

Report on Climate Change Programme in Mizoram

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OVERVIEW OF THE MIZORAM STATE ACTION PLAN ON CLIMATE CHANGE and Climate Change Scenario in Mizoram



State Climate Change Cell
(Under National Mission for Sustaining the Himalayan Ecosystem - NMSHE)
Directorate of Science & Technology
Govt. of Mizoram

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&
Climate Change Scenario
in Mizoram**

State Climate Change Cell
(Under National Mission for Sustaining the Himalayan Ecosystem - NMSHE)
Directorate of Science & Technology, Govt. of Mizoram

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INSTITUTIONAL FRAMEWORK OF THE MIZORAM STATE ACTION PLAN ON CLIMATE CHANGE (SAPCC)

CLIMATE CHANGE COUNCIL

Chairman : Hon'ble Chief Minister

Member Secretary : Secretary, Planning

Members :

Hon'ble Minister, Rural Development

Hon'ble Minister, Agriculture, etc.

Hon'ble Minister, PHE, Tourism, etc.

Hon'ble Minister, Transport, etc.

Hon'ble Minister, Revenue

Hon'ble Minister, Forests

Vice Chairman, State Planning Board

Chief Secretary, Govt. of Mizoram

Principal Secretary, PHE, Agri., etc.

Secretary, Environment & Forests

Secretary, Tourism

Secretary, Rural Development

Secretary, Horticulture

EXECUTIVE COUNCIL ON CLIMATE CHANGE

Chairman :

Chief Secretary, Govt. of Mizoram

Member Secretary :

Chief Scientific Officer

Dte. of Science & Technology

Members :

Principal Secretary, PHE, Agri., etc.

Principal Chief Conservator of Forests

Secretary, Planning

Secretary, Rural Development

Secretary, Horticulture

Secretary, Tourism

Secretary, UD&PA

Principal Adviser, Planning

CEO, Aizawl Municipal Council



Shri Lal Thanhawla
Hon'ble Chief Minister
Chairman
Climate Change Council
Mizoram

Shri Lalmalsawma
Chief Secretary
Chairman
Executive Council on
Climate Change



Dr. C. Vanlalramsanga
Secretary, Planning etc.
Member Secretary
Climate Change Council
Mizoram

Dr. R.K. Lallianthanga
Chief Scientific Officer
Member Secretary
Executive Council on
Climate Change



Climate Change

Preface

- Dr. R.K. Lallianthanga

Climate change and its associated impacts on human life are concerning issues of this century as we have all been woken up by the fact that the planet we live in is under a lot of induced pressure and stress. India with its varied cultural heritage, socio-economic background and diverse physiographic landforms have been challenged by the forces of nature to adapt and mitigate against climate change in every nook and corner of the country. The unique terrain features and environmental conditions of the north-eastern region of India poses a far more complex situation on issues with Climate Change. Mizoram being one of the states in this region has felt and experience the wraths of global climate change at a scale which has devastating effects on the economy and social life of the people.

Dissemination of information and creating awareness of this global issue is one of the important steps taken towards making the general masses aware about the impending impacts of climate change. It can be noted that the State Action plan on Climate Change (SAPCC) for Mizoram is the first comprehensive action plan prepared which touches every aspect of possible actions for climate change adaptation in the state and involving various state departments. It is in such interests and as per the initiatives under the State Action Plan On Climate Change that this information booklet has been prepared. This information booklet is an initial venture by Directorate of Science & Technology towards publication of Climate Change programmes in the state and is an effort to bring about co-operative participation of state's line departments & agencies towards Climate Change Adaptation and Mitigation in the state, in line with policies of National Action Plan on Climate Change (NAPCC).

Engineered to co-exist : Producer and Consumer



Photo : Diva

Chapter 1

An Introduction to Climate Change Programme in Mizoram

It is indeed a windfall for a small state like Mizoram that a comprehensive plan to mitigate and adapt from Climate Change adverse effects in the form of the State Action Plan On Climate Change (SAPCC) is launched.

Among the various issues that the global communities are concerned at the present generation would be the changing climatic conditions and its linked affect on humanity and economic conditions of every community. The changing climatic conditions are often attributed to Global warming, and this phenomenon has swept across the world relentlessly and regardless of caste, creed or economic stability. With the concerns building up across the decades, the global community with leaders from developed nations has felt the need for taking measures and steps to curb the developing magnitude of climate change as it affects every aspect of the human life.

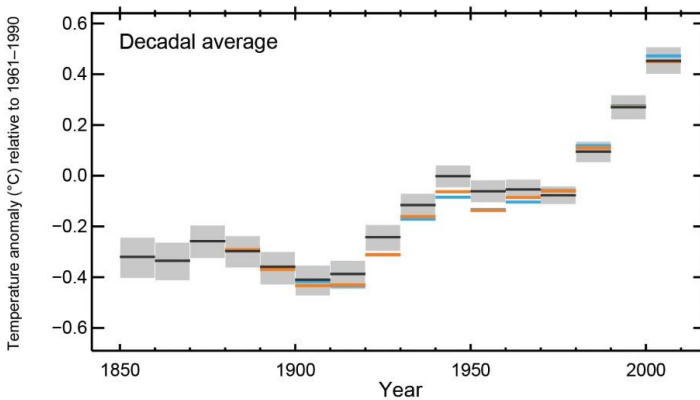
In this endeavor, the Intergovernmental Panel on Climate change (IPCC) was formed and is the leading international body for the assessment of Climate Change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in Climate Change and its potential environmental and socio-economic impacts. Being intergovernmental and scientific in nature, it currently has members from 195 countries of which India is also one of its members.

