

**PROGRAMMES TAKEN UP
FOR
GLACIER STUDIES AND CLIMATE CHANGE
ADAPTATION PROGRAMMES IN SIKKIM**

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AT SHIMLA.

Today, Humanity is facing its biggest challenge from climate change, resulting from global warming. Leaders from wide spectrums of human spheres have turned their spotlight on this manmade disaster which has exposed human survival to great risk. Conferences are held around the world on “How to keep the Earth cool.” The world at large has well appreciated the need to evolve global consensus on measures to tackle global disaster looming large to engulf the world.

In dealing with the challenge of climate change and environmental degradation we face the unfair burden of past mistakes not of our making.

In India also, Climate change was threatening the fragile ecosystems and an impending drought was staring the country in the face. Water scarcity was becoming a way of life and pollution is a growing threat to our health and habitat. There were fundamental choices people had to make about their lifestyles.

Today, as we sit here to address the global concern of climate change, let me welcome and congratulate all policy planners, eminent glaciologists, scientists and other experts of the Country for joining hands towards finding some durable mechanism to address this global concern.

Sikkim which accounts for only 0.2 percent of total geographical area of the Country with little over five and a half lakhs population has always remained the custodian of Himalayan eco-system. We provide environmental security to the entire eastern Himalayan region of the Country.

Sikkim is a Biodiversity hot spot. Nature has blessed us with rich biodiversity, exquisite species of flora and fauna. A quick look at our nature statistics can excite our minds and elevate our sense. For example, within the boundary of the State, we have a total of 150 species of mammals, 552 species of birds, 690 species of butterflies, 424 types of medicinal plants, over 500 types of orchids, 28 mountain peaks, 104 rivers and streams. Further, our state is perhaps the only geographical location where within a distance of over 114 kms, one finds five opulent climatic zones. These climatic zones namely tropical, sub-tropical, temperate, sub-alpine and alpine are placed within the altitudinal range of 300 meters to 8,598 meters. This includes the valleys, hills, fast

flowing rivers, still lakes and Mt. Kanchenjunga, the third highest peak in the world.

Sikkim is phyto-geographically significant, as it has six global elements: Sino-Himalayan-Japanese, Southeast, Peninsular Indian, Tibetan, Euro-Siberian, and Arctic-alpine. Sikkim is home to nearly one fourth of the total flowering plants of India. Also, it has 60 flowering species per 100 square kilometers, whereas other Indian states in eastern Himalaya and Nepal and Bhutan have 4 to 12 species. Sikkim has 123 endemic species. Plant endemics appear to be high in Sikkim because of deep river valleys with high mountain peaks that can limit species dispersal.

We are worried in Sikkim as we have seen warm winters, very short springs and long spell of rainy season. Unseasonal rainfall, rising temperatures, increased flooding, landslides and rock avalanches from destabilized slopes are already being experienced in the state. The torrential rains and unusually prolonged monsoon in Sikkim in 2007 caused extensive damage due to occurrence of landslides.

The rainfall pattern in Sikkim has become quite erratic in last few years if we compare with long period average – LPA for the period 1957 to 2005 with the present pattern of rain fall and temperature. We have received on the average 26% less rain fall in the month of May, and 8% in June and 10% less rain fall in the month of July for the year 2006 to 2009 as compared to long term average of 1957 to 2005. The winter rain fall has also reduced to the sizable extent by 73% less in the month of January 19% less in February and 25% less in March for the period 2006 to 2009 as compared to long period average for these months from 1957 to 2005. The situation in 2009 is very serious and we have received 30% less rainfall in the month of May, 27% less in the month of June and 24% less in the month of July. The winter months were also very dry during this year and received 65% less rainfall in January, 88% less in February and 21% less in March as compared to long period average of 1957 to 2005 as per the recent report received from North East Space Application Center and North Eastern Council. The North District of Sikkim has very severe drought condition and has received less than 55 mm of rainfall for more than four consecutive weeks during paddy cultivation season.

Our average minimum temperature of Gangtok has also increased from 0.9^o centigrade to 2.1^o centigrade in different months during 2006 to 2009 as compared to long period average of 1957 to 2005 as per the records of the Indian Meteorological Department.

