Department of Science & Technology
Ministry of Science & Technology
Government of India

NMSHE NATIONAL MISSION FOR SUSTAINING THE HIMALAYAN ECOSYSTEM

THEMATIC TASK FORCES

for the Indian Himalayan Region

Under

National Mission for Sustaining the Himalayan Ecosystem (NMSHE) as part of National Action Plan on Climate Change (NAPCC)

Climate Changes Programme (CCP) | (SPLICE Division)
Department of Science and Technology (DST)
Ministry of Science and Technology Government of India

October 2017

FOREWORD

31.10.2017

The Indian Himalayan region occupies a special place in the mountain ecosystems of the world. These geodynamically young mountains are not only important from the standpoint of climate and as a provider of life, giving water to a large part of the Indian subcontinent, but they also harbour a rich variety of flora, fauna, human communities and cultural diversity. Despite the abundance of natural resources, most of its people are marginalized and still live on subsistence level. The unscientific exploitation of natural resources is leading to increasing environmental degradation and aggravating the impact of natural hazards. There is a need to evolve new paradigm to restore balance between economic interest and ecological imperatives with due regards to socio-cultural principles. The Indian Himalaya continues to face increasing anthropogenic stressors despite numerous conservation actions. Further, climate change has the potential to negatively affect this biodiversity rich region. To counteract the changing climatic variables, targeted education programmes could act as a strategy and assist in protecting the floral/faunal species requiring urgent intervention, and benefit communities and ecosystems at large. The conservation of degrading ecosystems and threatened species has now become a national priority in the wake of the changing climatic variables.

The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is a national mission under the National Action Plan on Climate Change (NAPCC). This project aims to understand the complex processes affecting the Himalayan ecosystem due to climate change and evolve suitable management and policy measures for sustaining and safeguarding Indian Himalayan species, ecosystems and communities. Mitigation and adaptation strategies propagated through targeted educational programmes among the most vulnerable communities and

long-term ecological monitoring are a few of the many targeted outputs of this project.

The Department of Science and Technology (DST), Government of India (GOI) has been given the responsibility to coordinate and implement various activities under the National Mission for Sustaining the Himalayan Ecosystem (NMSHE), which is one of the missions under the National Action Plan on Climate Change (NAPCC). I am delighted that DST is bringing out this information brochure providing salient features on the objectives of six thematic Task Forces (TF) in the Indian Himalayan Region which have been established by DST. Climate change programme (CCP), DST would be hosting a special side event on "Mountain Ecosystem" at the 23rd Conference of Parties (COP-23) under the United Nations Framework Convention on Climate Change (UNFCCC) Bonn being held during 6-17 November, 2017. We are happy to share it with the stakeholders and participants at the India pavilion of the prestigious COP-23.

I must compliment Climate Change Programme, SPLICE Division for bringing out this Information Brochure which I am sure will be of great value to the participants of the Side events organised by DST at the CoP-23.

I sincerely wish the event a grand success!

Prof. Ashutosh Sharma
Secretary
Department of Science and Technology

CLIMATE CHANGE: A REALITY

Climate change is the single most pressing issue facing the society globally, with serious implications for the food security and survival of billions of lives. On June 1992, in UN Summit Conference on Environment and Development, UNFCCC was adopted as the first multilateral legal instrument on climate change which was joined by many countries, to cooperatively consider what they could do to limit the average global temperature increases and the resulting climate change, and on top of it, cope with whatever impacts were, by then, inevitable. The 23rd Conference of Parties (CoP-23) of UNFCCC is being held during 6 to 17 November, 2017, wherein nations of the world will meet to advance the aims and ambitions of the Paris Agreement and achieve progress on its implementation guidelines. The COP receives the outputs of the IPCC and uses IPCC data and information as a baseline on the state of knowledge on climate change in making science-based decisions.

IPCC has recently reported that atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased, all of which is a matter of great concern. To tackle the issue of climate change at the national level, the Government of India launched National Action Plan on Climate Change (NAPCC) on June 30, 2008.

National Action Plan on Climate Change (NAPCC)

On June 30, 2008, the Prime Minister released India's first National Action Plan on Climate Change (NAPCC) outlining existing and future policies and programs addressing climate mitigation and adaptation. Emphasizing the overriding priority of maintaining high economic growth rates to raise living standards, the plan identifies measures that promote development objectives while also yielding co-benefits for addressing climate change effectively. For achieving sustainable development path that simultaneously advances economic and environmental objectives, the NAPCC focuses to follow the following cardinal principles to be enshrined:

- Deploying technologies – for hazard mitigation & disaster management, development of ideal human habitats, and agriculture and forest sector innovations.
- Enhancing ecological sustainability – by investigating causes and consequences of disturbance regimes, promoting conservation of native and endemic elements, and understanding glacier and river system dynamics.
- Protecting vulnerable sections of the society – this includes participatory resource management strategies and development of livelihood options.
- Developing human resource – there has to be heavy emphasis on skill development, at all levels, across various sectors to enable communities become sufficiently empowered with know-how and mountain specific required skills, necessary for adaptation to climate change.