IPCC

The IPCC Report

The reports and findings provided by IPCC has been looked up by many nations for assessing the issues with climate change in their own perspectives.

The Fifth assessment synthesis report of IPCC on global climate change has revealed that continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks. Cumulative emissions of CO₂ largely determine global mean surface warming by the late 21st century and beyond.



IPCC 5th Assessment (AR5) Synthesis Report

The Fifth Assessment Synthesis Report of IPCC on global climate change has revealed that each of the past three decades has been successfully warmer than the preceding decades since 1850, as shown above in the globally average combined land and ocean surface temperature graph

NAPCC

Advent of NAPCC

At the national level, the concerns on prevailing climate change and its impact on environment and socio-economic profile has gained importance with the current environmental issues faced by the country and concerns at the global stage. In line with the path laid out at the international level about climate change, the National Action Plan on Climate Change (NAPCC) was launched by the former Prime Minister of India, Mr.Manmohan Singh on June 30th 2008. The NAPCC emphasized the overriding priority of maintaining high economic growth rates to raise living standards of the people and aligns the measures that promote the development objectives while also yielding co-benefits for addressing climate change effectively. The plan also outlines existing and future policies and programs to address climate mitigation and adaptation in the country.

Following its objectives, the NAPCC has also identified eight core national missions. These missions collectively plan to converge and address the issues relating to adaptation as well as mitigation actions to contain climate change. The implementation of these plans require a concrete effort at grass-root level ensure that every measure and objective of the national plan is carried out and implemented even in remote areas of the country.

- ➔ National Solar Mission
- ➔ National Mission for Enhanced Energy Efficiency
- ➔ National Mission on Sustainable Habitat
- ➔ National Water Mission
- ➔ National Mission for Sustaining the Himalayan Ecosystem
- ➔ National Mission for a Green India
- ➔ National Mission for Sustainable Agriculture
- ➔ National Mission on Strategic Knowledge for Climate Change

SAPCC

State Action Plan On Climate Change

The idea of a sub-national action plan emerged as it is grounded locally and has high ownership, better awareness linking experiences of climate linked issues to corrective actions, better preparedness and also to set strategic priorities at the sub-national level.

The context of climate change at a sub-national level and recognition of its importance at the state level for effective implementation of the NAPCC objectives has profoundly evoked the formulation of State Action Plan on Climate Change (SAPCC). The plans set at the national level could have been reflected well through state-specific priorities as each state in the country has diversified socio-economic and environmental setup. These priorities would enable the state leaders to make plans for the resources and also see the savings in terms of long run cost associated with climate change more closely. As with other states in the country and in line with the NAPCC, the draft State Action Plan for Climate Change (SAPCC) was also submitted to the Ministry of Environment & Forest (MoEF) for the state of Mizoram on February 2012 to strategize adaptation and mitigation initiatives towards emission stabilization and enhance the resilience of the ecosystem.

On 3rd April, 2013, the Second meeting of the National Steering Committee on Climate Change endorsed the SAPCC document of Mizoram and it can be rightly said that the first ever comprehensive action plan to tackle climate change for our state, in the form of SAPCC, came into existence on this day. This SAPCC has its institutional framework consisting of a Climate Change Council created on 17th June 2010 under the chairmanship of the Chief Minister of Mizoram and involving other 14 members including Ministers and Secretaries from the Government of Mizoram.

SAPCC

The operating arm of this Climate Change Council was designated to the Executive Council with the Chief Secretary, Government of Mizoram as its Chairman and the Chief Scientific Officer, Science & Technology, Government of Mizoram as its Member Secretary, and other nine members from line departments of the state. The objective of the Executive council will be to monitor the directions and other related matter of the Climate Change Council.



Meeting of the State Executive Council on Climate Change

Ever since the inception of SAPCC in Mizoram, all related work in the formulation of plans for Climate change for the state has been taken up by Directorate of Science & Technology, Government of Mizoram. The State has entered a new chapter in the national concerted efforts to adapt and mitigate issues related with climate change and the Directorate of Science & Technology, Planning & Programme Implementation Department, Government of Mizoram has been in the forefront towards accomplishing the set national goals and objectives. The current strength/manpower at the Directorate of Science & Technology along with its multi-facet thematic & scientific expertise under its administration can be justifiable factors for entrusting the task of climate change related studies and works in the state.

SAPCC

State Climate Change Cell

To supplement the effective implementation of priorities as set in the SAPCC, a State Climate Change Cell (under the National Mission for Sustaining the Himalayan Ecosystem [NMSHE] & the Strategic Knowledge Mission) has also been set up under the Directorate of Science & Technology, after the approval of the project proposal and subsequent sanctions by Department of Science & Technology, Govt. of India. Project Scientists will assist in works related to climate change. Capacity building programme will also be in the limelight.

