSC GOI, Forest Department GOS

6. **Wetland mapping of Sikkim**
   Funding Agency: Department of Space, GoI
   Collaborating Agency: SAC Ahmedabad

7. **Vegetation Carbon Pool Assessment Project in North Sikkim**
   Funding Agency: Indian Institute of Remote Sensing, Dehradun
   Collaborating Agency: Indian Institute of Remote Sensing, Dehradun

8. **Application of Remote Sensing and GIS in Sericulture Development in Sikkim**
   Funding Agency: Central Silk Board, India
   Collaborating Agency: NESAC, Shillong, Meghalaya

9. **Establishment of Landslide database Centre in Sikkim**
   Funding Agency: Government of Sikkim

10. **NUIS (National Urban Information System)**
    Funding Agency: Ministry of Urban Development, Govt of India
    Collaborating Agency: NESAC, Shillong, Meghalaya

11. **Identification of Bamboos in Sikkim Using RS and GIS Technique**
Funding Agency: Horticulture and Cash Crops Development Department, GoS
Collaborating Agency: Horticulture and Cash Crops Development Department, GoS

12. **Land Use Land Cover 2nd Cycle**
Funding Agency: NRSC, Indian Space Research Organization, Bengaluru
Collaborating Agency: NRSC, Hyderabad and NESAC, Shillong, Meghalaya

13. **Programme on Climate change research in Terrestrial environment (PRACRITI):**
Funding and collaborating Agency: Space Applications Centre (ISRO), Ahmedabad

14. **Snow monitoring of Sikkim Himalayas (Phase-II)**
Funding Agency: Department of Space, GoI
Collaborating Agency: SAC, Ahmedabad

15. **Seismic Hazard and Risk Assessment of Darjeeling-Sikkim Himalaya (HRA)**
Funding Agency: DST, Government of India
Collaborating Agency: IIT Kharagpur

Support to the User Agencies in the State

- GPS data collection and mapping of the polling station of Sikkim for the Election Department.
- Post earthquake relief activities mapping for Land Revenue and Disaster Management Department.
- Catchment area mapping for various projects of Irrigation and Flood Control Department
- Hands on training on RS and GIS to the students of Sikkim University.

Future Programme

1. Participate in all the national level project of Department of Space GoI pertaining to Sikkim
2. Setting up of the School level seismic laboratories
3. In depth study of the vulnerable High altitude lakes of Sikkim.
4. Take up state relevant DST GoI sponsored projects.
5. Fulfill the of RS and GIS related requirement of the State.

BIOTECHNOLOGY DIVISION

1. Establishment of Biotechnology Research and Application Centre at Sajong, Rumtek

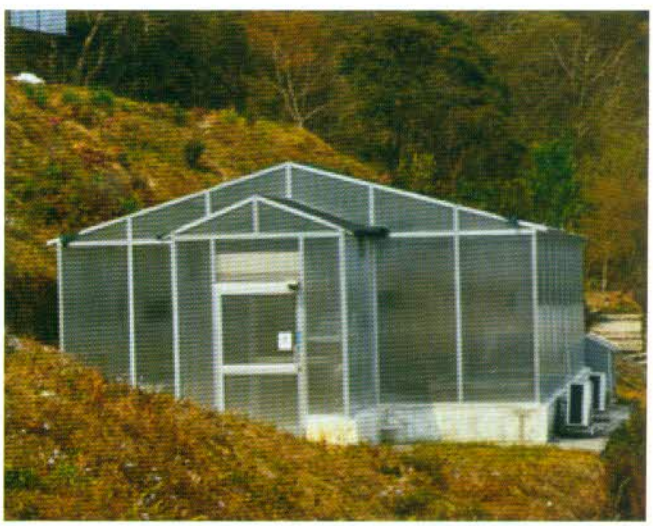
Biotechnology Research and Application Centre has been established at Sajong, Rumtek. Single storied building to house the laboratory and office has been constructed and furnished with laboratory designs. The instruments procured under various project is housed in this laboratory and R&D activities is being carried out. 01 hi-tech green house fully automated is constructed along with the five normal polyhouse and two shade house. Field for development of herbal garden, trial/experimental field is under preparation. Junior Research Fellows and other technical staffs are deputed to the centre to carry out the R&D and field related works.

2. Establishment of State Biotech hub project:

The project is being funded by Department of Biotechnology (DBT), Govt. of India for a period of three years commencing from December 2010.

The main objective of the project is the establishment of major biotechnology facility and trains the coordinators of the institutional hubs as well as providing support to research and training. Dr. B. C. Basistha, Additional Director is the Coordinator and Shri. K. B. Subba, A.S.O. is the Co-coordinator of the project. The project is being coordinated by Biotech Consortium India Ltd (BCIL), a company promoted by DBT, Govt. of India. The state council has received first years' budget for the project.

A



B

Figure A. Structure of State Biotechnology Research and Application Centre (BRAC) at Sajong, Rumtek (E. Sikkim)
Figure B. High-tech (automated system) Green-house for raising seedlings of economically and medicinally important plant species at Biotechnology Research and Application Centre, Sajong, Rumtek (E. Sikkim) (B).

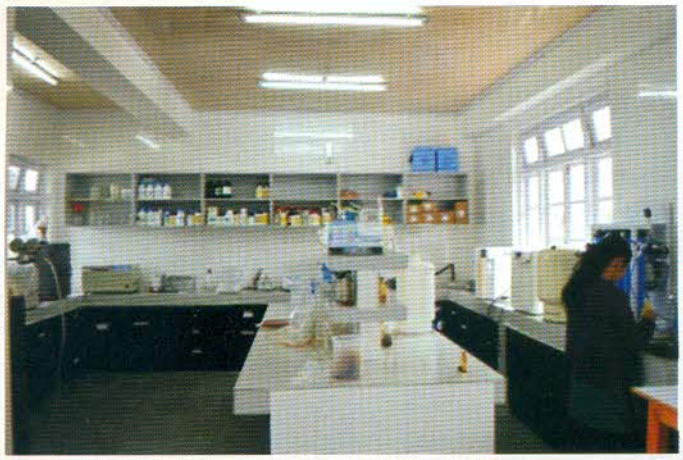


Figure. Work-space inside the laboratory of Biotechnology Research and Application Centre at Sajong, Rumtek (East Sikkim) established through State Biotech Hub project in Sikkim.

I. In order to give advice, suggestions and overall monitoring the progress of the project a Scientific Advisory Committee (SAC) consisting members from different scientific institutions like North Bengal University, ICAR, G.B. Pant institute, Sikkim University, Government College, NRC Orchids was constituted with the Member Secretary, Sikkim State Council of Science & Technology as Chairman. The meeting of the SAC has been conducted to achieve the objectives of the project successfully.

Dr. Arnab Sen, Head, Botany Department, North Bengal University has been appointed as consultant for a period of two years to guide, suggest and advice on the overall progress of the project.

II. A workshop has been conducted on "Biodiversity of Sikkim Himalayas" at Science Centre, Marchak on 22nd Sept. 2012. The Junior Research fellows (JRF), technical assistant and lab attendant in the project are actively involved in Research and Development (R&D) activities.

Bioinformatics Centre

Introduction

During the seventh five year plan, the Department of Biotechnology (DBT), Government of India started a National Network on Biotechnology called Biotechnology Information System Network (BTISNet). Under this network, the DBT has established different Bionformatics Centres including the Bioinformatics SUB DISC (Distributed Information Sub-Centre) in the public sector institutions across the country. Bioinformatics SUB DISC, Sikkim was established under the aegis of Sikkim State Council of Science & Technology (SSCS&T), Department of Science & Technology and Climate Change, Govt. of Sikkim with the support of DBT with the following objectives:

Objectives

The Bioinformatics SUB DISC, Sikkim has been assigned to work on Bioinformatics and its related activities with the following objectives;

i. To provide a national bio-information network designed to bridge the interdisciplinary gaps in biotechnology information.

ii. To build up information resources, prepare database on biotechnology and develop relevant information handling tools and techniques.

iii. To continuously evaluate information requirements, organize creation of necessary information and to provide information and computer support services to users of Sikkim state.

iv. To establish linkages with international resources in biotechnology information, e.g., Databanks, published literature, patents and other information of scientific and commercial values.

v. To evolve and implement programs on education and training of information scientists responsible for biotechnology information and its application to biotechnology, research and development.

vi. To develop, support and enhance public information resources for biotechnology, e.g., Genebanks, molecular biology data and related research information resources.

vii. To undertake, prepare and publish survey, reports and forecasts on several branches of biotechnology.