The Himalayas are home to an estimated 10,000 plant species, 300 mammal species, 977 bird species, 176 reptiles, 105 amphibians and 269 freshwater fish. We can well appreciate that with such a range of natural wealth, the Himalayan States can ill afford to act casually on such a crucial issue. Climate change can have serious impacts on mountain biodiversity as it causes the retreat and sometimes disappearance of alpine species that become trapped on mountain summits. Mountain regions are also already under stress from various human activities in the world reducing their natural resilience to climate change. Moreover, the shrinking of the snow, mountains or in glaciers may modify the water-holding capacities of mountains, thus affecting downstream ecosystem. The change in hydrological cycle may affect river runoff, accelerate water-related hazards, and affect agriculture, vegetation, forests, biodiversity and health. On the other hand, mountain ecosystems have a significant role in biospheric carbon storage and carbon sequestration. Mountain ecosystem services such as water purification and climate regulation extend beyond geographic boundaries and affect all continents.

Sikkim as an ecological fragile state located in the Eastern Himalaya has proceeded very cautiously while undertaking various developmental activities and taken up a number of measures for protection of environment and addressing challenges of Climate Change for Sustainable Development.

For Sikkim conservation, protection of eco system and environmental sanctity has remained avowed policy priority. The year 1995 was declared as a "*Harit Kranti Varsha*" and the decade 2000 to 2010 as "*Harit Kranti Dasak*" to generate mass awareness among the people. This Green initiative was followed by other more diverse and more innovative green initiatives including ban on use of non-biodegradable materials like plastics, ban on grazing in reserve forest areas, effective implementation of various Forests Acts and promotion of people's centric concepts of Smriti Van. The Government of Sikkim, in the year 2006, has launched a unique and innovative programme called 'State Green

Mission' with a view to raising avenue plantation along the roads. This also beautifies institutional areas and religious places by planting trees and ornamental flowers. This also covers all vacant and wastelands including private lands. The greening drive has been comprehensive in taking every member of the society into confidence and every element of nature in the overall campaign. This programme has generated awareness on environment and forests and brought a sense of participation and ownership among the people. Keeping in view conservation of heritage and fragile ecology, the Sikkim Government has banned scaling of sacred peaks, sacred caves including Mount Kanchenzanga for mountaineering expedition.

As part of our green initiatives, we recently initiated one more innovative green campaign mobilizing the over six lakhs population of the State to plant sapling under the '10 minutes to earth' program creating history in the State, country and probably in the world for the massive success to plant 6 lakhs and 10 thousands saplings within a matter of ten minutes. This is a very positive event and unique one in the entire country.

In Sikkim, mountain springs, i.e. dhara in local parlance, have been traditionally playing a vital role in providing water security to nearly 80% rural households. These springs get recharged from the subsurface flow or from the rain-water that percolates down. However over the years, many of these springs are drying up or becoming seasonal and the discharge during the lean season is declining. Hence development of these spring sources under the banner of "Dhara Vikas or Spring-shed Development is being taken up across the villages with active participation of village panchayats, department functionaries and all the stakeholders at the village level. Furthermore, we have taken up the task of preparing Village Spring Atlas across the State so that we can undertake remedial measures to replenish the traditional source of water and ensure long term water security for our people in villages.

We have more than 200 Alpine lakes in the State. Like in the other parts of the globe, alpine lakes and wetlands are the primary carbon sequestration mechanism. Draining and drying water bodies can release significant amounts of carbon dioxide and methane. Therefore the State Government has taken necessary and adequate actions to protect and avoid degradation of these

wetlands through people's participation. In order to protect and conserve unique aquatic ecosystems, innovative steps have already been taken by the State Government by establishing the innovative 'Pokhari Sangrakshan Samitis' or 'lake conservation committees' These committees need to be strengthened by way of capacity building and empowering and allowing them for collection of fees in lieu of providing various services to the tourists. They should be the key stakeholders in the preparation of management plans for protection and conservation of important wetlands of Sikkim. Apart from climate change, this is essential because most of the tourists flow in our State is lakes centric.

We are conscious of our responsibilities to both the present and future generations and we seek to enhance the ecological sustainability of our development path. Local communities were the environmental bare foot soldiers who had guarded forests and evolved a sophisticated way of living in harmony with nature over the centuries. Their wisdom and their experience should be utilised to preserve our forests. We should stress the need to ensure that local communities benefited from conservation to the maximum extent.