Initial Projects

For a start, seven project proposals prepared by Line departments of the state and endorsed by the State Executive Council on Climate Change, which is also the State Steering Committee have been submitted to MoEF&CC. Resource from all possible sources will be seek for including the Green Climate Fund, Adaptation Fund and the National Adaptation Fund, etc. Meanwhile, it would not be justifiable to depend solely on external assistance. To get the best success out of this endeavour, the state must strive to utilize its resources as best as possible, in true spirit and with endless passion.

- ▶ Development of Horticulture under Climate Change Adaptation Programme (Horti.)
- ▶ Climate Change Adaptation and Mitigation Strategies (Agri.)
- ▶ Green Value Addition Chain in Mizoram (E&F)
- ▶ The Muga Sericulture Development Scheme in Mizoram under Green India Mission (Seri.)
- ▶ Sustainable Agriculture Development Through Expansion, Enhancement & Modeling (Agri.)
- ▶ Eco-restoration of degraded jhumlands as a Climate Change adaptation and mitigation project through community forestry (E&F)
- ▶ Climate Friendly Waste Management Systems and Improvement of Aesthetics (UD&PA)

SAPCC

Way Forward

Mizoram being one of the youngest states of India, still has a long way to go towards the plans and strategies laid out for climate change mitigation and adaptation. With the current scenario of its vulnerability to the impacts of climate change, the objectives and priorities set forth in the SAPCC could help to a considerable extent once concerted efforts are made. Owing to its natural topography, remoteness and socio-economic background, the state has become prone to various natural hazards which are interlinked with change in climate at the local level. A study on the climatic data of the state reveals this scenario and puts Mizoram at a stand point where it shares more or less similar impacts of global climate change. Though still being an envisioned phase, the initiatives taken by the Directorate of Science & Technology, Planning & Programme Implementation Department, Government of Mizoram towards climate change issues could go a long way for policy makers and administrators in making informed and scientifically advised strategies to cope climate change at a local platform.

Classification of Project Activities under SAPCC

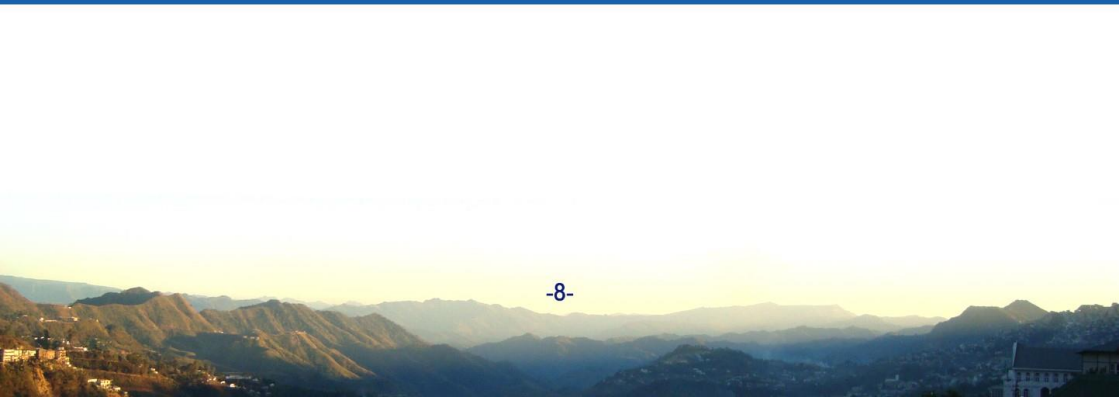
Priority	<ul style="list-style-type: none"> → High (H) → Medium (M) → Low (L) 	Nature	<ul style="list-style-type: none"> → Research Study (RS) → Policy Action (PA) → Pre-investment study (PS) → Demonstration project (DP) → Investment project (IP) → Capacity Building (CB) → Regular Operation & Maintenance (OM)
Type	<ul style="list-style-type: none"> → Mitigation (MI) → Adaptation (AD) 	Scale	<ul style="list-style-type: none"> → None/Nil
Scale	<ul style="list-style-type: none"> → State Wide (S) → Particular/Focused area (A) 	Time frame	<ul style="list-style-type: none"> → Low → Medium → High/Large
Time frame	<ul style="list-style-type: none"> → Short term (ST) → Medium term (MT) → Long term (LT) 	Constraint	

Where tranquility prevails



Photo : SL

A touch of nature's gloom over Reiek village.



Chapter 2

SAPCC

State Action Plan On Climate Change and Sector-wise Key Priorities

The Mizoram State Action Plan on Climate Change (SAPCC) in its planned framework and in concordance with the NAPCC has identified 9 main sectors, each of which having set priorities. Based on these priorities a number of activities have been considered under each sector as shown below :-

Sectors	No. of Key Priorities	No. of Activities Considered
Sustainable Agriculture	17	17
Sustainable Himalayan Mission	14	28
Green Mission	13	17
Sustainable Habitat	7	24
Health	11	14
Solar Mission & Renewable Energy	7	22
Energy Efficiency	7	29
Water	11	18
Strategic Knowledge Mission	3	3
TOTAL	90	172

Each sector has been associated with corresponding line Departments of the State Government. The sector-wise components with their key priorities & activities considered are elaborated as follows:

Sustainable Agriculture

SAPCC

The state's economy is predominantly agrarian, with more than 60% of the total work force engaged directly or indirectly in agriculture. Despite a considerable fraction of land area under irrigated cultivation, the common agricultural practice still remains under-developed and the predominant form of cultivation is still Shifting cultivation or jhuming. As such the agricultural productivity and production of the state are relatively low. Utilization of available cultivable land through scientifically proven sustainable agricultural practices is the need of the hour. This mission on sustainable agriculture has the following key priorities and activities :-