The Bioinformatics Centre organized a training on "Documentation of Ethno-traditional knowledge using Bioinformatics tools" on 07th December, 2012. The Resource persons of the training programme were Shri. L.K. Rai, Scientist, GBPHED, Pangthang, Dr. Bharat Kumar Pradhan, Survey Expert, JICA and Shri. Laydong Lepcha, Information Officer, Bioinformatics Centre, Sikkim State Council of Science & Technology, During the training programme the Resource Persons delivered lectures and demonstration on the Ethno-botany, its major studying phases, importance of documentation of Ethno-traditional knowledge, role of Bioinformatics for the documentation of Ethno-traditional Knowledge, threat and conservative aspects of Ethno-traditional knowledge and roles of Bioinformatics software. In the conclusion session, Dr. B.C. Basistha, Additional Director and Coordinator, Bioinformatics Centre, SSCS&T, distributed certificates to the participants of the training programme.

Figure. The trainees of the programme along with Resource persons of the training progarmme. Dr. B.C. Basistha, Additional Director

Figure. Science Direct training under progress at Bioinformatics web laboratory.

I. The Centre has prepared a database on economically important Agro-horticultural crops diseases of Sikkim. The database shall be very useful for the researchers in studying crop diseases and its mitigative aspects.

II. On 9th September 2012, the Centre conducted a training programme on techniques and methodologies of online research journals from Science Direct. The training was attended by Scientists, Senior Research Fellows, Junior Research Fellows, Research Assistants and other relevant researchers, working in the Council. During the training

programme Mr. Tanumoy Misra, Product Trainer, Elsevier Science & Technology, New Delhi, gave hands on training to the trainees.

III. The Bioinformatics Centre has published its V[th] Volume of the News Letter "BIOGYAN" which is also been made online at centre's website: http// www.bioinformaticssikkim.gov.in.

IV. The Bioinformatics Centre has developed a Biological animation on Plant Physiology and Genetics. The animation software will be very helpful, both to the teachers and the students to understand Biology in much convenient way. The animation CDs shall be distributed among the various Colleges and schools of Sikkim.

V. Bioinformatics Centre, Sikkim State Council of Science & Technology is preparing Videographic Documentation of *Rhododendron* species of Sikkim. The videogrpahic documentation of Rhododendron species will promote sustainable research and conservation of *Rhododendron species* of Sikkim Himalayas and can be preserved as authentic database.

BIOGYAN

BIOINFORMATICS CENTRE

Sikkim State Council of Science & Technology

Quarterly News Letter, Volume -V, April, 2012

Training on accessing of online e-journal, gene sequence alignment and phylogenetic analysis

Three days training programme on accessing of online e-journal, gene sequence alignment and phylogenetic analysis was organized at Bioinformatics Centre, Sikkim State Council of Science & Technology on 23rd March 2011.

The resource persons of the training programme were, Dr. D.D. Lal, Coordinator, DELCON consortium, Government of India, Shri. Sunil Thorat, Senior Scientist and Dr. Pradeep, Scientist, Regional Centre of Institute of Bioresource and Sustainable Development (RCIBSD), Government of India, Tadong. In the inaugural session of the training programme Compiled research articles book on Bioresources of Sikkim, III[rd] volume was also unveiled by Shri. M.L. Arrawatia, IFS, Secretary, Department of Science & Technology.

During the training, Dr. D.D. Lal, imparted hands on training on accessing of online e-journals and downloading the full text research papers to the research scholars of the Sikkim State Council of Science and Technology and other research institutes of Sikkim. The free online journal facility is available in Bioinformatics Sub DISC, Sikkim State Council of Science & Technology.

Shri. Sunil Thorat and his colleague delivered lectures on gene sequence alignment and phylogenetic analysis and performed demo of the aligning gene sequence and construction of phylogenetic tree, followed by followed by hands on session.

Training on Biodiversity and Biological Database Development, its Retrieval and use in Research and Conservation

Two days training programme on "Biodiversity and Biological Database Development, its Retrieval and use in Research and Conservation" was conducted by Bioinformatics Centre, Sikkim State Council of Science & Technology, Department of Science & Technology and Climate Change on 04th & 05th November, 2011. During the training the resource persons, Mr. Kiran Sonar and Mr. Bikram Saha, from Department of Botany, -

Figure. V[th] Volume of the News Letter BIOGYAN.

Publications:

- A reckon on the conservation and sustainability of *Abroma augusta* Linn. of Sikkim Himalaya: A review report in *Journal of Medical Science and Research. (Accepted)*
- Pradhan. Sushen, Basistha.B.C., Handique.J.Pratap (2012). Determination of genetic fidelity of Micropropagated plants of *Zingiber officinale* cv-*Majhauley* of Sikkim Himalaya using RAPD markers. Int. J. Fundamental Applied Sci. Vol. 1, No. 2, 21-24.
- Laydong Lepcha, B.C.Basistha and ML Arrawati (2012). Landslides: A threat to Bioresource of Sikkim Himalaya. Sikkim Biodiversity: Significance and Sustainability. Pp. 271-276.
- Laydong Lepcha & B.C. Basistha (2013). *Proteomics in Bioinformatics.* Biogyan News Letter, Bioinformatics Centre, Sikkim State Council of Science & Technology. Vol.6, p3.
- Smrita Pradhan & B.C. Basistha (2013). Stinging Nettle (*Urtica dioca* L). Biogyan News Letter, Bioinformatics Centre, Sikkim State Council of Science & Technology. Vol.6,p3.
- Sushen Pradhan (2013). Ginger, *Zingiber officinale (*Variety,*Sanuaduwa*). Biogyan News Letter, Bioinformatics Centre, Sikkim State Council of Science & Technology. Vol.6,p4.
- *Rajdeep Gurung* & B.C. Basistha (2013). *Patenting of Biotechnology in India.* Biogyan News Letter, Bioinformatics Centre, Sikkim State Council of Science & Technology. Vol.6, p4.

3. Patent Information Centre

Introduction

The Patent Information Centre (PIC) was established under the aegis of Sikkim State Council of Science & Technology (SSCS&T), Department of Science & Technology and Climate Change, Govt. of Sikkim in the year 2007 and it is the eighth youngest centre in India. Technology Information and Assessment Council (TIFAC), New Delhi funded the centre until 2010. Presently, the PIC is supported and funded by the Department of Science and Technology (DST), Govt. of India (GoI). The centre is a one of the main parts of TDT (Technology D T) of DST, (GoI), and has been financially supported as a grant-in-aid scheme of Council. Recently, the Government of Sikkim accorded the PIC, SSCS&T as the State Nodal Agency for Intellectual Property Rights and its related activities in the State of Sikkim vide notification no. 05/DST/2013 dated 20.03.2013.

Figure: Display at Sikkim Science Centre Marchak

Objectives

The Patent Information Centre is engaged to work on the Intellectual Property Rights (IPRs) with the following objectives;

i. For sensitization and awareness about IPR in Sikkim.

ii. To carry out research activities in the field of IPRs.

iii. To identify potential Intellectual Properties (IPs) of Sikkim state.

iv. To facilitate registration of IPRs.

v. To facilitate commercially exploitation of the IPR registered assets.

vi. Continuous awareness activities of IPR in the Science Centre through displaying of permanent flex.

II. Patent Search Activity.

Patent search activity is going on for proving support for patent filing from the state. PIC is providing patent search facilities to all the research institutes and the colleges and universities. The centre has also created awareness and sensitized about patent search, patent drafting and filing activities of the PIC during different programs of the Council. The PIC, Sikkim has procured 30 years patent database with bimonthly renewable version from Patent Infos Chennai. The work is under process (ongoing activity).

III. IPR Cell created by PIC, SSCS &T

Total five numbers of IPR cell has been created in the state by PIC, Sikkim State Council of science & Technology in the year 2012-13. Name of the IPR cell created are :

a. Sikkim University
   6th Mile, Tadong, Gangtok, East Sikkim
b. College of Engineering & Post Harvest Technology (Central Agriculture University) Ranipool, East Sikkim
c. Sikkim Government College, Tadong, East Sikkim.
d. Sikkim Government College, Gayzing, West Sikkim.
e. Sikkim Government College, Rhenock, East Sikkim

IV. Geographical Indication (GI) registration

Geographical Indication registration and award of certificate from GI registry Chennai is under process. The two local items of Sikkim has been filed for Geographical Indication (GI) Registration under Geographical Indication Registration & Protection Act, 1999 & Geographical Indication Registration & Protection Rule, 2002. GI is one of the IPR, it helps to protect from other elite infringement and also help to get high value in the market commercially. (State like Sikkim has great scope for GI registration from the Agricultural and Horticultural field along in the field of Handicraft and Handlooms, etc). Presently, the GI filled following two items for registration is working with its legal formalities by Technology Information and Forecasting Assessment Council (TIFAC), New Delhi.