Eight National Missions on Climate Change under NAPCC

The plan identifies eight "national missions", which form the core of the National Action Plan. These represent multi-pronged, long-term and integrated strategies for achieving key goals in the context of climate change.

1. **National Solar Mission**
2. **National Mission for Enhanced Energy Efficiency**
3. **National Mission on Sustainable Habitat**
4. **National Water Mission**
5. **National Mission for Sustaining the Himalayan Ecosystem**
6. **National Mission for a "Green India"**
7. **National Mission for Sustainable Agriculture**
8. **National Mission on Strategic Knowledge for Climate Change**

The **National Mission for Sustaining the Himalayan Ecosystem (NMSHE)** is one of the eight missions under the National Action Plan on Climate Change (NAPCC). NMSHE is a multi-pronged, cross-cutting mission across various sectors. It contributes to the sustainable development of the country by enhancing the understanding of climate change, its likely impacts and adaptation actions required for the Himalayas- a region on which a significant proportion of India's population depends for sustenance.

NMSHE seeks to facilitate formulation of appropriate policy measures and time-bound action programmes to sustain ecological resilience and ensure the continued provisions of key ecosystem services in the Himalayas. NMSHE intends to evolve suitable management and policy measures for sustaining and safeguarding the Himalayan ecosystem along with developing capacities at the national level to continuously assess its health status.

Recognizing the importance of scientific and technological inputs required for sustaining the fragile Himalayan Ecosystem, the Ministry of Science and Technology has been given the nodal responsibility of coordinating this mission. However, the mission involves valuable cooperation of Indian Himalayan States, the Planning Commission and the Ministry of Environment, Forests and Climate Change to achieve its goals.

The mission would attempt to evolve management measures for sustaining and safeguarding the Himalayan ecosystem by:

- Enhancing monitoring of Himalayan ecosystem with a focus on recession of Himalayan glaciers and its impact on river system and other downstream socio-ecological processes

- Establishing observational and monitoring network to assess ecosystem health including freshwater systems
- Promoting community-based management through developing mechanisms for incentives for protection and enhancement of forested lands
- Strengthening regional cooperation through established mechanisms for exchanging information with countries sharing the Himalayan ecology

The National Mission for Sustaining the Himalayan Ecosystem will undertake:

a. Collation and documentation of all relevant knowledge existing within the formal and non-formal sectors
b. Building of institutional and human capacities to observe and assess changes in ecosystem along with correlations of likely causes for the changes
c. Providing inputs for formulation of policies and strategies for management
d. Establishment of a State-of-the-Art National Center for Himalayan Glaciology complete with provisions for promoting research in the area
e. Assistance to the Ministry of Environment and Forests in the formulation of polices and management strategies and
f. Assistance to states in the Indian Himalayan Region for implementation of sustainable actions through coordination functions

In order to address the various technical thematic issues in the Himalayas, NMSHE has set up six Task Forces with coordinating institutions for each one. The Task Forces will focus on applying knowledge in the larger societal context and knowledge synthesis for policy formulations related to adaptation actions in the Himalayas considering the development needs of the society.

Thematic Task Forces (TF):

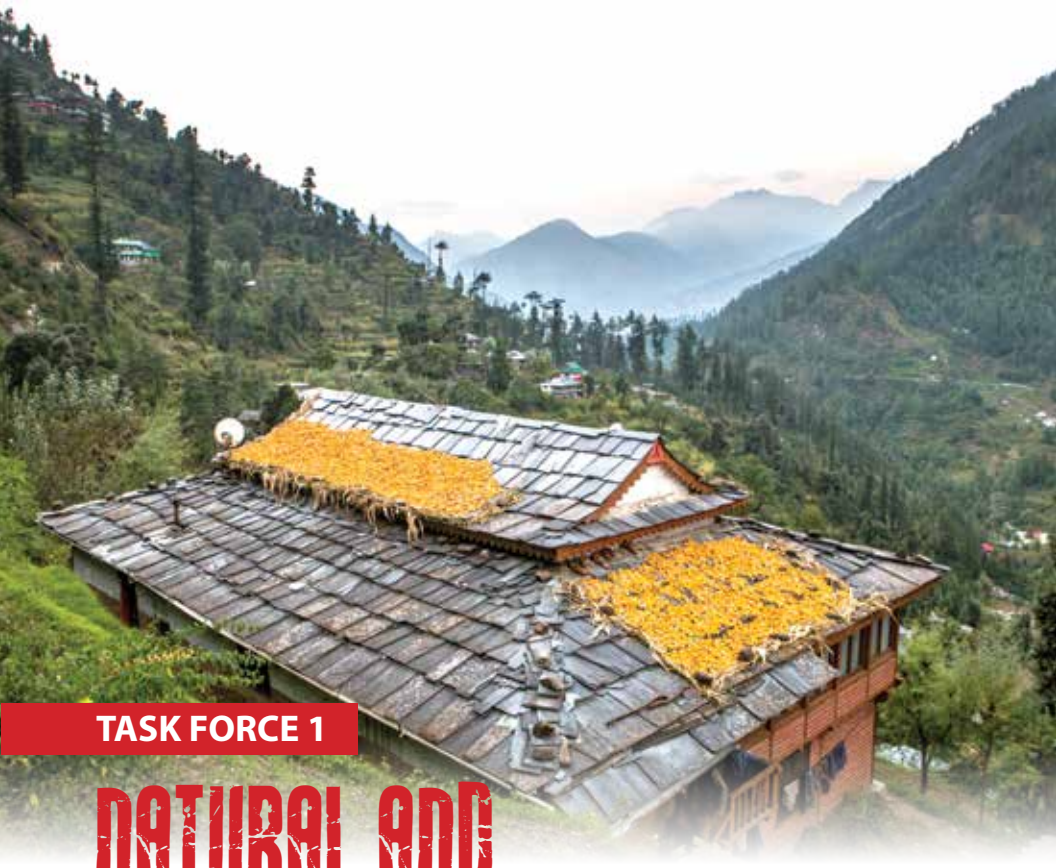
As part of NMSHE deliverables, DST has set up six Thematic Task Forces (TF) anchored around lead institutions working in different areas important for the sustenance of Himalayan ecosystem. These institutions and the thematic areas include:

Task Force (TF)	Theme	Lead Organisations
TF-1	Natural and Geological Wealth	Wadia Institute of Himalayan Geology (WIHG), Dehradun
TF-2	Water, ice, snow resources including glaciers	National Institute of Hydrology (NIH), Roorkee
TF-3	Forest resources and plant biodiversity	Govind Ballabh Pant National Institute of Himalayan Environment and Sustainable Development ,Almora (GBPIHED)
TF-4	Micro flora and fauna and wild life & animal population	Wildlife Institute of India (WII), Chandrabani, Dehradun
TF-5	Traditional Knowledge System	Jawaharlal Nehru University (JNU), Delhi
TF-6	Himalayan Agriculture	Indian Council of Agricultural Research (ICAR), New Delhi

Through the Task Forces, NMSHE aims to provide support in the formulation of policies and evolve management strategies. It also aims to provide the IHR states with a knowledge base for informed actions needed for sustaining the Himalayan ecosystem and their implementation for coordinated functions. The Task Forces have engaged more than 100 research teams so far from more than 60 research and academic institutions spread across the 12 Himalayan states in the IHR.
All the 6 task Forces have been given the task to undertake the following technical work elements:

i. Establishing database
ii. Designing monitoring systems
iii. Modeling and simulation
iv. Vulnerability assessment
v. Adaptation policy research
vi. Pilot studies for revalidation

The salient features of all the six thematic task forces as established by DST under NMSHE are as follows:



TASK FORCE 1

NATURAL AND GEOLOGICAL WEALTH

(Impact of Geological Resources on Himalayan Ecosystem)

Background

The Indian Himalayan region (IHR) represents a geologically fragile, vulnerable and ecologically sensitive zone. This region is prone to the impacts of global climate changes on natural resources. The natural geological wealth/resources include water (glaciers, rivers, lakes and groundwater) and localized mines, which play important role in maintaining the sustainability of the Himalayan Ecosystem. The landslides are also an important factor which affect the Himalayan ecosystem. The various phenomena and natural processes associated with the Himalayan ecosystem are interrelated and manifested in an interdisciplinary manner.

Objectives

1. Establishment of a database and an information system about Himalayan glaciers, lakes, groundwater, and mineral resources to facilitate policy decision about the sustainable development of the Himalayan ecosystem taking into account the work of existing knowledge
2. Generation of possible required data to fill the gaps in the information system about glaciers, lakes, groundwater and mineral resources
3. Integration of available information about glaciers- climate and lakes, groundwater-climate land use/land cover population and hydrological data and state-of-the-art models.
4. Preparation of a database on Himalayan lakes and wetlands for monitoring their environmental degradation and enhancing sustainability
5. Study changes in glacier and snow cover and groundwater availability (spring discharges) under various climate change scenarios and to analyze consequential impacts on net water availability, in particular on changes in snow and glacier melting and changed spatio-temporal monsoon patterns.
6. Assessment of the impact of minerals and mining on society and land degradation

Coordinating Institute- Wadia Institute of Himalayan Geology (WIHG), Dehradun

Partnering Institutes

National Institute of Hydrology, Roorkee

Jammu University: Jammu

Indian Institute of Remote Sensing, Dehradun

Kashmir University: Srinagar

Central Ground Water Board, Faridabad

Nagaland University: Kohima

Indian Bureau of Mines, Nagpur

GB Pant Institute of Himalayan Environment and Development, Almora

Hemwati Nandan Bahuguna Garhwal University, Srinagar (Garhwal)

Indian Institute of Soil and Water Conservation, Dehradun

Total budget sanctioned = Rs 11.36 Crores
Date of start of TF activities = 03 June, 2016

Manpower:
No. of Scientists involved = 04
No. of RA = 01
No. of JRF/SRF = 02
No. of PA/TA/FA = 02
No. of research scholars registered for Ph D = 02