1. Development of Land (levelling, bundling, etc) for Wetland Rice Cultivation (WRC) on available lands having 0-10% slope and Improvement of Existing Wet Rice Cultivation WRC) - Agri. (AD, H, S, LT - PA/PS/DP)
2. Developing database on genotypes of local crop varieties (mainly rice varieties) and identification of suitable varieties for different agro-climatic zones.
- Agri. (AD, H, S, ST - CB)
3. Impact assessment of paddy cultivation through agricultural inputs such as crop varieties, kharif crops and promotion of rain water harvesting and construction of eco-friendly mini check dams for irrigation. - Agri. (AD, H, S, ST - RS)
4. Assessment study and demonstration of Systematic Rice Intensification (SRI) cultivation and Capacity building to train farmers in latest rice cropping techniques specially evolved to counter adverse effects of climate change.
- Agri. (MI, H, S, ST - RS/CB)
5. Optimization of jhum cultivation through conservation of arable land, water utilization management, parallel cultivation of alternative crops and alternative jhum control to livelihood. - Agri. & AH&Vety (MI, H, S, MT - PS/PS)
6. Construction of hill slope terraces for conservation of moisture and cultivation of foodgrain, vegetable, pulses and oilseed crops. - Horti. & Agri. (AD, H, S, LT - PS)
7. Increasing the area under perennial fruit plantation crops & low value high volume crops to help cope with uncertain weather patterns.
- Horti. & Agri. (AD, H, S, ST - PA/PS)

Sustainable Agriculture

SAPCC

8. Management of climate change impact on horticulture & Climate risk management studies. - Horti. (AD, H, S, ST - RS)
9. Improving post harvest management such as cold chain for perishable crops and winter cultivation practices. - Horti. & Agri. (AD, H, S, ST - PS)
10. Promotion of organic farming through usage of compost and vermicompost.
- Horti. & Agri. (MI, H, S, ST - PA)
11. Adoption of Integrated Pest Management for improved crop yield, Preparedness to tackle emerging scenarios of pests and capacity building for stakeholders.
- Horti. & Agri. (AD, H, S, ST, PA)
12. Research study on livestock disease and establishment of early warning system and capacity building to stakeholders. - AH & Vety (AD, H, S, ST - RS)
13. Study of impact of climate change on the indigenous fauna of aquatic ecosystem and open waters. - Fisheries (AD, H, S, ST - RS)
14. Water storage & providing diversion channels to the existing ponds for drainage of catchment runoff during sudden heavy rains. - Fisheries (AD, H, S, LT - RS/PA/PS)
15. Providing extensive support and services to fishermen through establishment of district level training centre. - Fisheries (AD, H, S, LT - CB)
16. Water bodies conservation for fishery sector and establishment of fishery units in reservoirs and riverine areas. - Fisheries (AD, H, S, LT - PA/PS)
17. Greening of devastated barren wasteland for fodder cultivation (7000 hectares).
- Agri. (AD, H, S, ST - PA)

Sustainable Himalayan Mission

SAPCC

Mizoram forms a fragment of the lower Himalayan range with varying altitudes ranges and ridgelines running parallel from north to south. The immense variety of climatic, edaphic and altitudinal variations have resulted in a range of ecological habitats in the state. Climate change impacts coupled with anthropogenic pressure has its negative effect in the fragile mountain ecosystem of Mizoram. This requires special attention to combat the situation by way of policy action and sustainable land use systems, etc. The identified activities and key priorities under this mission are :-

1. Inventorying & conservation of Medicinal Plants/Orchid.
- E&F (AD, H, S, LT - PA/IP)
2. Protection of forests and forest land from soil erosion in 1,35,000 Ha.
- E&F & SWC (AD, H, S, LT - PA)
3. Research on wildlife populations and corridors - Mountain goats, Burmese Peacock, Himalayan Bear. - E&F (AD, H, S, LT - RS/PA)
4. Conservation & management of two major wetlands. - E&F (AD, H, S, LT - RS/IP)
5. Biodiversity Assessment. - E&F (AD, H, S, LT - RS)
6. Assessment of climate vulnerability & climate change impacts on state biodiversity and forest resources. - E&F (AD, H, S, ST - RS)
7. Monitoring of carbon stock & biodiversity at regular intervals.
- E&F (AD, H, S, MT - ROM)
8. Policy formulation on transportation subsidy or development of low cost transportation for primary forest products of the state.
- E&F and Transport (AD, H, R, LT - PA/IP)
9. Documentation of the People's Biodiversity Registers. - (AD, H, S, ST - RS)
10. Undertaking study on valuation of forest resources (Non-traded) and climate change impacts on vulnerable ecosystem. - E&F (AD, H, S, ST - RS)
11. Ecotourism promotion for biodiversity protection and sustainable livelihood through Pre-investment feasibility study, DPR preparation, pilot implementation in 2 regions.
- E&F and Tourism (AD, H, S, LT - IP)