The names of the two items are:-

i. Sikkim Mandarin *(Sikkim Soontala)* &
ii. Sikkim Temi Tea *(Sikkim Temi Chiyapati)*

IV. Copyright filed.

The following two copyright has been filled by the centre:-

i. Gyapo (A story)
ii. Kathaa (A story)

V. Plant Protection Variety & Farmers Right (PPV& FR) filed.

One local variety of rice, *Kalo Nunia* has been applied for the registration of Farmers Variety with denomination *Kailash Rana* under Plant Protection Variety & Farmers Right has (PPV & FR) Act, 2001 and Plant Protection Variety & Farmers Right, Rule 2003. This rice variety was developed by one of the progressive farmer of Sikkim. The registration has been applied to the Plant authority, PPV & FR registry, Govt. of India through Deputy Registrar, Guwahati, Branch office, PPV & FR. The seed of rice *(Oryza sativa)* has been submitted to Gene Bank, NBPGR for Genetic testing.

VI. Website maintained.

The centre has maintained its own website www.picsikkim.gov.in. The website is also ready for relaunching with new design and latest updates of PIC activities (VPN and Digital Certificated has been procured and gov.in domain is also renewed from New Delhi Govt. of India).

PIC Publications:

- The PIC has published brochure with latest updates of PIC activities.
- Publication of IPR article in the Journal of "Sikkim Biodiversity- Significance and sustainability.
- A future prospective; intellectual property rights (IPR) in Sikkim himalaya- Rajdeep Gurung, Sonam R. Lepcha, Bharat C. Basistha & Murari L. Arrawatia.
- Traditional *Lepcha* craft *Sumok-thyaktuk* (*Lepcha* Hat) and its conservation in Dzongu Tribal Reserved Area (DTRA), Sikkim, INDIA. S.R Lepcha*, R. Gurung & B. C Basistha, M.L Arrawatia.
- Concept of Geographical Indication (GI)" in the local paper of the state 'Sikkim Mail".
- Patent an Intellectual Property Rights (IPR) in the local paper of the state 'Sikkim Mail'.
- Booklet of IPR questionnaire in local language (Nepali version) is in the press for final editing.
- IPR posters for awareness and sensitization about different legal rights in Indian IPR forum.

Activities taken-up during the 11th five year plan under Biotechnology Division

The division was initially established as plant tissue culture laboratory in 1994 as then under the State Forest Department. The laboratory was transferred to the Department of Science and Technology in 1998 and since then it is involved in development and standardization of protocol of various economically important plants including orchids and medicinal plants. The transition of tissue culture into the biotechnology was made with the support from Department of Biotechnology, Govt. of India. Now, the division is involved in carrying out the various biotechnological research and extension. The division is executing number of R&D and extension projects.

1. **Establishment of Bioinformatics Centre and infrastructures in the Department.**

   The centre is being funded by Department of Biotechnology, Govt. of India in 2001 and is one of the many network centre established by DBT. The centre is involved in database development and dissemination of information on biological sciences to the research and students. The centre also conduct workshops, seminars.

2. **Establishment of Patent Information Centre(PIC)**

   Patent Information Centre was established in the year 2001 supported by Department of Science and Technology, Govt. of India. The centre is actively involved in identification and facilitation of potential Geographical Indication product and patent, copyrights etc in the state. The Government has also notified the PIC as nodal agency for Intellectual Property Right in the state.

3. Development of plant tissue culture protocol of economically important and rare plants of Sikkim including large cardamom, ginger, orchids etc.

4. Execution of "**DBT mission for the Production of Quality Planting Materials and Utilization for the North East**" funded by Department of Biotechnology, Government of India. Under the projects demonstration of quality saplings of large cardamom, ginger and citrus were taken up. About 200 farmers were benefited from this project and more than one lakh saplings were distributed and demonstrated in the farmers field till date. The project is on-going.

5. Execution of "**Ecological study of Seabuckthorn and the genetic diversity of *Frankia* associated with it in Sikkim**" funded by Department of Biotechnology, Government of India.

   Ecological and genetic diversity studies

of the wonder plant of Himalayas, sea buckthorn was carried out and significant findings were made.

6. Developed protocol for micro-propagation of *Cymbidium whitae*, a rare orchid species of Sikkim Himalaya discovered by the wife of James Claude White in the jungle of Gangtok. This orchid is endemic to Sikkim only.
7. Developed protocol for micro-propagation of *Cymbidium eburneum,* another rare orchid species of Sikkim Himalaya.
8. Development of large cardamom sucker nursery for research purpose, development of mandarin plot, plantation of citronella, plantation of bamboo and other trees in the premises of Biotechnology Research & Application centre (BRAC), Sajong.
9. Construction of Laboratory Building, Guest House and Staff quarters at Biotechnology Research & Application centre (BRAC), Sajong.
10. Establishment of State Biotech Hub in Sikkim funded by DBT, Govt. of India.
11. Construction of hi-tech greenhouse, polyhouse, modular furnishing of laboratory, construction of automatic controlled growth rooms, supply and installation of castor racks, laminar air flow, autoclave etc. at BRAC, Sajong to be carried out shortly.
12. Construction of polyhouses and shade houses under the DBT mission project is going to be carried out shortly in the premises of BRAC, Sajong.
13. Procured laboratory equipments, instruments and chemicals for Biotechnology Research & Application centre (BRAC), Sajong.
14. Selected a plot of land measuring approximately 5 acres in Pakyong, East Sikkim for establishment of Biotech Park in Sikkim.
15. **Project on State Biotech hub**

    The project is being funded by Department of Biotechnology, Govt. of India. Under the project state of art biotechnology laboratory was established. The project is on-going.

    Future activities:.

    - Project proposal on training on floriculture submitted.
    - Project proposal on mushroom training submitted.
    - Project proposal on documentation of traditional knowledge submitted.
    - Project proposal on in-silico bioinformatics programme submitted.
    - Submission of biotech incubation/biotech park to the funding agency.
    - Genetic documentation and study of local medicinal and economically important crops.
    - Extensive breeding programme in large cardamom for development of disease resistant breed.

TRANSFER OF TECHNOLOGY
&
COMMUNICATION AND POPULARISATION OF SCIENCE

The details of work carried out under the different projects are as under:

Science Awareness, Communication and Science Popularization Programme:

1. DNA Club (DBT's Natural Resources Awareness (DNA) Clubs):

The need for inculcating a scientific ethos at a young age has been felt especially in view of the fact that today we not only need to make children scientifically aware but also need their complete participation in conserving our rich biodiversity. National Bio resource Development Board (NBDB), Department of Biotechnology (DBT), Ministry of Science and Technology, Govt. of India started a DNA Club for school children in 2009. **DNA Club is DBT's Natural Resources Awareness (DNA) Clubs for school going children.**

The clubs has been divided into two groups: VI-VIII standard and IX-XIIth standards. Each school enrolled 40-50 children per school. The contents of the activities for the groups varied. While VI-VIIIth standard, the activities would focus more on Biodiversity and Bio-resources in general, the activities for IX-XIIth standard would focus primarily on Biotechnology. The activities was defined in such a manner that they are extra-curricular, yet oriented towards the curriculum, to ensure acceptability by the school teachers. A teacher orientation programme would be a necessary component of these activities, preferably arranged by the RRAs at least once a year. Vacation Training Programme was also a part of these clubs activities. Each club was given few essential types of equipment to carry out experiments and field studies.

Sikkim State Council of Science & Technology has been identified as the REGIONAL RESOURCE AGENCY (RRA) to implement the programme in Sikkim. TERI-North Eastern Regional Centre is the PROJECT MONITORING UNIT (PMU) of the project. This programme funded by Department of Biotechnology, Government of India is being implemented in Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and **Sikkim**. Thirty five schools were identified within the state for implementation of this project for support through TERI-NE Regional Centre. The duration of the project is three years.

Objectives of DNA Clubs:

- To inculcate among young students a renewed sense of appreciation for bio-resources of the country, their use and management.
- To promote deeper awareness about bio resources and to enthuse students about role of biotechnology and their sustainable utilization especially in the North- East region.
- To introduce young minds to the cutting edge of science as it interfaces with bio-resources.
- To facilitate interface between generation next and individuals and institutions of excellence in science.
- To create opportunities for DNA clubs to showcase their efforts and achievements.
- To invite bright young minds to participate in vacation programs aimed at creating a core constituency of support for conservation and sustainable management of bio-resources through use of science.