Publications
Reports/ Monographs/Internal publication = 02

Significant Findings So far

- Overall, the recession of the glacier tongues (snout) has accelerated in the last few decades. In general, Himalayan glaciers are under thinning (Mass loss) and reduction of length and area in the present climate conditions. However, the recession rate and the amount of mass loss of Himalayan glaciers vary with glacier to glacier depending on the geographical location and climatic regime.
- The landslides and related phenomena are ubiquitous in the Himalayan region, though their magnitude and frequency have been increased during recent times.
- The anthropogenic activities and climate change have its effects on the efficiency and efficacy of water recharge system, especially in aquifers which are the main sources of water for springs.
- Most of the mining activity in the Himalayas is located in the Lesser Himalayan belt and even many ancient mines are observed from this zone suggesting that the region was known for mining since ancient times. The mining activities have an impact on the biodiversity and environment of the area

TASK FORCE 2

WATER, ICE, SNOW INCLUDING GLACIERS

(Long-Term Sustainability of the Himalayan Water Resources)

Background

Because of its geography, the Himalayan region is particularly vulnerable to the impacts of climate change. The rise in mean temperature here has been higher than the global average, and this trend is expected to continue. Glacial retreat is one of the serious concerns in the Himalayas, and this is expected to affect timing, location, and volume of the stream flow in significant ways. The enormous hydroelectric potential is partially offset by the hazardous factors of slope instability, high sediment discharge, extremes in flow, and vulnerability of structures to seismic activity. Ecological and hydrological data are unavailable. The entire Himalayan region is afflicted with a serious problem of soil erosion

and the rivers flowing through this region transport a heavy load of sediment. In view of the challenges, the task force focuses on addressing the issue of comprehensive integrated hydrological studies for upper Ganga basin up to Rishikesh.

Objectives:

1. Analysis of existing and proposed hydrological and hydro-meteorological network in the study area and collaboration with State agencies and other concerned departments/agencies for the development of a network of automated telemetry stations for providing hydrological and hydro-meteorological data for research and development. Investigation of the available spatial database from a number of satellites for use in water resources analysis.
2. Capacity building of the State agencies and other relevant departments/ agencies for the use of software for maintaining the database in HIS.
3. Downscaling of future scenarios of climate change at the scale of river basin and calibrating and validating hydrological models for the selected area for determining various hydrological components, spatial and temporal water availability, and for estimating the relative contributions of snow, glaciers, and rainfall in the flow characteristics in the present and changed climate scenarios.
4. Development of regional flood frequency relationships for estimation of floods of various return periods and to determine representative design floods in the selected area including flood hazard zoning.
5. Systematic hydrological investigations for selected lakes to suggest scientific measures for their conservation and management.
6. Study of the hydrological behavior of selected Himalayan springs and evaluate possible impacts of climate change on their flow characteristics.
7. To understand the climate forcing on the Himalayan cryosphere through orographic processes, integrated response of the Himalayan cryospheric system and to develop its linkage with the social sector for providing scientific inputs to policy formulation.
8. Assessment of the sediment yield from the selected Himalayan catchment and to assess life of a reservoir under different climate change scenarios.
9. To use isotope techniques for understanding of hydrological processes in the selected Himalayan basins and to partition different components of stream runoff processes at different spatial and temporal scales to support calibration of hydrological models.

10. To assess potentially dangerous glacial lakes in the selected Himalayan basins for glacial lake outburst flood (GLOF) studies.
11. Generation of information about the changing snow cover characteristics in study area for forecasting likely flows in river systems for planning adaptive strategies.
12. Assessment of the existing operation policies of important water resources projects in study area in light of climate change impacts.
13. Development of an interactive website for the study area

Coordinating Institute- National Institute of Hydrology (NIH), Roorkee

Partnering Institutes

Bhakra Beas Management Board, Chandigarh
Hemwati Nandan Bahuguna Garhwal University, Srinagar (Garhwal)
Indian Institute of technology, Bombay
Forest Research Institute, Dehradun
Jawaharlal Nehru University, New Delhi
Central Inland Fisheries Research Institute, Kolkata
Central Water Commission, New Delhi
Indian Institute of Remote Sensing, Dehradun
Indian Institute of Science, Bangalore
Indian Institute of Soil and Water Conservation, Dehradun
Indian Meteorological Department
Indian Institute of Technology, Guwahati
National Remote Sensing Center, Hyderabad
Govind Ballabh Pant Institute of Himalayan Environment and Development, Almora
Forest Survey of India, Dehradun
Wadia Institute of Himalayan Geology, Dehradun
Survey of India, Dehradun
State Centre on Climate Change, HP
Space Application Centre, Ahmadabad
Central Ground Water Authority, Faridabad
Snow and Avalanche Study Establishment, Chandigarh
National Centre for Antarctic and Ocean research, Goa
Kumaun University, Nainital
Kashmir University, Srinagar

Total budget sanctioned = Rs. 13.04 Crores
Date of start of TF activities = 13 January, 2016

Manpower:
No. of Scientists involved = 35
No. of RA =04
No. of JRF/SRF = 17
No. of PA/TA/FA = 08
No. of research scholars registered for Ph D = Nil