Sustainable Himalayan Mission

SAPCC

12. Work to establish new systems to support for public awareness building through Establishment of ENVIS Centre - E&F / SPCB (AD, M, S, ST - IP)
13. Documentation of Medicinal Plant resources in Mizoram. (AD, H, S, ST - RS)
14. Restructuring land use policy for jhum cultivation & habitation on notified forest lands. - E&F / Agri. (AD, H, S, ST - PA)
15. Consider unique mountain spaces as entities with “Incomparable Values” in developing strategies for their protection. (MI, M, S, LT - PA)
16. Assessing threats to biodiversity and wildlife. (AD, M, S, LT - RS/PA)
17. Creation and management of community and conservation reserves for economic welfare of local communities and conservation of biodiversity. (AD, M, S, LT - IP)
18. Capacity building of JFM committees and Panchayati Raj Institutions to adapt to climate change (AD, M, R, ST - CB)
19. Assessment and quantification of the changes in the Himalayan ecosystem attributable to the climate change as a result of global emissions and human activities in the region and model for future projections. (AD, M, S, LT - RS)
20. Exploration of linking of traditional and formal knowledge systems through strategic mechanism of formalization for mutual benefit and value for the sustainability of the Himalayan ecosystem. (AD, M, S, LT - CB)
21. Adaptive species identification for effective plantation through establishment of permanent Nursery. (AD, M, S, ST - RS)
22. Sequestering carbon through avenue plantations. (MI, M, S, ST - IP)
23. Study on dependence of people on forest resources. (AD, M, S, ST - RS)
24. Promoting community-based management through developing mechanisms for incentives for protection and enhancement of forested lands. (AD, M, S, ST - PA/IP)
25. Building human and institutional capacities in the different existing/new institutions in the Himalayan region. (AD, L, S, LT - PA/IP)
26. Identification of most desirable adaptation policies to improve regional sustainability. (AD, L, S, LT - RS/PA)
27. Creation of Biodiversity park. (AD, H, S, LT - IP)
28. Documentation and enrichment of Biodiversity database through Peoples Biodiversity Register (PBR) at the JFMC level. (AD, H, S, LT - CB)

Green Mission

SAPCC

Forests constitute a dominant feature of the state's landscape and environment. These forests are vital for maintaining the balance in the state's ecosystem as it houses a variety of unique flora and fauna. Forested lands are often found within notified forests and also significant area managed under communities and individuals. The major constraints in conservation of forests are due to an increase in deforestation rates caused by practice of jhum cultivation and degradation due to increased biotic pressure. The National mission for Green India under the NAPCC has recognized forestry sector as one of the most effective carbon sinks to mitigate and adapt to climate change, and an indispensable role for restoring ecological balance and biodiversity restoration. The Green Mission under the Mizoram SAPCC is also prepared under the national guidelines and has identified the following activities & key priorities :-

1. Improvement of forest quality & density in degraded & abandoned jhum lands.
- E&F / Agri. (MT, H, S, LT)
2. Improvement of productivity of bamboo & promotion of local value addition through establishment of market linkages. - E&F (AD, H, S, LT - CB/IP)
3. Undertaking studies on climate change impacts on NTFP productivity & sustainable harvesting practices for adaptation of climate change. - E&F (AD/MT, H, S, LT-RS/IP)
4. Capacity building of community forest management institutions for climate change adaptation. - E&F (AD/MT, H, S, LT - CB)
5. Prevention & control mechanism for forest invasive species & its utilization strategies.
- E&F (MT/AD, H, S)
6. Formulation of conservation strategies for orchids & establishment of market linkages for value addition. - E&F (AD, H, S, LT)
7. Strengthening of local VSS. - E&F (AD, H, S, LT - RS)
8. Publicity/media & outreach. - E&F (MT, H, S, LT)
9. Strengthening of Forest department. - E&F (AD, M, S, LT - CB)
10. GIS based monitoring & evaluation of the programme. - E&F (H, S, LT)
11. Strengthening local level institutions about forest management and climate change adaptation. (MT, H, S, LT)



Green Mission

SAPCC

12. Livelihood improvement activities for forest dependent communities.
- E&F (AD, H, S, LT - CB)
13. Establishment of Mission Directorate. - E&F (MT/AD, H, S, LT)
14. Increasing plantation activities on outside forest land (plantation activities and supporting natural regeneration in 500 Ha) (AD/MT, M, S, LT)
15. Enhancing the resilience and ability of vulnerable species/ecosystems to adapt to climate change. (AD, M, S, ST - RS)
16. Enabling adaptation of forest dependent local communities in the face of climatic variability. (AD, M, S, ST - RS)
17. Assessing fire management strategies. (AD/MT, M, S, LT)
18. Promotion of forest based industries*. - E&F and Industries

Sustainable Habitat

SAPCC

Mizoram being a hilly terrain region is vulnerable to climate change with respect to warmer temperatures, unusual rainfall, landslides and other natural calamities induced by relentless exploitation of natural resources. Better urban planning and policies can reduce energy use and green house gas emissions and also improve the resilience of urban infrastructure to climate change, thus shaping future trends. The geographic location of the state with its proximity to natural calamities vulnerable countries like Bangladesh places Mizoram in a unique situation and requires special attention in initiatives taken under sustainable habitat mission. The identified activities and key priorities under this mission are :-