Activities related to the DNA Clubs:

The activities under the DNA clubs are proposed to be unique mix in school, out of school activities as well as interaction with eminent person engaged one way or the other with Bio-resources and Bio-technology.

Activities of Regional Resource Agency (Sikkim State Council of Science & Technology) in the schools:

I. Lectures and discussion
II. Field visits to study diversity
III. Hands-on activities and action projects
IV. Laboratory studies and experiment
V. Visits to laboratories and institutions for demonstrations on advanced techniques in biotechnology
VI. Competitions on various biotechnology themes
VII. Defining tentative activity calendar.

Activities of DNA clubs in the school:

I. Lectures by scientists, school teachers
II. Do it yourself activities
III. Discussion forum
IV. Competitions on themes of Biodiversity
V. Field visit for plant exploration and collection
VI. Project works
VII. Visit to research Labs and institutes
VIII. Visit to botanical gardens and zoological parks
IX. Exposure visit to biodiversity hotspots
X. Vacation training programme

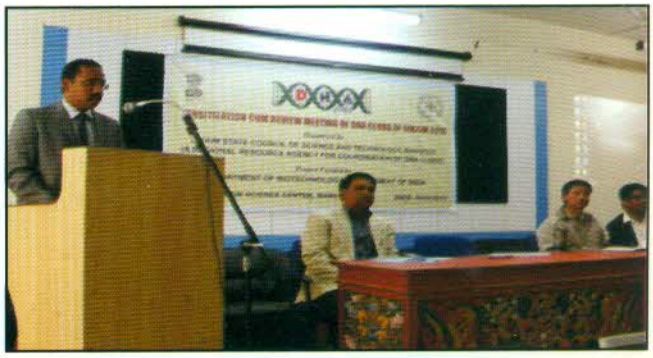
Role of Project Monitoring Unit TERI-NE:

I. Charting out the yearly activities and communicating to all the schools
II. Training of teachers
III. Establishment of laboratories and defining activity calendar
IV. Helping RRAs in arranging field visit and making course material
V. DNA Club festival
VI. Disbursement of funds to respective agencies in States
VII. Monitor implementation of school activities
VIII. Preparation of consolidated periodic reports for all the clubs
IX. Conduct meetings of the RRAs of North-East
X. Facilitating visits of committee members to monitor the work being done by each RRAs on a periodic basis.

Hon'ble Chief Minister launching the DNA Club programme During Platinum Jubilee Celebration of Namchi Sr. Sec. School On 14th October 2009

Hon'ble Chief Minister giving away science equipments to DNA members

Hon'ble Minister Addressing the Coordinators of DNA Clubs during Veledictory Function



Secretary Science & Technology addressing the DNA Club members during inaugural session of lecture series

2. Innovation in Science Pursuit for Inspired Research (INSPIRE):

INSPIRE Programme is centrally funded flagship programme of the Department of Science & Technology, Govt. of India which is being implemented through State and UT administrations. The objective of this programme is to develop scientific temper amongst the young and to motivate them to take up scientific career for the scientific and technological advancement of the country. This programme has five components covering entire range of education and research from class VI to post doctoral stage of a student. The first component of this programme is INSPIRE Award which recognizes the talents among students at a very early stage. Each INSPIRE Awardee receives a onetime award of Rs.5000/- in his /her school carrier and with this money the awardee will be required to make a project / model which will subsequently be displayed at the exhibition organized at various level , including national level.

In the year 2010-11, Students from Sikkim bagged IInd and IIIrd position at the National Level Exhibition in Regional Category held at Pragati Maidan, New Delhi during 15-16th August, 2011. The winners received the awards from the President of India. Accordingly a total of 631 INSPIRE AWARDS have been distributed to various schools all over the state so far. District level and State Level Exhibition was held for these awardees to enable them to compete at National Levelduring 2012-13. Students received awards for state level category during National Level Exhibition cum Project Competition in August 2012 held at Pragati Maidan, New Delhi. It is now targeted to cover all schools within the state for INSPIRE Award in the year 2013-14.

Students of Sikkim receiving awards from President of India

3. National Science Day Celebration 2012
The focal theme: "Clean Energy Options and Nuclear Safety"

National Science Day is observed on February 28, every year. It is the programme of National Council of Science & Technology Communication (NCSTC), DST, New Delhi. Various activities are being organized throughout the country to generate scientific temperament among the Students/ Collegians/ General Public/etc.

With the above view the Sikkim State Council of Science & Technology had organized the launching celebration of National Science Day2012 on Feb. 28.2012 at Sikkim Science Center, Marchak and thereafter declared to organize various activities such as District Level Quiz Competition/ Debate/ Lecture series/etc.

Accordingly District level quiz & painting competition and Lecture series was organized starting from April 2-13,2012 covering 60 schools.

The Programme (Quiz & Painting Competition and Lecture) was conducted first at Govt. Sr. Sec. School, Mangan on 02.04.2012 then followed by venue at Passingdong SS, Upper Dzongu on 3.5.2012. Next venue was to Dikiling SSS then to Modern SS and finally at Sikkim Science Center, Marchak where 5 schools participated out of 7 schools invited for the programme. Quiz was participated by the students of class IX & X and Painting was done by the Class V students.

The winners of Quiz & painting competition at the identified venues are

1. Renuka Pandey and Pankaj Kumar Gupta from Mangshila SS at Mangan SSS,
2. Savita Kumari and Ongchu Lepcha Gor SS, U. Dzongu at Passingdong SS,
3. Anish Sharma and Jiwan Giri from Sudunglakha SS at Dikiling SSS,
4. Anup Kr. Gupta and Ravi Kr. Prasad from Modern SS at Modern SS
5. Ayantika Santo and Arun Rajak from Rangpo SSS held at Sikkim Science Center in quiz competition.

The Resource Person, Dr. Rabin Chettri, HOD (Physics), Sikkim Government College and Mr. B.Kunwar, Assoc. Professor(physics dept.) presented their lecture and presentation. The lecture was based on the given theme of NSD 2012 . Both of them explained about various aspects of Clean Energy options, cost of maintenance & feasibility of Renewable sources of Energy, the functioning system of Nuclear Energy, its benefit, the effect of nuclear rays, Success and failure stories of all the sources of energy options etc.

Shri A.K.Srivastava addressing the gathering during valedictory function of NSD 2012

Lectures series during NSD 2012 on the focal theme 'Çlean Energy Options and Nuclear Safety'

Hands on experiments demonstration during NSD 2012

4. State Level National Children Science Congress 2012

National Children Science Congress is the programme funded by National Council of Science & Technology Communication (NCSTC), DST, Govt. of India. The primary objective is to make a forum available to children of the age group of 10-17 years both from formal school system as well as from out of school to exhibit their creativity and innovative skills and more particularly their ability to solve a societal problem experience locally by using the method of science.

Resource Teachers Orientation Workshop was organized in November 9-10, 2012 at Sikkim Science Centre and attended by 38 Science Teachers from various schools of the state. The given theme for this year and 2012 was 'ENERGY: EXPLORE, HARNESS & CONSERVE' with six sub themes based on focal theme.

I. Energy Resources
II. Energy Systems
III. Energy & Society
IV. Energy & Environment
V. Energy Management & Conservation
VI. Energy Planning & Modelling

Additional Director, Sikkim State Council of Science & Technology and Dr. B. C. Kusre, Associate Professor, College of Agriculture Engineering & Post Harvest Technology, Marchak, Ranipool, Dr. Bhakta Kunwar, Senior Lecturer, Sikkim Government College and Associate Professore from Sikkim University were the Master Resource Person during the Workshop.

The State Level 19th National Children Science Congress was organized by Sikkim State Council of Science & Technology in the month of December 10, 2012. Total of Fifteen Projects were selected from the entire four districts to present at State Level Children Science Congress. Best project were selected from Chujachen Senior Secondary School, Namchi Girls Senior Secondary School, Temi Senior Secondary School National Level Children Science Congress was held at Banaras Hindu University, Benares December 27-31.

State Level National Children Science Congress 2012 programme at Sikkim Science Centre, Marchak.

5. Environmental Information System (ENVIS) centre on Eco-tourism:

The Ministry of Environment & Forests, Government of India has provided Environmental Information System (ENVIS) Centre on **Eco tourism theme for the whole country at Sikkim State Council of Science & Technology.** This Centre has taken up various activities for promotion of Eco-Tourism and also publishes ENVIS newsletter on Eco-Tourism regularly. A website www.scstsenvis.nic.in provides various information's on Eco-Tourism. The project is funded by the Ministry of Environment and Forests, Government of India. The Center is functioning since December 2000.