Publications
Research paper published = 03
Reports/ Monographs/ Book chapter/Internal publication = 01

Significant Findings So far

- Studied sediment yield from selected Himalayan catchment under different climate scenarios and its impact on the life of a large reservoir (Tehri)
- Assessed potentially dangerous glacial lakes for glacial lake outburst flood (GLOF) studies
- Identifying the origin and recharge areas of Himalayan spring, and to partition different components of stream runoff at different spatial and temporal scales.
- Assessed the impact of snow and glacier-melt on the groundwater dynamics through groundwater observations and sampling
- Water quality assessment, monitoring of point and non-point source pollution, adsorption characteristics of sediments, and monitoring of temporal abundance of different aquatic species at selected locations is being done
- Used Normalized Difference Snow Index (NDSI) for snow cover delineation which has been explored for different sensors

TASK FORCE 3

FOREST RESOURCES AND PLANT DIVERSITY

(Long-Term Sustainability of the Himalayan Water Resources)

Background

The Himalaya is one of the biodiversity hotspots, and supports representative, natural, unique socio-economically important biodiversity components. Although, a vast range of scientific information is available on various aspects of forest resources and plant diversity, yet an appropriate and effective monitoring system is not available for the same covering various biogeographical zones/provinces. This task force intends to develop approaches for actions for developing a strong and commonly acceptable and widely applicable monitoring system for the Indian Himalaya.

Task force 3 has been developed to cover three major aspects of mission approach:

- Enhanced monitoring by way of establishment of observational and monitoring network,
- Promoting community based management, and
- Strengthening regional cooperation.

Objectives:

1. Development of coherent database for forest resources and plant diversity of Indian Himalayan Region.
2. Establishment of effective monitoring system for forests resources and plant diversity in relation to changing climate.
3. Validation of Climate Model Projections with reference to forest resources and plant diversity in Indian Himalayan Region.
4. Sensitization and capacity building of inhabitants towards climate change adaptation and mitigation.

Coordinating Institute- GB Pant Institute of Himalayan Environment and Development (GBPIHED), Almora

Partnering Institutes

GBPIHED Regional Units located at: Kullu (Himachal Pradesh), Srinagar-Garhwal (Uttarakhand), Pangthang (Sikkim) and Itanagar (Arunachal Pradesh)

Total budget sanctioned = Rs. 10.34 Crores
Date of start of TF activities = 18 September, 2014

Manpower:
No. of Scientists involved = 22
No. of RA = 3
No. of JRF/SRF = 25
No. of PA/TA/FA = 02
No. of research scholars registered for Ph D = 14

Publications
Research paper published = 05
Reports/ Monographs/Book chapter/Internal publication = 05

Significant Findings So far

In order to achieve (i) enhanced monitoring, (ii) community based management, and (iii) strengthened regional cooperation, Task Force 3 has initiated and accomplished various activities in the Indian Himalayan Region (IHR).

Database of plants being developed in a standard format as follow:

- **Trans and North Western Himalaya:** Herbs: 1061 Species, 246 Genera & 40 Families
- **Jammu & Kashmir:** 944 Species, 236 Genera & 40 Families
- **Himachal Pradesh :** 690 Species, 196 Genera and 39 Families.
- **Uttarakhand:** 574 trees, shrubs & herbs
- **North East India:** 982 species, 532 genera & 158 families
- Tree diversity of Western Himalaya has been published as a book that includes an inventory of 490 tree species, of these 372 species are represented in wild and 118 as cultivated.
- List of 242 Red Data species and 456 threatened (IUCN) plant species prepared and database being developed. Nativity and endemism of the species analyzed.
- Representative Long-Term Ecological Monitoring (LTEM) plots have been established (06) in Uttarakhand (west Himalaya) representing sub-tropical, temperate and sub-alpine zones.
- GLORIA sites in alpines of west Himalaya have been established in collaboration with KSLCDI project including four summits in Chaudans valley (Greater Himalaya) and three in Byans valley (Trans Himalaya).
- Long-term forest monitoring criteria and indicators w.r.t. climate change have been identified. First-hand information on distribution pattern of invasive species in west Himalaya has been compiled.
- Conducted campaigns for vegetation assessment along altitudinal transects; Sikkim - Yuksam to Dzongri (1500-4200 m), Teesta valley up to Yumthang (1000-4000 m); West Himalaya – Bhagirathi valley (1000-4300 m), Byans, Chaudas, Johar valley (1500-4400 m); North West Himalaya – Great Himalayan National Park, Himachal Pradesh (2000-5000 m).
- Assessment of changes in forest cover and uses of forest resources in the Indian Himalayan Region was carried out for 2001-2015.
- Monitoring of climate sensitive species of Rosaceae family (Rubus ellipticus, Prinsepia utilis, Pyracantha creneluta) initiated for phenological studies and biochemical responses along altitudinal gradient.
- The SEIB-DGVM model was identified to simulate vegetation dynamics of certain forest type, and model simulations and validations are under process.