1. Capacity building & research initiatives on Climate Change Impacts & Preparedness - UD&PA/Power/Transport/PHED
 - a) Awareness generation and capacity building on Climate Change Impacts & Preparedness. (AD, H, S, LT - CB)
 - b) Capacity building for departments on advance solid waste management. (AD, H, S, LT - CB)
 - c) Capacity building on Water management and efficient distribution of supply and delivery. (AD, H, S, LT - CB)
 - d) Capacity building on Urban Management. (AD, H, S, LT - CB)
2. Improvement in water usage management for urban drainage to reduce climate change impacts - PHED/UD&PA
 - a) Liquid waste management through improved sewage design for addressing climate change impacts (AD/MI, H, S, MT - PA/CB/OM)
 - b) Developing models of urban storm water flows and capacities of existing drainage systems. (AD, H, S, ST - RS)
3. Development of climate friendly waste management systems and improvement of aesthetics - UD&PA/Municipal Council
 - a) Developing a climate friendly waste management system (AD/MI, H, A, LT-RS/PA)
 - b) Landfill gas recovery from closure landfills. (MI, H, A, LT-RS/IP)
 - c) Reduction of vector borne diseases from unmanaged dumping grounds (AD, H, A, MT - CB)



Sustainable Habitat

SAPCC

- d) Improvement of collection efficiency and segregation at source.
(AD/MI, H, A, LT - IP/ROM)
- 4. Reduction of disaster risk through climate change adaptation. (UD&PA)
 - a) Formulation of building guidelines with provision of promoting traditional houses for different agro-climatic zone, flood plains and in consideration of the seismic vulnerability of the state. (AD, H, A, LT - IP)
 - b) Developing climate-responsible master plans for selected city/towns (CDP)
(AD, H, A, MT - PA)
 - c) Reformulation of land tenure policy to enable sustainable urban development.
(AD/MI, H, S, LT - PA)
- 5. Energy Efficiency improvement & promotion of renewable energy usage in urban sector. (UD&PA)
 - a) Promotion of solar water heating and lighting in buildings through policy mechanisms. (MI, H, S, MT - IP)
- 6. Improvement of vehicular pollution control mechanism for reduction of GHG emissions. (Transport/UD&PA)
 - a) Improve enforcement to control vehicular pollution through certification of PUC (Pollution Under Control Certificate). (MI, H, S, LT - PA)
- 7. Assessment & inventorisation of climate change impact on urban sector. (UD&PA)
 - a) Quantitative assessment of the impact of climate change. (AD, H, S, LT - RS)
- 8. GHG Emissions foot printing for all urban bodies including upcoming satellite townships. (AD/MI, M, A, MT - RS/OM)
- 9. Improvement of Water use efficiency and conservation through leak reduction, reuse and recycle in urban areas. (AD, M, S, LT - PS/OM)
- 10. Urban poor mapping to identify vulnerable urban population. (AD, M, S, LT - RS)
- 11. Improvement of pumping energy efficiency in water supply system. (MI, M, A, MT - IP)
- 12. Assessment of carbon emissions from the transport sector. (AD/MI, M, S, ST - RS)
- 13. Replacement of more polluting old vehicles with advance low emission vehicles.
(MI, M, S, LT - IP)
- 14. Piloting low carbon highways. (AD, M, S, LT - IP)
- 15. Energy efficient street lighting. (MI, L, A, MT - PS/PA)

Health Mission

SAPCC

Accrued health related empirical evidence has already established facts on climate-disease relationship. Public health which is highly dependent upon the availability of adequate quantity and quality of basic daily requirements of the population is projected to be affected by climate change. It is expected that changes in climate will profoundly catalyze the propagation of infectious communicable and vector-borne diseases as some of the vectors are highly sensitive to climate change with regards to temperature and rainfall. Considering the scenario in Mizoram, profiling of the health condition towards determining possible impact of climate change on health status and modeling of impact reduction framework are necessary. In addition, the following activities and key priorities have been considered :-

1. Identify extrinsic & intrinsic drivers of malaria & identifying immunity intervention measures towards control of incidence of malaria.
- Health/Research Institute (AD, H, S, MT - RS/PS)
2. Assessment of impact of heat stress on human health & framing adaptation strategy, identification, documentation and awareness creation on temperature related morbidity. - Health/Research Institute (AD, H, S, MT - RS/PS/CB)
3. Evidence based assessment of biophysical determinants of malaria & development of framework for adaptation measures for malaria control.
- Health/Research Institute/MIRSAC (AD, H, S, ST - RS/CB/IP)
4. Carrying out of adaptation study. - Health/Research Institute (AD, H, S, MT - RS)
5. Research initiatives to identify change in pattern of diseases by region due to climate change/weather variation. - Health/Research Institute (AD, H, S, ST - RS)
6. Study and documentation of diseases caused by water (water borne) & development of institutional mechanism to reduce the incidence/outbreaks of such diseases along with awareness generation. - Health (AD, H, S, ST - RS/CB/IP)
7. Development of institutional framework & infrastructure for early detection of vector borne diseases, including management outbreaks. - Health (AD, H, S, MT - RS/IP)