The first task is to educate people and the greatest challenge is of arriving at a new equilibrium between man and nature

A survey found that nearly 70 per cent of the biodiversity hotspots in India were in forests. To protect them, the quality and density of forest cover, which absorbed 11 per cent of greenhouse gases emitted in the country, would be improved, taking the absorption capacity up to 15 per cent.

Forests is one of the richest natural resources of Sikkim and more than 46% of the geographical areas is under forest cover with a per capital forest cover of 0.61 hectare against the national average of 0.08 hectare.

We should now concentrate on regeneration of degraded forest area in such a way that it migrates to medium density forest cover, medium density forest area to high density area and put efforts for conservation and preservation of high density forest area which will turn into heavy carbon sink

We are today standing on a firm ground seeking to transform our villages like Switzerland and all our urban areas like that of Singapore. We have engaged professional consultancy from Singapore to prepare urban blue print with future

perspective in mind. This would involve locating or re-locating urban public facilities in the best way possible in consonance with our geographical features. We intend to Develop Sikkim as eco-city state.

In similar fashion, our villages are spread out in our natural setting from the sparsely populated to considerable concentration of human habitation. The State Government has, therefore, decided to prepare a blue print under the broadly defined Village Development Action Plan program. We are already engaged in serious discussion with Professor Bernard Dafflon from the University of Fribourg in Switzerland and who we have appointed as our consultant to assist us in preparing the Village Development Action Plan.

Sikkim has been declared as an organic state from 2003 onwards with doing away with the use of chemical fertilizers and pesticides. This decision has helped in achieving environmental sustainable agriculture production system.

Our traditional life style and many of our traditional faith and creed centred round Nature. Majority of us in Sikkim are nature worshippers one way or the other. We worship Nature, the mountain, rivers and forest as part of our local deity. And this philosophy to worship Nature probably exists only in our part of the world. When I shared similar views during my Climate Change interaction in Los Angeles in last November, people from the western society were pleasantly surprised to know our way of worshipping the rain, the sun, trees etc. And you will kindly agree with me that amidst the continuing debate on climate change and its mitigation, our ways could be an effective remedy to address this global threat.

We are promoting only environmental friendly sustainable development strategies both keeping in view environmental security as well as to ensure stable inflow of internal revenue to sustain our economic. Hydro-power generation, promotion of eco-tourism, setting up of clean industries like pharmaceutical units have been identified as core sectors to strengthen our revenue base on a long term basis without compromising our environmental security. We have drawn up our road map with regard to harnessing of our hydel power resources of over 8000 MW capacity with several hydel projects involving a combined power generation capacity of almost 5000 MWs are in the pipe lines. The commissioning of the 390 MW Teesta Hydroelectric Project

Stage V as well as the operationalization of the 60 MW Rangeet Hydel Project along with several mini and micro hydel projects under the State Sector have substantially contributed to augmenting hydel power generating capacity of the State. We have envisaged a target to mobilize more than Rs.1,000 crores of revenue with a combined generation of about 5000 MWs from all the hydel projects which are under various stages of execution.

Eco-tourism in Sikkim has firmly established as the economic instrument to bring about qualitative transformation in people's lives. Given the salubrious climate, the enchanting natural endowment and the ever hospitable people, tourism in Sikkim is a booming industry. As per one report, Sikkim has witnessed a 35 percent increase in domestic tourist arrival into the State leading to commensurate increase in state's revenue. The target is to generate combined revenue of Rs.1,500 crores annually by 2015 which will be in addition to other lapsable and non-lapsable pool of resources and other similar grants from the Central Government.

Sikkim has also taken up the initiative for setting up Village Resource Centres with the support of the Department of Space at Block level. More than 15 village resources are already in operation for skill development, scientific awareness and use of remote sensing and GIS technology and at the Natural Resources Management at village level.

Sikkim has also taken initiative for taking support through external added projects. Major projects with the support of Japan International Cooperation Agency (JICA) for sustainable development of forest resources of Sikkim, Asian Development Bank project on rural livelihood and project through German Financial Corporation on Natural Resource Management base climate change adaptation programme in Sikkim are in pipe line.