- Tree ring width (TRW) chronology developed for indicator species Cedrus deodara (407 year: 1609 to 2015) and Pinus roxburghii (307 year: 1709 to 2015).
- For reconstruction of climate, linear regression model was developed for mean relative humidity of February to April months for which a significant positive relationship was observed. To verify transfer function model, the reduction of error (RE), product mean (t), coefficient of efficiency (CE) and sign test (S1, S2) was used.
- Expected changes in the numbers of monsoon strong and weak phases over IHR were investigated using differences of ensemble averages of strong and weak phases, obtained from CORDEX-CSIRO model runs for RCP 4.5 & RCP 8.5 scenarios of 2020-40 and 2041-70 and 1970-2005 periods.
- People's perception on climate change and its impacts, documentation and validation of adaptations to cope up with climate change by different communities of IHR have been carried out in Uttarakhand: Byans, Darma, Chaudas, Johar and Bhagirathi valley; Himachal Pradesh: Sutlej and Parvati valley; Sikkim: Zuluk, Rumtek, Sadam-Melli, Mamlay watershed and Lachen-Lachung; Arunachal Pradesh: East Siang, West Siang and Upper Siang.
- Vulnerability assessment of different forests following identified indicators-population density, diversity, richness of non-native species, disturbances, and forest dependence of people. These indicators were categorized under three parameters of vulnerability assessment: Threats, Sensitivity & Adaptive capability.
- Training module on Sustainable Community Forest Management (with reference to Climate change mitigation and adaptation) was published with major focus on issues related to community forest management, policy gaps and community empowerment
- Fifteen capacity building trainings and one National Workshop were organized on diverse issues of forest resource utilization and plant diversity conservation w.r.t. climate change.

TASK FORCE 4

MICRO FLORA AND FAUNA AND WILDLIFE AND ANIMAL POPULATION

Background

Climate change has become a major driver of ecological patterns and processes, and in determining well-being of human societies across the globe. Evidences suggest that responses of species to impacts of climate change are inter-alia manifested in changes in phenology, earlier onset of spring, migration, and lengthening of growing seasons. The effects of climate change are pronounced in places such as the Himalaya, where the network of snow-clad mountains, ice-peaks, high intensity drainage and precipitation characterizes the bio-social landscape. The goal of this project is to develop strategies to mitigate climate change effects on wild animal species and ecosystems in the IHR. The thematic

areas identified under the research project include terrestrial and aquatic System, human ecology and spatial ecology. The project sites have been identified across IHR considering the river catchments as representative ecological units.

Objectives:

1. Identify the drivers of landscape change (climate and anthropogenic) in the IHR (Ganges river basin) and their effects on the ecological and social systems
2. Conduct focused research on wildlife aspects (terrestrial and aquatic fauna and their habitats) and human dimensions in IHR (Ganges River Basin) for framing evidence based policy measures
3. Develop monitoring and Decision Support System (DSS) for indicator species in the IHR (Ganges River Basin)
4. Undertake climate change scenario analyses and visualization for predicting potential effects on fauna and ecosystems as a strategy to communicate with stakeholders and to influence Policy and decision making
5. Develop spatial and inter-operable database to facilitate policy decision making
6. Build capacities within WII and of other stakeholders for sensitization and development of action plans for climate change impact mitigation and to enhance capabilities for negotiations at the national and international forum

Coordinating Institute- Wildlife Institute of India, (WII) Dehradun

Partnering Institutes

GB Pant Institute of Himalayan Environment and Development , Almora
Indian Institute of Tropical Meteorology, Pune
National Botanical Research Institute, Lucknow
Birbal Sahni Institute for Paleobotany, Lucknow
University of British Columbia, Canada

Total budget sanctioned = Rs. 10.02 Crores
Date of start of TF activities = 14 August, 2014

Manpower:
No. of Scientists involved = 12+3 Project Scientists
No. of RA =03
No. of JRF/SRF = 09
No. of PA/TA/FA = 05
No. of research scholars registered for Ph D = 07

Publications
Research paper published = 05
Reports/ Monographs/Internal publication = 36

Significant Findings So far

- New distribution records of two canids, Tibetan Argali, and Tiger in Uttarakhand
- Records of Rhesus macaque in the cold deserts of Bhagirathi basin
- Several new species/species complex for amphibians and fishes, some may be new to science
- Individual identification through dorsal patterns and abundance estimation tried for beautiful stream frog
- New distribution records of odonate species in Uttarakhand
- Possible three new species of odonate for science
- Reports of nematods presence in the soils of glacial and trans-Himalayan areas of Bhagirathi basin
- Open Top Chambers established in alpine areas of Bhagirathi basin
- Data loggers deployed in all the 500m elevation classes from 500m to 5000m

TASK FORCE 5

TRADITIONAL KNOWLEDGE SYSTEM

(Network Programme on Convergence of Traditional Knowledge Systems for Integration to Sustainable Development in the Indian Himalayan Region)

Background

Traditionally people in the Indian Himalayan Region have lived with the nature in harmony and developed various traditional systems as part of their livelihood that sustained for thousands of years. However, presently due to the factors such as increase in human population, low productivity of fragile mountain ecology and increased use of modern and/or unsustainable development practices, these traditional knowledge systems are eroding at a faster pace. It is important that these rich traditional knowledge systems are understood, documented in an integrated manner for conservation of Himalayan ecosystems and wellbeing of humans. A platform for Indigenous Knowledge Systems in the Himalayan region can assist the formal decision support systems for sustainable development of the Indian Himalayan region.