Health Mission

SAPCC

8. Establishment of pathological laboratory with state of the art technology for diseases identification. - Health (AD, H, S, ST - DP/IP)
9. Public health system infrastructure development for extreme climate risk management & managing outbreaks of major diseases.
- Health (AD, H, S, ST - DP/IP)
10. Capacity building & training for health workers for sensitization of climate variation & health impacts. - Health/NGO (AD, H, S, ST - CB)
11. Research study on malnutrition of vulnerable group due to food security caused mainly due to climatic variation. - Health/Research Institute (AD, H, S, ST - RS/IP)
12. Upgradation of State health policy through incorporation of health impact due to climate change. (AD, M, S, MT - PA)
13. Capacity building and training of the health sector practitioners for psychological or physical trauma due to the impact of extremes climate event.
(AD, M, S, ST - RS/CB)
14. Establishment of mobile health centre to provide medical facilities in far off areas during extreme climatic events. (AD, M, S, MT - DP/IP)

Solar Mission & Renewable Energy SAPCC

Climate change is admittedly a serious issue and must be a key consideration in any energy policy, but ensuring diversity of energy supply and providing affordable energy options are also important issues. The plan on solar mission and renewable energy is presented to enable communities to understand the uncertainty of future climatic conditions and engage effectively in a process of developing adaptation and mitigation programmes. This mission also addresses measures to portray pathway of reducing carbon emission intensity and achieving sustainable development. The following are the identified activities and key priorities for the state :-

1. Up-scaling Renewable Energy (RE) Application for meeting up decentralized, distributed or Off-grid area energy demand.
 - a) Maximizing use of stand-alone solar power packs of 250 Wp for decentralized power generation through pilot scale implementation of 100 systems under JNNSM scheme. (MI, H, S, MT - PS/DP)
 - b) Promotion and facilitate installation of stand-alone off-grid solar power plant with capacity range below 100 kW with targets of 0.80 MW by 2016-17 and 1.60 MW by 2021-22. (MI, H, S, LT - PS/IP)
 - c) Electrification of un-electrified villages and hamlets by non-conventional energy sources and undertake electrification of 10 villages through solar and other renewable energy systems to meet the power demand of the remote villages. (MI, H, S, MT - PS/IP)
2. Unlocking grid interactive solar power generation and supplement the conventional grid power under National Solar Mission.
 - a) Undertake a demonstration project of install 1 MW interactive solar power plant at Lengpui, Aizawl by 2013. (MI, H, A, ST - PS/IP)
 - b) Facilitate in installation of 2 MW grid connected solar plant of capacity 100 kW - 2 MW by 2022. (MI, H, S, LT - PS/IP)
3. Reduce anticipated energy and peak demand through promotion & implementation of pilot SWH application by undertaking installation of 100 Nos. of 100 LPD systems & 100 Nos. of 200 LPD systems across various demand segments. (MI, H, S, ST - PS/IP)

Solar Mission & Renewable Energy SAPCC

4. Develop Renewable energy systems supply chain through empanelment of renewable energy technology manufacturers/distributors with ZEDA and support in development of their set-up in the state. (AD, H, S, MT - RS/PA)
5. Institutional development and strengthening of ZEDA for promotion of Renewable Energy (RE) applications.
 - a) Restructure and functional re-organization including increase of human resource strength at ZEDA to achieve efficient functioning and increase implementation of renewable energy projects. (AD, H, S, ST - PA/IP)
 - b) Training of the working group member and their representative from ZEDA and other concerned departments and organizations on sector specific climate change issue and enhance the knowledge about the policy measures. (AD, H, S, MT - CB)
6. Awareness creation & manpower development for enhancement of RE application.
 - a) Supporting state level entrepreneurs to become RESCOs, Channel partners under JNNSM scheme and RE device manufacturers, distributors, installers, etc. (AD, H, S, MT - PA/CB)
 - b) Curriculum or technical course development with ITIs and other technical institutions in the state for production, engineering, installation and maintenance activities of RE systems. (AD, H, S, MT - CB)
 - c) Awareness creation among the citizens on the need and benefit of new and RE systems and also on wider dissemination of opportunities for diffusion of RE in infrastructure and other socio-economic sectors through all feasible routes, viz. awareness campaign and workshop, print and electronic media, State nodal agencies, village panchayats, CBOs, NGOs. (AD, H, S, MT - CB)
 - d) Support schools, education institutions in preparing and introducing, curriculum on RE applications and preparation of book. (AD, H, S, ST - CB)
7. Market Transformation of RE applications through policy measures
 - a) Modification of existing power policy particularly power generation to investment friendly policy for promotion of solar thermal and other RE application in PPP, IPP mode and other options. Inclusion of climate change and CDM aspects in the State Power Policy. (AD, H, S, ST - PA)

Solar Mission & Renewable Energy SAPCC

- b) Development of fiscal instrument to promote RE systems and preparation of operation plan for power trading. (AD, H, S, ST - PA)
 - c) Declaration of tariff policy for solar and other renewable power purchase and incorporation of zero transmission/wheeling charges for transmission of renewable power to the grid. (AD, H, S, ST - PA)
 - d) Modification of building bye-law according to state profile for mandating use of solar water heater and renewable energy systems for lighting in the common or open space of govt. and commercial establishments. (AD, H, S, ST - PA)
 - e) Create demand for renewable energy services through pilot scale demonstration projects in state government and public sector establishments.
(AD/MI, H, S, LT - PA/DP)
8. Improved and geographically focused assessment of energy potential from solar, biomass, etc. particularly solar radiation to be undertaken. (AD, M, S, MT - RS/PS)
9. Engage with bilateral and multi-lateral fund managers for project report preparation for funding in pilot implementation project and also undertake CDM activities.
(MI, M, S, LT - RS/PA/PS)
10. Installation and promotion of solar pumps for agriculture practice in hilly and remote areas as a demonstration project. (MI, M, S, MT - PS/DP)
11. Promotion of use of community based solar cooker system at schools/education centers. (MI, L, S, MT - PS/DP)