ENVIS is a decentralized system using the distributed network of data bases to ensure integration of national efforts in environmental information collection, storage, retrieval and dissemination to all concerned including policy planners, decision makers, research workers and the public.

The Objectives of the ENVIS Centre are as given below:

1. Long-term objectives:

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

2. 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 objectives 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 utilisation capabilities;
- to promote exchange of information amongst developing countries.

3. The responsibilities of the ENVIS Centre on Ecotourism are:

- Establishment of linkages with all information sources, and creation of data bank on selected parameters in the subject area assigned.
- Identification of information gaps.
- Publish newsletters and Bulletins.
- Develop library facility and provide support to the focal point on the subject area.

Most importantly serve as interface for the users on the assigned subject.

Activity Report of the ENVIS Centre Sikkim on Ecotourism for 2012-2013:

1. Database on the parameters specified by the Ministry as Status of Eco-tourism, Flora and Fauna and Research and Literature has been worked upon and new information on these parameters updated regularly in our website www.scstsenvis.nic.in for proper dissemination.
2. Information also in the form of monthly news clippings collected from local and national dailies/internet/books and magazines, ecotourism events worldwide has

been updated in the website with a linkage to their websites, case studies and articles on ecotourism and other issues pertaining to the ecotourism of the country.

3. Information pertaining to the tourism of the state is updated as and when available thus assisting the tourism of the state towards information dissemination on a national level.
4. The ENVIS homepage has been redesigned and made more dynamic with adding more photos on the photo gallery and bringing changes to make it more users friendly.
5. The Centre has brought out a newsletter addressing issues related to climate change and tourism and health tourism and also a compilation of abstracts from research papers on Ecotourism of India.
6. Important linkages to the tourism websites of the country and the state as well have been given in the ENVIS homepage.
7. The queries coming to the Centre in the form of emails, telephone, letters or personal visits has been effectively responded and books from the ENVIS library has been effectively made use of thus assisting the research workers, students and the general public in the area.
8. The infrastructure of the Centre has been upgraded rendering benefits on the usage of facilities to the visitors and various research papers on Eco-tourism have been collected for reference.
9. The Centre mainly focused on the village tourism and the tourism infrastructure in the national as well as state level during the year.

Specific achievements made by the Centre towards ENVIS objectives

- The Centre has built a repository for information dissemination through its website and its publications in the form of Newsletters, Abstract volumes, books etc.
- The Centre has maintained a good collection of books in the ENVIS library in the concerned thematic area.
- The Centre has effectively responded to the queries that comes in the form of e-mails, telephone calls or personal visits.
- Thus the Centre has played a significant role in helping out the research workers, students, policy planners and those in the field through information dissemination.

6. Bio-Informatics infrastructure Facility (BIF) for the Biology Teaching through Bio Informatics(BTBI) under BTISnet DBT at Sikkim Science Centre, Marchak Activities of BIF at Sikkim Science Centre:

i. Developing the website to creating awareness of biotechnology through bioinformatics.
ii. Development of interactive information and interpretation kiosk with visuals on different facets of biodiversity of Sikkim
iii. Collection, collation, compilation & dissemination of biotechnology related Information to students.
iv. Nature interpretation facility about wild sanctuary and Nature Park.
v. Development of interactive computer based quizzes on bio resources of Sikkim.
vi. Web links to Biotechnology research centre and state of the art institute around the country for research prospects.
vii. Display and Visual tour of biological processes in interactive ways with multimedia.
viii. Environmental awareness through short documentaries.
ix. Generating awareness about recent advancement in the field of biotechnology and nanotechnology.

x. Awareness and visual tour in Human Genome Project, robotics, genetics telemedicine, instrumentation etc.

xi. Web links to DBT website, ENVIS, Sub DISCs, DST websites etc.

7. Extension of Sikkim Science Centre and Construction of 8meter dia Planetarium

- The Sikkim Science Centre is one of the important facilities created for communication, popularization and outreach of science and technology in the State. This Centre has been set up at Marchak, East Sikkim with the support of National Council of Science Museums, Government of India. It was inaugurated and dedicated to the people of Sikkim on 22nd February, 2008 by the Hon'ble Chief Minister of Sikkim.
- Further extension of Sikkim Science Centre has also been taken up with the support of National Council of Science Museums, Government of India. This will include 8 meter diameter Planetarium as well as thematic galleries on recent advances in science and learning science through fun, 3D theatre, space & biotechnology gallery.
- The works for extension of centre and planetarium is expected to be completed by October 2013.

Sikkim Science Centre, Marchak

8. Construction of Technology Bhawan at Deorali, Gangtok:

For the development of Science & Technology in the State, construction of Science & Technology Bhawan at Deorali, Gangtok with modern and state of the art facilities is expect to be completed by mid 2013.

Activities taken up during 11th five year plan under Technology Transfer and Communication & Popularisation of Science

1. Project Title: Identification of strategy of mapping of S&T needs in State (Completed)
Approved objectives of the proposal

1. Inventorisation and mapping of relevant sectoral area of entire state requiring S&T Intervention based on secondary resources.
2. Documentation of problem including areas, drafting of specific and well defined problem statements, mapped together with S&T resources available to plan and implement Problem specific S&T interventions.

2. Project Title : Biological Integration of Farming Activities and Resource Management (BIO-FARM) (Completed)

Approved objectives of the project:

- To produce food of high, nutritional quality in sufficient quantity for the family
- To enhance biological cycles within the farming system involving microorganisms, soil flora and fauna, plants and animals.
- To use, as far as possible, renewable farm resources in locally organized agricultural systems.
- To preserve, document and enhance traditional and indigenous knowledge of cultivation, land management, pest control, seeds, cropping patterns, varieties and animal breeds.
- To explore possibilities of forward linkage and value addition at individual and collective levels.
- To study the income feasibility generated from a compact area of half an acre or less.
- To design suitable tree-crop integrated systems for sloping cultivated lands of the region in a participatory and collaborative framework.
- To involve local **Panchayati Raj Institution members** in various stages of farming system.

3. Project: Establishment of Sikkim Science Centre, Marchak (Completed)

The Sikkim Science Centre is one of the important facilities created for communication, popularization and outreach of science and technology in the State .This Centre has been set up at Marchak, East Sikkim with the support of National Council of Science Museums, Government of India. The Science Centre has a number of thematic galleries, outdoor science park and facilities for training and capacity building programme.

The further extension of Sikkim Science Centre is also being taken up with the support of National Council of Science Museums, Government of India. This will include 8 metre diameter planetarium as well as thematic galleries on recent advances in science and learning science through fun, space & biotechnology gallery.

4. Name of the Centre: ENVIS Centre Sikkim on Eco-tourism (Ongoing)

Subject Area Assigned: Environment and Eco-tourism

The Centre has been working on the various parameters like:

➢ Region wise Network of Eco-tourism sites,Wildlife and Avian Ecology in India,

Number of Endemic Birds, Wildlife by sites, Location wise distribution of threatened animals and birds in India, Institutional Network of museums in India, State wise Domestic and Foreign tourists, Receipts from domestic, foreign tourists, Situation of Agri-Tourism by region, Ecotourism travel infrastructure, Information system of eco-tourism, Economic benefits of birds and animals

State of Art of R&D in Eco-tourism, Documentation on Specie-wise details, habitat, food, human interaction, Educational, Research Institutions, Situation of wild life crime, misuse, Legal, regulatory network by region

5. Bio-Informatics infrastructure Facility (BIF) for the Biology Teaching through Bio-Informatics(BTBI) under BTISnet DBT at Sikkim Science Centre, Marchak (Ongoing)

Activities of BIF at Sikkim Science Centre:

i. Developing the website to creating awareness of biotechnology through bioinformatics.

ii. Development of interactive information and interpretation kiosk with visuals on different facets of biodiversity of Sikkim

iii. Collection, collation, compilation & dissemination of biotechnology related Information to students.

iv. Nature interpretation facility about wild sanctuary and Nature Park.

v. Development of interactive computer based quizzes on bio resources of Sikkim.