Objectives

1. To capacitate the institutions working in the Indian Himalayan Region on Traditional Knowledge System (TKS) and its importance in sustainable development of indigenous community
2. To identify the traditional ecosystem based approaches to climate change adaptation and scientific validation of the same
3. To create a digital database on Traditional Knowledge System in the Himalaya
4. To understand the impact of modernization on Traditional Knowledge System
5. To formulate strategic framework for indigenous knowledge management

Coordinating Institute- Jawaharlal Nehru University (JNU), New Delhi

Partnering Institutes

State Forest Research Institute, Itanagar
INSPIRE Network, New Delhi
CSIR- Institute of Himalayan Bioresource Technology, Palampur
Indian Agriculture Research Institute, Kullu
Defence Institute of High Altitude Research (DRDO), Leh
Indian Council of Agricultural Research, Barapani, Meghalaya
Central Himalayan Environment Association, Nainital
Doon University, Dehradun
Indian Council of Social Science Research, Shillong
INSPIRE Network of Environment, New Delhi
Indian Council of Agricultural Research, New Delhi
Kashmir University
Govind Ballabh Pant Institute of Himalayan Environment and Development, Himachal Unit, Mohal Kullu
Himalayan Forest Research Institute, Shimla
Govind Ballabh Pant Institute of Himalayan Environment and Development, Almora
Govind Ballabh Pant University Of Agriculture and Technology, Pantnagar
Vivekananda Krishi Anusandhan Institute, Almora
North Eastern Hill University, Shillong
INSPIRE Network, IIM Ahmedabad
Indian Council of Agricultural Research, New Delhi

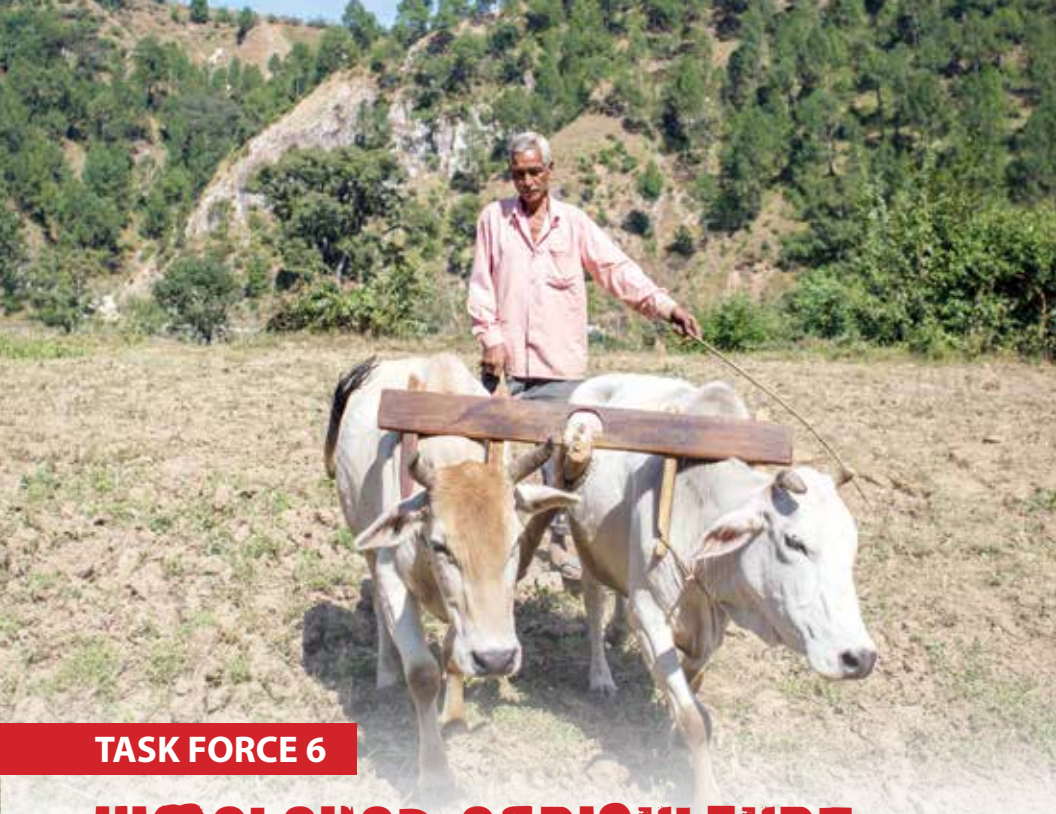
Total budget sanctioned = Rs. 14.01 Crores
Date of start of TF activities = 14 January, 2015

Manpower:
No. of Scientists involved = 02
No. of RA = 13
No. of JRF/SRF = 13
No. of PA/TA/FA = 01
No. of research scholars registered for Ph D = 03