The efforts made by our Government have been well appreciated by different organizations for adopting various environmental friendly programmes. In recognition to our efforts, Centre for Science & Environment, New Delhi, in the year 1999 voted me as the '**Greenest Chief Minister of India**' based on a rigorous nationwide poll. Being the greenest Chief Minister of the country, I have been bestowed with sacred responsibility to act in a mature and responsible

manner and also provide valuable suggestions at national level on environment related public policy formulations.

We know that global warming is the biggest and most difficult issue which we are facing today. Therefore, we will have to change our ways and switch to a non-carbon path which requires a multidisciplinary and holistic approach with proper combination of science and the society. This means going green without sacrificing growth and prosperity. The civil society needs to create awareness among people and prepare them for change. If people are prepared and aware, change will come dramatically. The consuming class has to change its lifestyle to consume less. In some cases, viable alternative livelihoods must be presented to the people.

The Sikkim Government has not only made steady progress to improve the people's standard of living by providing quality health, education etc but has always been a staunch supporter of environmental conservation and sustainable management of natural resources for the general well being of the people of the state.

We should identify and prioritise the areas which are more susceptible to climate change hazards. Identification of the newly formed lakes in the past 30-40 years in the glacier areas should also be carried out. Monitoring the lakes in the glacier areas which are expanding in size should also be initiated on priority. Defence forces, Border Road Organization and ITBP located in these areas can play a pivotal role in these aspects. There is very urgent need for developing a warning system and action plan for identification of moraine dammed glacial lakes which are potentially dangerous for outburst and flooding.

The development in alpine areas in terms of road construction and other activities should adequately take care to protect these lakes. The concept of green roads should be introduced and there should not be any muck disposal on the downhill side of the roads. This will greatly help in preventing siltation of alpine lakes.

The Government has initiated awareness programmes against burning of leaf litter, garbages, agricultural wastes etc in the open in order to keep the State clean and reduce air pollution. We have also taken positive steps for

discouraging the use of non biodegradable materials by imposing 'environmental cess' on various non bio-degradable materials.

We are also toying with the idea of making eco-labelling of various hotels mandatory. This is primarily for promoting the use of energy efficient devices compact fluorescent lights (CFLs) and solar water heaters and proper management of solid wastes. Similarly we are also designing a long term plan for regulating the transportation sector mainly with a view to de-crowding the urban settlements and checking air pollutions. Further, we are soon making it mandatory to keep three dustbins in each of the household for keeping (a) degradable materials; (b) non-degradable materials and (c) hard metals like irons and bottles in three separate dustbins.

There is a need for conducting extensive studies regarding the nature, direction and impacts of climate change. I personally feel that these studies should be done in holistic manner as I feel the phenomenon of climate change everyone and everything both living and non-living. It is imperative that the states build a knowledge database on the climate change so that it can prepare itself for reducing the impacts and adapting to the forecasted changes. More and more research studies should be initiated in the fields of biodiversity, farming livelihoods, animal husbandry, health, tourism etc vis-à-vis impact of climate change.

We are counted as one indispensable whenever people discuss about concern on glacial retreat and depleting Himalayan eco-system. As the world community look up to us for future guidance in the best practices of nature conservation, we will continue with all our on-going green initiatives and will find new innovation from time to time to infuse greater vigour and excitement into our green campaign.

The Himalayas possess one of the largest resources of snow and ice and its glaciers form a source of water for the perennial rivers they are acting as natural reservoirs for supply of water to major river systems of the State.

Glacial melt may impact their long-term lean-season flows, with adverse impacts on the economy in terms of water availability and ecological security of the State. It is precisely because of the ^{Page 10 of 19}gigantic challenges and very imminent

The glacier field studies for Zemu Glacier, which is largest glacier in Eastern Himalayas, has been taken up jointly with Prof. Milap Chand Sharma, Jawaharlal Nehru University, who is also a member of the Sikkim Glacier Commission.

In a nutshell, as per study carried out in collaboration with JNU for the retreat of Zemu Glacier, Zemu retreated from 1976 to 1989 and advanced for next 12 years based on Satellite Image analysis, and then had a standstill thereafter from 1999-2008 based on photographic evidence.

As per the field visit carried out in 2008, after 1999 there is a vertical thinning in the ice cover only without any significant change in the snout position between 1999 to 2008. This retreat is in line with the rest of the world trend during the last century. The rate of retreat of Himalayan Glacier was much faster in the second half of 20th century which has now reduced considerably. This trend is similar to other parts of the world as well.