6. Project Title: Scientific evaluation of Water purification system in State of Sikkim (Completed)

Broad area of Research: WATER

Methodology :

1. Identification of NABL accredited Laboratory
2. Field collection of samples and testing
3. Laboratory testing of samples
4. Compilation of report and analysis
7. Salient Research Achievements: Testing of water samples completed

7. Project Title: DBT-Natural Resources Awareness (DNA) Clubs programme in Sikkim State:

Objectives:

- To enhance understanding among students about the immense value of biological diversity of our country, the importance of locally available bioresources, their sustainable use and conservation;
- To equip them with relevant skills for bioresource conservation;
- To familiarize students with scientific and technological issues related to biotechnology;
- To provide students with an experimental learning opportunity;
- To create opportunities for hands on experiments in the field at the school level;
- To organize field trips to National Institutes and National Biological parks of the country.

8. Innovation in Science Pursuit for Inspired Research (INSPIRE):

INSPIRE Programme is centrally funded flagship programme of the Department of Science & Technology, Govt. of India which is being implemented through State Governments and UT administrations. The objective of this programme is to develop scientific temper amongst the young and to motivate them to take up scientific career for the scientific and technological advancement of the country. This programme has five components covering entire range of education and research from class VI to

post doctoral stage of a student. The first component of this programme is INSPIRE Award which recognizes the talents among students at a very early stage.

9. Construction of Technology Bhawan at Deorali, Gangtok:

For the development of Science & Technology in the State, construction of five storied building for Science & Technology Bhawan at Deorali, Gangtok with modern and state of the art facilities is in progress.

10. Preparation of Project Design Document for submission to Kfw, Germany.

- Goal: Strengthen adaptive capacities of the target (rural) communities and reduce their vulnerability to climate change through sustainable Climate Change Adaptation (CCA) measures.

Background

Following the Feasibility Study of the proposals presented by the five states including Sikkim, the KfW Mission and the State government agreed on the framework for implementation of NECCAP in Sikkim (Minutes of Meeting, October 2010), The MoM outlined the broad focus and the structure, and highlighted the need to elaborate the feasible climate-change relevant proposals / measures in the form of Project Design Document (PDD). A team of consultant was appointed by KfW to assist the nodal agency in each state for the purpose.

A multi-department core team constituted by the nodal agency (DSTCC) constituting representatives of DSTCC; RMDD; FSADD, HCCDD, FEWD, and SIMFED discussed and finalized the project design. For the purpose a series of core team meetings, department level meetings and district as well as cluster level stakeholder consultations were undertaken between Dec 11, 2011 and Feb 17, 2012 with the help of the KfW Consultant.

11. The details of work carried out under the different projects are as under:
Science Awareness, Communication and Science Popularization Programme:

Communication and Popularisation of Science is one of the area of activity of the Council which pervades through all activities and initiatives of the council. This is a common platform where all divisions meet for popularization of extension work. The communication and information sharing is taken up at various levels and by identifying various location specific problems in which science & technology can play a manifested role for preparing young minds for future. Many planned activities are taken up every year which can be summarized as follows:

National Childrens Science Congress	**Annual Programme**
North East Students Summer Training on basic Science	2008
North East Teachers Training on basic Science	2009
Lecture on Scientific writing of Research paper	June 2009
Master Resource Person Training / Lecture Series on Total Solar Eclipse (Under celebration on International year of Astronomy)	1-22 July 2009
Workshop on Astronomy Radio Serial (Vigyn Prasar)	June 2009

Series of Workshop on

a.	Assembling Gallelien Telescope	
b.	Observing Nature & Biodiversity	
c.	Innovative Experiment on Physics	April 2010
Translation /Adaptation of Radio Science Serial Scripts		May 2010-11
Green School Training Programme		27-28 July 2010
Master Resource Person Training Programme on Weather and Climate Change		06/08/ 2010
Master Resource Person NCSC-		22/10/2010
Lecture cum Training on Scientific writing on Research Paper and Articles		10/11/2010
Meeting National Science, Museum		17 to 20/12/2010
Intellect Property Right Awareness Programme		23/02/2011
National Science Day Celebration		24/02/2011
Programme organised by Rotary Club		14/04/2011
Diary, Livestock, Awareness Programme		14/04/2011
IUCCA workshop		28/04/2011
Awareness Programme organised by Institute of Fundamental Research, Mumbai		09th to 10th /05/2011
Multi-location Local Area Network Programme		22/06/2011
Annual Meets on Research Council on Large Cardamom		19/06/2011
INSPIRE Districts Level and State Level Programme		14-15 July 2011
NATIONAL Children Science Congress MRP Training		06/07/2011
Review Meeting of DNA Club		08/09/2011
National Science Day		28/02/2012
Districts Level INSPIRE Programme		30-31July 2012
State Level INSPIRE Programme		09/10/2012
Resource Person Training (NCSC)		09/11/2012
Sanitation cum Review Meeting DNA Club		23/11/2012

Future Proposals:

1. Scientific Evaluation Of Water Purification System In The State Of Sikkim (Phase-Ii: Selection, Installation And Assessment
2. North East Climate Change Adaptation Programme (NECCAP)
3. Extension of Sikkim Science Centre
4. Integrated Development of Model Village for Socio economic Development

CLIMATE CHANGE INITIATIVES

North-East Climate Change Adaptation Programme (NECCAP) for Sikkim:

- **Preparation of Project Design Document for submission to Kfw, Germany (Financial Cooperation):**

Background

Following the Feasibility Study of the proposals presented by the five states including Sikkim, the KfW Mission and the State government agreed on the framework for implementation of NECCAP in Sikkim (Minutes of Meeting, October 2010), The MoM outlined the broad focus and the structure, and highlighted the need to elaborate the feasible climate-change relevant proposals / measures in the form of Project Design Document (PDD). A team of consultant was appointed by KfW to assist the nodal agency in each state for the purpose.

A multi-department core team constituted by the nodal agency (DSTCC) constituting representatives of DSTCC; RMDD; FSADD, HCCDD, FEWD, and SIMFED discussed and finalized the project design. For the purpose a series of core team meetings, department level meetings and district as well as cluster level stakeholder consultations were undertaken between Dec 11, 2011 and Feb 17, 2012 with the help of the KfW Consultant.

Broad Features of NECCAP

- Programme Area: **5 States (Sikkim, Meghalaya, Assam, Mizoram, Nagaland)**
- Total Financial Cooperation (FC): **Euro 76 million (INR 456 Crore)**
- Initial FC Commitment for each State: **Euro 5 million (INR 30 Crore)**
- Programme Duration: **7 years**
- Nodal Agency: **Ministry of DONER (Central); Sikkim Council for Science & Technology (for Sikkim)**
- FC by KfW supported with **additional investment through Technical Cooperation** (GIZ)
- Focus on sectors, regions and target groups which are most vulnerable to climate change
- Mixed Portfolio: **Micro-plan based** Interventions as well as **Stand-alone Investments**; **CCA-proofed topping-up** of ongoing government programmes
- Stakeholder Contribution: **GoS 15%, GoI / DoNER 10%, Beneficiaries (5-30%)**

Goal and Objectives of NECCAP Sikkim

NECCAP seeks to contribute to the implementation of National Action Plan for Climate Change (NAPCC), its related missions and State Action Plan for Climate Change (SAPCC).

Goal: Strengthen adaptive capacities of the target (rural) communities and reduce their vulnerability to climate change through sustainable Climate Change Adaptation (CCA) measures.

Objectives:

1. Develop and implement an integrated and participatory community-based process for planning and implementation of sustainable CCA measures.
2. Improve the natural resource base to reduce vulnerabilities associated with water scarcity and agriculture-based livelihood in selected clusters.
3. Improve livelihood security through climate proof and diversified agriculture and improved marketing infrastructure for farm products..
4. Improve capacities for planning, implementing, and monitoring CCA measures through capacity building and knowledge management.

Proposed Project Areas for NECCAP Sikkim

NECCAP proposes to focus on most climate change vulnerable regions, sectors and population in the state. Based on findings of earlier studies South and West districts were agreed upon as potential project districts. The Core Team identified 15 Gram Panchayat Units (GPUs) falling in the Darjeeling rain shadow, divided in three clusters for implementation of NECCAP in Sikkim with focus on reducing vulnerabilities associated with water and agriculture sectors.