Publications
Research paper published = 07
Reports/ Monographs/Internal publication = 16

Significant Findings So far

- Various aspects of TKS have been and are being documented of more than 40 traditional/indigenous communities. Changes in food habits and utilization of bio-locally available resources have been a major coping strategy. Use of various wild plants, dried vegetables, wool processing and weaving, meat processing for winters, traditional apicultural practices, traditional alcoholic beverage (Jaan), agroforestry products has been recorded. Important species from different taxonomic group have been identified which are used for construction of houses, or being used as fodder, fuelwood and food supplements
- An attempt has also been made to document the traditional architectural practices, and natural resource conservation practices.
- Cropping pattern, crop protection methods, local knowledge about climate change and productivity, weather prediction are being documented. Studies on ethnopedology, ethnomycology, seed selection, storage and exchange, and knowledge transfer in various age groups and gender are also being attempted
- Several aspects of TEK have been documented. Changes in food habits and maximum utilization of bio-resources which are easily available have been a major coping strategy.



TASK FORCE 6

HIMALAYAN AGRICULTURE

(Sustainable agriculture for food, nutritional and ecological security and for ameliorating climate change impacts in the Indian Himalayan Region)

Background

Agriculture is the mainstay of people in the Indian Himalayan Region. However, with climate variability and the growing capriciousness in precipitation and rising temperatures, the traditional farming systems and cropping patterns are increasingly under threat. The resource-poor rural farming communities are most vulnerable to the risks of climate change due to poor adaptation capacity. Furthermore, the physiographic and environmental constraints associated with the wide variability in altitude, slope, and aspect limit the adoption of modern agricultural technologies in the IHR. This calls for urgent extensive

investigation on the hill agriculture to develop resilience in this vulnerable sector. The focal geographical areas of this taskforce are eastern (NEH region), central (Uttarakhand) and western Himalayas (Leh, Ladakh, HP, and J&K).

Objectives:

1. Development of a database repository on soil (fertility and erosivity), water, genetic resources (arable crops, horticulture, agroforestry, livestock, and coldwater fisheries), socioeconomics and farmers' practices
2. Identification and promotion/scaling up of suitable practices for conserving soil, water and vegetation focusing on carbon sequestration model to attract and flow green bonus towards the farming community
3. Validating the extant technologies and refinement of farming systems and practices to cope with climate variability and climate change
4. Capacity building of farmers for a low carbon future through climate resilient agricultural practices including popularization of suitable farm machinery
5. Assessment of the potential of agro forestry and conservation agriculture to mitigate climate change impacts

Coordinating Institute- NRM Division, Indian Council of Agricultural Research (ICAR), New Delhi

Partnering Institutes

ICAR-Research Complex for North Eastern Hill, Umium, Barapani, Meghalaya (Lead Centres)
Regional Station for Tripura, Lambuchera
Regional Station for Mizoram, Kolasib
Regional Station for Nagaland, Medzipema
Regional Station for Manipur, Imphal
Regional Station for Arunachal Pradesh, Basar
Regional Station for Sikkim
Central Institute of Temperate Horticulture, Srinagar, Mukteshwar
Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora
Central Arid Zone Research Institute, Research Centre, Leh, Ladakh
National Research Centre on Camel, Bikaner, Rajasthan
Assam National Research Centre on Yak, Dirang, Arunachal Pradesh
National Regional Centre on Mithun, Jharanapani, Medzipema
National Research Centre on Pig, Rani
Indian Institute of Soil and Water Conservation, Dehradun

Directorate of Coldwater Fisheries, Bhimtal
Central Institute of Temperate Horticulture, Srinagar, Mukteshwar
Central Soil and Water Conservation Research and Training Institute, Regional Centre, Chandigarh
Indian Veterinary Research Institute, Research Station, Mukteshwar
National Research Centre on Agroforestry, Jhansi

Total budget sanctioned = Rs. 16,73,08,800
Date of start of TF activities = 13 May, 2015

Manpower:
No. of Scientists involved = 61
No. of RA = 3
No. of JRF/SRF = 32
No. of PA/TA/FA = 23
No. of research scholars registered for Ph D = 1 enrolled

Publications

- 16 Technical Reports
- 38 Souvenir & Proceedings
- 27 Articles in Journal
- 8 Chapters in books

Significant Findings So far

The project is playing a great role in biodiversity and forest conservation along with strengthening the hill agriculture in IHR by providing the farmers modern technologies, good quality seeds, productive animal breeds (Pig, Mithun, Yak), fishery, etc, so that they can withstand the present climate scenario. Different kinds of capacity building programs like training workshops, awareness programs, scientist-farmer interactions, kisan goshti, field demonstrations are being organized from time to time to familiarize the farmers with modern agricultural technologies. Along with this, integrated models for soil and water conservation, agro-forestry, springshed and watershed, lake development, climate resilient varieties and other input management practices are being provided to the farmers to increase the overall production, thus maintaining the food security in the hills.

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IHCAP Indian Himalayas Climate Adaptation Programme

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