Many of the Scientists feel that there is no evidence yet to claim the rate of retreat of glaciers, ranging from a few cms to couple of metres a year, has accelerated in the recent past. In fact, the rate of recession of some of the glaciers have actually reduced in recent years. Some of the glaciers are retreating, but others seem to be advancing. However, there is no robust scientific evidence to suggest that climate change is causing the retreat.

The scientific community is also of the opinion that the process of retreat and advance of the glaciers was a natural process and that at present there is no evidence to prove that the current glacial recession phase is a consequence of climate change.

The scientific reports also suggest that while glaciers react to climate, immediate effects of climate may not reflect on the snout of a glacier.

Seasonal snow cover is one of the important natural resources of the Himalayas. This is an important parameter in assessing the availability of water in the Himalayan Rivers, forecasting and assessing avalanches and numerous other applications.

Year wise snow cover Atlas of Sikkim for last four years starting from 2004 to 2008 has been prepared as a part of Glacier and Climate Change

Studies by the Sikkim State Council of Science & Technology under Department of Science & Technology, Government of Sikkim jointly with the Space Application Center, Ahmedabad. For preparation of these Atlases 200 images of RESOURCESAT Satellite was used.

The significant highlights of the results are as follows:

- During February –March on the average 49% of the Geographical Area of the State is covered with the snow.
- Among four years between (2004-2008), February 2007 had the highest snow cover covering 58% of the total geographical area of the state.
- Month of November received a uniformly high snow cover (35%) during the all four years.
- Month wise trend of minimum snow cover varies from year to year and there is comparatively less snow cover during October, December & January (8-15%).
- It is observed that summer too receives sufficient snow precipitation in higher regions and there is high percentage of area under snow unlike Western Himalayas. Hence, there is continuous supply of snow to the glaciers during summer due to early monsoon.
- It is expected that this data will be useful for hydrological, climatologically applications and hydel power management.

The snow cover mapping works for 2008-09 will also be taken up and images of recently launched RISAT Satellite will be analyzed for better interpretation during the rainy season from May to September as well.

We have also taken up Collaboration project with TERI regarding Systematic Mass Balance, Energy Balance studies of East Rathong Chu Glacier in Sikkim jointly with Sikkim State Council of Science & Technology.

Keeping in view the initiative taken by the Sikkim State Government, the Ministry of Science & Technology, Government of India has also included East Rathong Chu Glacier of Sikkim as one of the 10 benchmark Glaciers of the country for long term studies on different aspect. We are always concerned about the health of the glaciers keeping in view the evidences of debris accumulation at the snouts in some of the glaciers.

As suggested by glaciologists we will be continued to carry study of various factors such as mass, length and breadth and not just the snouts of Himalayan glaciers.

For assessing the exact amount of carbon present in the forests of Sikkim, the Department is carrying out vegetation carbon pool assessment in Sikkim under ISRO's Biosphere Geosphere programme. It is heartening to know that the Department of Space, Govt. of India has agreed to install a carbon flux tower in Sikkim for detail study regarding net carbon absorbed by forests.

The State Government has also constituted an Advisory Council viz. **'Sikkim State Council of Climate Change'** for providing policy direction and institutional mechanism for effective implementation of various climate change adaptation programmes and the initiatives of the State Government is a trendsetter in the country.

The State Government has also re-designated the Science and Technology Department as **"Department of Science and Technology and Climate Change"** and also approved for creation of full fledged climate change wing by strengthening the facilities and manpower in a phased manner under this department with following mandate on climate change related issues in addition to already assigned mandate.

- Undertake detailed research and survey regarding impact of climate change.
- Co-ordination with all other departments for dissemination of appropriate technologies with respect to climate change adaptations.
- Initiate pilot projects and programmes on climate change adaptation in coordination with various departments.
- Cooperation with national and international agencies.
- Generating awareness about Clean Development Mechanism (CDM) and carbon credits.

The State Government has also approved in principle for development of a full fledged Geo-Informatics Center for application of Remote Sensing, GIS and GPS Technology for Climate Change Studies under this Department.