	Cluster 1: Seti-Kannam Khola	Cluster 2: Reshi Khola	Cluster 3: Tendong	Total
District	South	West	South	
Block	Namthang	Kaluk	Namchi	
No. of GPU	3	4	8	**15**
No. of Wards	21	22	45	**87**
No. of HH	1439	1921	6294	**9654**
% BPL	30%	36%	17%	**23%**
Area (ha.)	4279	4199	6445	**14923**
% Farm Land	41%	69%	71%	**62%**
% of Population dependent on farming	65%	64%	46%	**53%**

Proposed Investments
Microplan Based Investments

Component	Activities	Scope
A. Enhancing Rural Water Security through Rain Water Harvesting, Spring Revival and Strengthening Water Storage Infrastructure	Spring Recharge Groundwater recharge to	50 Springs
	improve base flow in streams	675 ha
	Household Tanks	1000 Tanks
	Community Tanks	100 Tanks
	Village Tanks	5 Tanks
B. Climate Secure and Climate Adapted Farming Practices	Promotion of CC resilient crops Bench terracing Rural / Vermi / EM Composting Green Manure (Azolla) Reclamation of Acidic Soils	20% of farm land
	Integrated Pest Management	15 GPUs
	Drip & Sprinkler Irrigation	750 + 150 Units
	Greenhouse	350 Units / 7 GPUs
C. Biodiversity & Water ResourceConservation Through Oak Forest Rehabilitation	Oak Plantation	600 ha.
TOTAL FOR MICROPLAN BASED INTERVENTIONS		

Stand-alone Investments

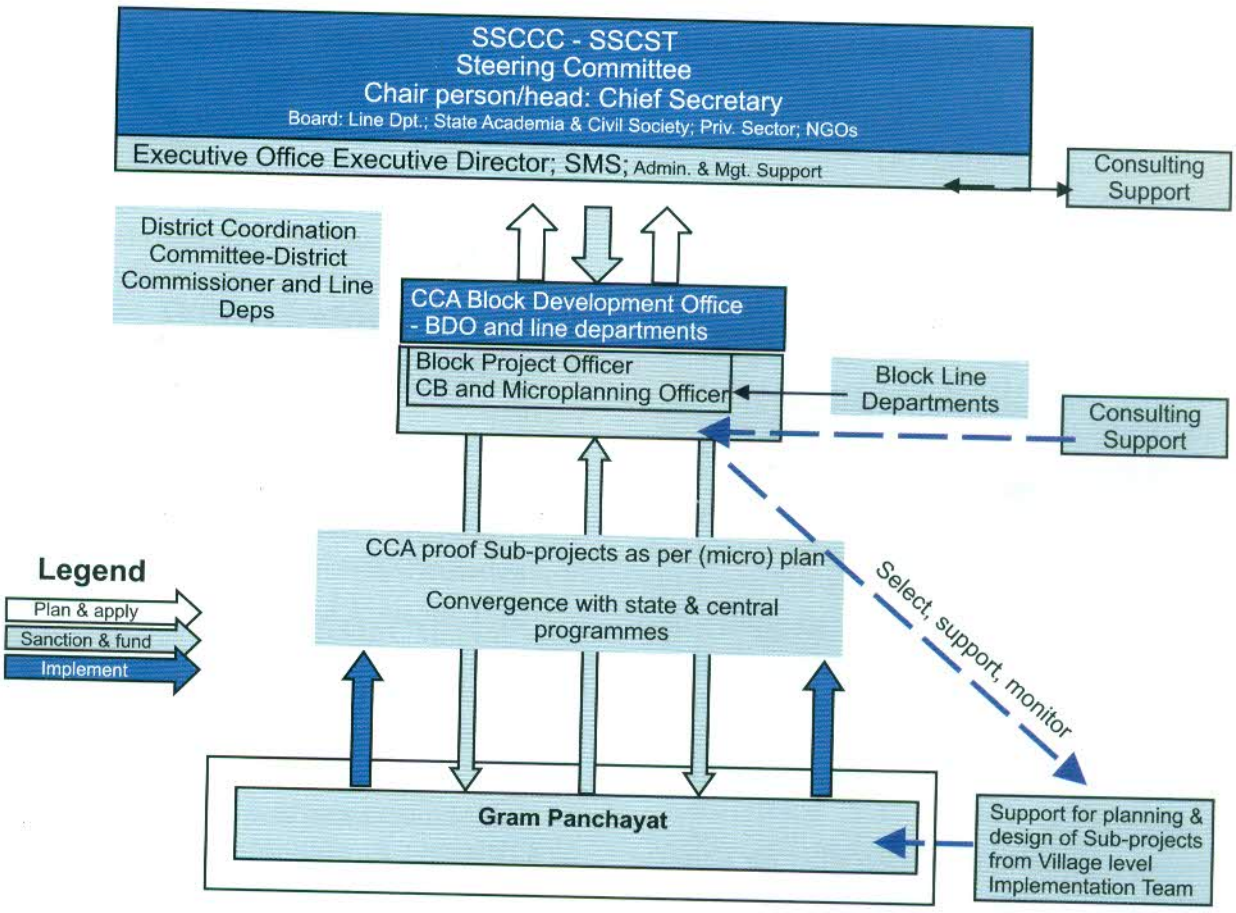
Component	Activities
D. Improved Livelihood Security	
1. Marketing Infrastructure fro Value Addition to Farm Products	Study on value chain and market development
	Market Intelligence Cell
	Primary Agri Marketing Centres (8)
	Secondary Agri Marketing Centres (3)
	Transport facility
	Multi-chamber cold storage (2)
	Brand development
	Training & Capacity Building
Total SIMFED	
2. Improved Infrastructure & Arrangements for Procurement of Milk	Strengthening lab facilities
	Bulk Cooling Facilities
	Transport Facilities
	Chaff cutters
	Estb. Village milk collection centres (110)
	Milk Collection Utensils
	Milk Transportation Cans
	Training & Capacity Building
TOTAL SIKKIM MILK	

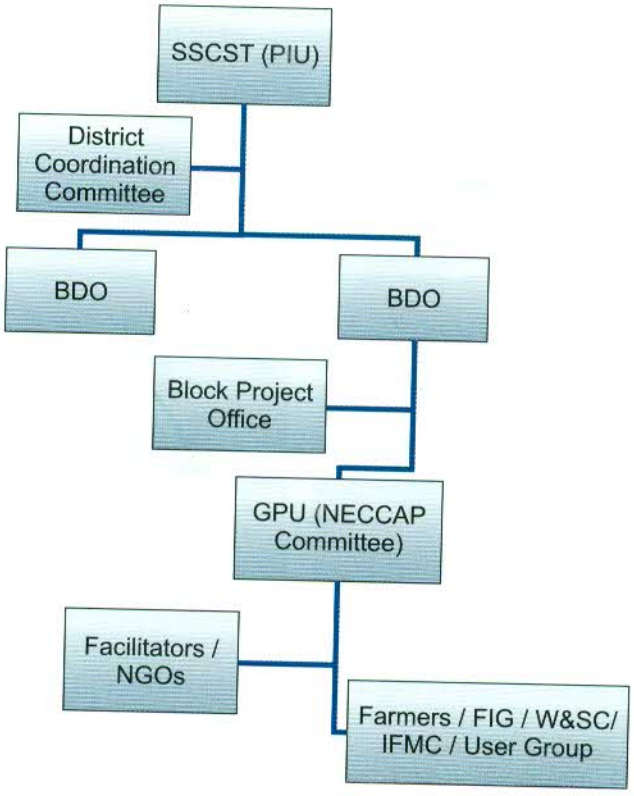
Other Proposed Investments

- Entry Point Activities
- Climate Change Adaptation Innovation Fund
- Studies and Action Research
  - Weather Indexed Crop Insurance
  - Rehabilitation of Lakes
  - Harnessing streams for domestic use and irrigation
  - Value chain development for CC resilient crops
- Capacity Building & Training for stakeholders
- Knowledge Management

NECCAP Implementation Structure

To implement the programme, a Project Implemented Unit (PIU) would be established with experts deputed from line departments as well as recruited from market. The PIU would report to Secretary, SSSCST. At the district level a Disctrict Coordination Committee (DCC) under the chairmanship of District Collector and with representation of relevant departments would be created to approve the microplans and monitor the implementation of the programme. The BDO office would have the main responsibility for field implementation of micro-plan based investments in collaboration with staff of relevant line departments. It would be supported by a Block Project Office with staff recruited from the market for the purpose of the project. GPU would be the basic unit for microplanning and implementation under the supervision of the BDO / BPO. Existing community based institutions would be involved in planning and implementation process.


SSCCC - SSCST
Steering Committee
Chair person/head: Chief Secretary
Board: Line Dpt.; State Academia & Civil Society; Priv. Sector; NGOs
Executive Office Executive Director; SMS; Admin. & Mgt. Support
Consulting Support
District Coordination Committee-District Commissioner and Line Deps
CCA Block Development Office - BDO and line departments
Block Project Officer
CB and Microplanning Officer
Block Line Departments
Consulting Support
Legend
Plan & apply
Sanction & fund
Implement
CCA proof Sub-projects as per (micro) plan
Convergence with state & central programmes
Select, support, monitor
Gram Panchayat
Support for planning & design of Sub-projects from Village level Implementation Team


SSCST (PIU)
District Coordination Committee
BDO
BDO
Block Project Office
GPU (NECCAP Committee)
Facilitators / NGOs
Farmers / FIG / W&SC/ IFMC / User Group

Detailed Planning & Project Design Document Drafting

- Core Team Meetings (4)
- Cluster level Stakeholder Consultations (2)
- GPU level Community Consultations (4)
- District Consultation Meetings (2)
- Department level meetings to refine investment proposals wrt Climate Change Adaptation focus and design (15)
- Collection and analysis of secondary data on clusters, proposed investments, and on going development programmes.

Preperartion of State Action Plan for Climate Change (SAPCC):

Preparation of State Action Plan for Climate Change has been completed and approved by Ministry of Environment and Forests, Government of India.

- **Entry Point Activities on Climate Change with GIZ, Germany**

GIZ CCA NER initiatives in Sikkim (Technical Cooperation)

1 Assessing the hydrological potential of Tendong Mountain and preparation of Village Water Security Plan, South Sikkim in coordination with the RMDD.

2 Study on Sacred preserves of Sikkim: Enhancing their Significance in Kabi, Phensong Monastery and Labrang Monastery, in coordination with the Forest Department.

3 Number of Trainings has also been provided as below;

a) Climate Change Adaption and disaster risk management training to two media persons of Sikkim at Shillong.

b) Master Resource Person training on "Climate Change adaptation Disaster Risk Management and Biodiversity" at New Delhi to two officials each from Forest, Science & Technology, Land Revenue Department, Simfed etc.

c) Training on Management of Ground Water at ACWADAM, Pune etc.

Project: Cane/Rattan Conservation and Promotion of Cane handicrafts for Sustainable Livelihood"

In order to revive dwindling population of canes to its original glory State Council of Science &Technology has initiated a project titled "*Cane/Rattan Conservation and Promotion of Cane handicrafts for Sustainable Livelihood*" funded by the Dept. of Science & Technology, Govt. of India. The team working under the Cane project has been successful in locating 6 species within Sikkim viz. *Calamusacanthospathus (Gauribeth), Calamusinermis (Bruhl), Calamus flagellum, Pelctocomia Himalayana (phakrey), Daemonoropsjenkisiana* from Dzongu region and *Calamus erectus (rhim)* from Sangkhola.

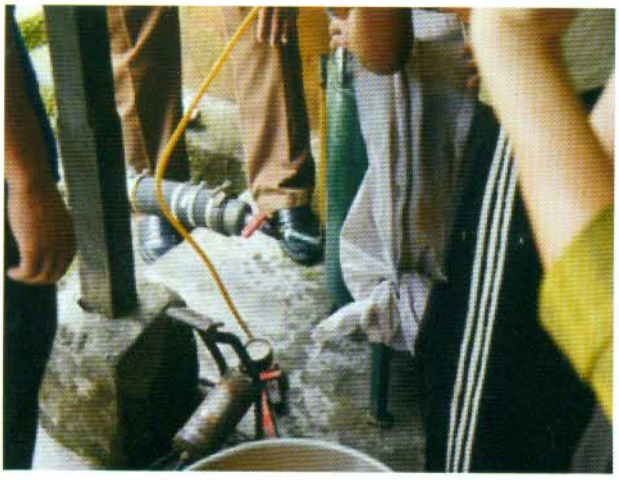
OBJECTIVES OF THE PROJECT:

Creation of Cane propagation nursery.

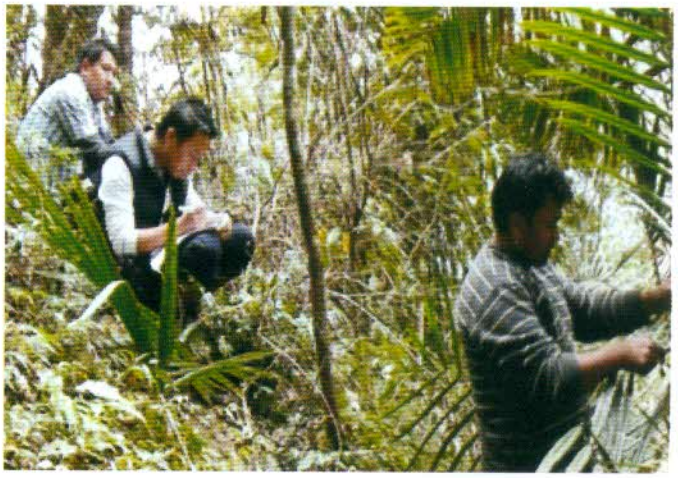
- Introduction of improved techniques for propagation of cane through seeds.
- Value addition and diversification of local traditional cane products for sustainable livelihood.
- Awareness generation and conservation of cane species through training of farmers.
- Creation of "*Germplasm*" for rattan diversity of Sikkim.
- Formation of a Co-operative Society of Tribal of the Region and transfer of equipments/ assets to the Society after completion of the Project

ACTIVITIES UNDER THE PROJECT:

- A three day training programme on Cane Propagation and its value addition was held at Hee-Gyathang, Lower Dzongu, North Sikkim with participants involving Self- help Groups, NGOSs, progressive farmers and craftsmen of Dzongu.
- Iintroduction of newly created machine on Cane & Bamboo treatment 'JAGRUTI' by the R.F.R.I,Assam with distribution of advanced tools to 35 trainees.
- A trial propagation on *Calamusacanthospathus* and *Calamuserectus* is being initiated at Sajong, Rumtekat Sikkim Sate Bio-technology Research and Application Centre.
- Two numbers of research articles on Cane has been published in research compiled book named "Sikkim Biodiversity (Significance and Sustainability).
- A short research article on distribution and diversity of *Calamusinermis*, endemic to Sikkim is already accepted for publication.



a.) Introduction of newly introduced Cane Treatment Technique "Jagruti"



b.) Field survey by the Project Staffs.

Documentation of the Ethno-Veterinary and its Formulations in Sikkim Himalayas:

Objective of the project

1. Resource survey and documentation of the ethno-veterinary and its formulations.
2. Database creation on ethno-veterinary and its formulation.
3. Awareness generation on ethno-veterinary amongst the tribal of the reserved areas
4. Creation of Digital library for ethno-veterinary.

1) The execution of the project is being initiated with the field survey cum documentation of ethno-veterinary practices and its formulations ofall parts of Sikkim. During research survey numerous ethno-veterinary practices and its formulation has been recorded for the three ethnic communities of Sikkim viz. *Lepcha*, *BhutiaNepalese*. These informants were mainly traditional healers, *Jhakris*, *Bijuwas*, farmers and other elderly persons.

2) Total 150 villages are covered under four districts andmore than 200 traditional practitioners have been successfully interviewed and the informant's audio visual record of these practitioners has been made accordingly. The plant which is being used for the veterinary purposes is completely recorded with its basic formulations.

3) Collection of specimen and the herbarium sheets is being created Additional data base is being updated. The digitization of data base is already being initiated of 200 species.

4) Till now 90% of the area of the state has been covered for the documentation of the ethno-veterinary practices and its formulations. Many of the uses especially plants species as traditional treatment for cattle are recorded for the first time, which deserves to be patented for the benefit of the farmers.

5) The field records and other allied information are being converted into a digital based library for wide range of use. The complete report of the project will also be publishing in a hard copy book.

Plate 1: A village women treating her cattle traditionally

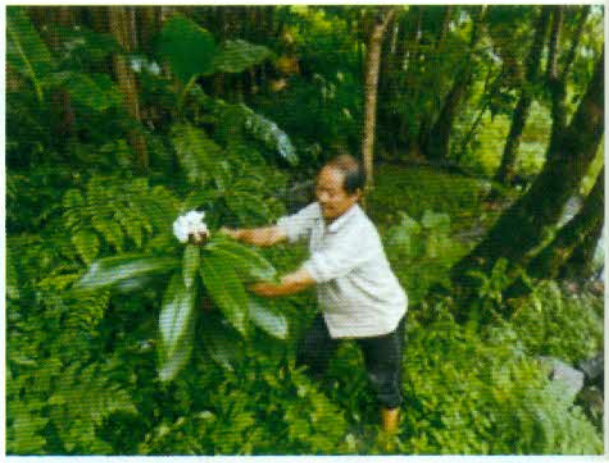


Plate2: Local practitioner demonstrating the local at Assam-Lingzey*Costusspeciosus*use in treatment of cattle.