We are also installing Automatic Weather Stations at block levels with the support of the Department of Space, Government of India at each of the Block Development Centers in a phased manner. First phase of 15 Automatic Weather Stations are already in the process of installation of 19

We are also pursuing with the Indian Meteorology Department, Ministry of Earth Sciences, Government of India for strengthening of network of snow gauges and weather stations in Alpine areas of Sikkim for long term climate change studies. We have also requested to the Ministry of Earth Sciences, Govt. of India for installation of Doppler Radar System for having large coverage for weather prediction and snow and glacier monitoring.

Keeping in view the importance of glacial studies and climate change, setting up of full fledged Glacier & Climate Change Centre in the State are being pursued with the Central Government. In fact, during the course of discussion at the National Development Council Meetings. I have personally requested the Government at the Centre to at least set up a regional Institute in the North Eastern region, on climate change and related issues in Sikkim.

We are happy to know that Eight National Missions on various fields has been constituted under dynamic leadership of Honourable Prime Minister as a part of National Action Plan on Climate Change. These National Missions on various aspects will definitely help us to deal with challenges of climate change.

We are very keen to take full advantage of various programmes being launched through Eight National Missions under National Action Plan on Climate Change. **We also need support of the Government of India on the following issues for addressing challenges of climate change in all Himalayan states.**

1. We should pursue with the Union Government that Himalayan states should be offered incentives for retaining high forest cover, rich biodiversity, protection of water resources and providing environmental security to the country.
2. The entire Himalayas is very prone to landslides occurrence and the problem is being aggravated due to the climate change phenomena and frequent torrential rains during the rainy season as experienced during the year 2007 in Sikkim which has triggered a large number of new landslides. There is a need of special focus on landslide rehabilitation under

the National Missions being taken up in all **Himalayan states**.

3. The river bank/river front protection and development programme should also be included as a part of National Mission on water resources and special emphasis should be given for tackling the problem of **Glacial lake outburst floods (GLOF)** and **Land slide dammed lake outburst floods**. The monitoring mechanism using sensors and satellite technology for prevention and for early warning system for glacial lake outburst floods should also be set up.
4. We should take initiative for setting up of empowered State River Conservation Authorities. The central sponsored scheme with 100% funding may please be considered for scientific management of Himalayan Rivers, alpine lakes and wetlands which are major sources of the water resources in Himalayas. The greater thrust may also be provided through central sponsored schemes on identification of the ground water recharging zones using latest scientific technology and also various measures for augmentation for water supply in the natural springs which are the major sources of drinking water in rural areas.
5. We need regular consultation and sharing of best practices among the Himalayan States on the issue of environmental conservation and climate change adaptation.
6. Climate change would reduce major crop yield by 4.5 per cent to 9 per cent between 2010 and 2039 if the current trends continued. Climate change was threatening several biodiversity “hotspots”. The loss of every species and gene limits our options for the future. There fore, the protection of biodiversity through community conservation and systematic efforts are needed to transform these areas into “happy spots.

7. Hereafter, the mode of tackling drought and flood must be more proactive. This calls for the preparation of drought, flood, and good weather codes designed to reduce the adverse impact of unfavourable weather and maximise the benefits of a good monsoon. Such anticipatory measures will include the building of seed stocks for implementing contingency plans, and water and energy security systems.
8. In the midst of drought-related crisis management, the challenge of dealing with the impact of climate change on Indian agriculture and rural livelihoods ought not to be ignored.
9. Proactive measures must be developed by breeding and selecting crops and crop varieties that can withstand higher temperatures.
10. The initiative for building genetic resources for a warming India should be taken timely and priority basis and long-term basis.
11. The organisation of a 'Weather Information for All' scheme based on village level agromet stations is essential.
12. We should initiate a time bound programme for preparation of State-level Action Plans on Climate Change consistent with the National Action Plan on Climate Change with a view to enable communities and ecosystems to adapt to climate change effectively;
13. The appropriate technologies for solar passive houses may also be promoted in alpine and high altitude region of the Himalayas.
14. For promotion of solar water heater systems in temperate and alpine areas of Himalayas a component of appropriate subsidy may also be introduced. This will help in saving a lot of fire wood for water heating purposes.

Change. More opportunities to the scientific and technical manpower of the State regarding Climate Change and Sustainable Development related trainings at national and international level may also be provided.

23. The Himalayan states being located in most eco-fragile and strategic region, so we request that they should be given highest priority by way of technical and financial support through Eight National Missions constituted as a part of National Action Plan on Climate Change by the Government of India.