Energy Efficiency

SAPCC

Energy production has been a basic infrastructure need for economic development of the state. For a remotely located state like Mizoram which mainly gets its power demand from small hydel, diesel and thermal power stations and other NE grids, the development of efficient energy generating stations are a necessity. In spite of the fact that generation capacity addition is highly essential for the economic growth of the state, it also has to be kept in mind that such additions could contribute to the existing increasing rates of GHG emissions. An approach to balance out the negative effects of energy production yet maintaining its efficient outputs from whatever available source is an essential factor to be considered under this mission. In this context, the following are the activities and key priorities identified :-

1. Awareness creation & manpower development to enhance the energy efficiency measures.
 - a) Supporting state level entrepreneurs to become ESCO. (AD, H, S, MT - PA)
 - b) Curriculum development for production, engineering, installation and maintenance activities of energy efficient devices with ITIs and other technical institutions in the state. (AD, H, S, MT - CB/PA)
 - c) Awareness creation among the citizens on the need of energy efficiency measures, use of star rated devices in everyday life as also for wider dissemination of opportunities for diffusion of energy efficiency measures in infrastructure and other socio-economic sectors through all feasible routes, viz. awareness campaign and workshop, print and electronic media, state nodal agencies, village panchayats, CBOs, NGOs etc. (AD, H, S, MT - PS/PA/CB)
 - d) Support schools, educational institutions in preparing and introducing curriculum on energy efficiency measures and preparation of book. (AD, H, S, ST - PA/CB)
2. Market transformation of Energy Efficiency applications through policy measures.
 - a) Development of fiscal instrument to promote energy efficient systems. (AD, H, S, ST - PA)
 - b) Enactment of ECBC code according to state profile for mandating building design in line with ECBC code and to build green building. (AD/MI, H, S, ST - PA/CB)

Energy Efficiency

SAPCC

- c) Create demand for energy efficiency activities through pilot scale retrofit projects in state government and public sector establishments.
(AD/MI, H, S, MT - PA/CB/DP)
3. Upgradation of transmission & distribution network for minimizing energy losses
 - a) Assessment of T&D infrastructure and development of action plan for improvement of T&D network and setting target for AT&C loss reduction.
(AD, H, S, ST - RS/PS/PA)
 - b) Upgradation of HT & LT lines and replacement of Distribution Transformers with star rated transformers. (MI, H, S, MT - PS/IP)
 - c) Reduction of AT & C losses by 10% consumer metering of the consumers with a connected load of 20 kW and above and introduction of on-line remote monitoring.
(MI, H, S, MT - PA/PS/IP/RO&M)
 - d) Introducing franchisee model in distribution system to reduce commercial losses and better management of the distribution system. (MI, H, S, MT - PS/PA/CB/IP)
4. Penetration of energy efficient devices in domestic & public utility systems facilitated by financial, supply chain and market incentives.
 - a) Introducing energy efficient lighting in domestic sector by supply and installation of CFLs lights and replacement of incandescent lamps in 1.5 lakhs domestic consumer. (MI, H, S, MT - PS/CB/IP)
 - b) Deployment of energy efficient lighting in public systems by replacing existing 250 HPSV lamps with 90W LED street lights in 5500 no. of electric poles.
(MI, H, S, ST - PS/CB/IP)
5. Unlocking the energy efficiency activity in IGEA mode.
 - a) Implementation of energy efficiency measures through demonstration projects in 7 no. of government buildings in Mizoram under IGEA mode where energy audit is already carried out by the Nodal department. (MI, H, A, ST - PS/PA/CB/DP)
6. Institutional development and strengthening of Energy departments for Energy Efficiency promotion
 - a) Restructure and functional reorganization including enhancing the human resources of the energy departments including SDA to achieve efficient functioning, promotion and implement energy efficiency activity in the state.
(AD, H, A, ST - PA/CB/RO&M)

Energy Efficiency

SAPCC

- b) Empanelment of Energy Auditors, Energy Services Companies (ESCO) for taking up energy efficiency activities in the state. (AD, H, S, ST - PA/CB)
- c) Training of the working group members and their representative from different departments and organizations on sector specific climate change issue and enhance the knowledge about the policy measures. (AD, H, A, MT - CB)
- 7. Increase hydro-power generation by supporting private/public investors in setting up projects and undertake demonstration project.
 - a) Detailed reconnaissance study on water availability and hydrology data evaluation for identification of new hydro projects and demarcation of hydro power sites with specific capacity mapping. (AD, H, S, ST - RS)
 - b) Promotion & facilitation of hydro power project implementation by providing adequate support from the state government in terms of clearance, land acquisition, power transmission network development. (AD, H, S, MT - RS,PA)
 - c) Declaration of water policy and mandate of siltation and pollution control in water bodies of hydro power projects. Two demonstration projects to be undertaken in existing hydro projects. (AD/MI, H, S, ST - RS/PA/DP)
 - d) Demonstration hydro project in already identified project sites
 - Setting up of 100 kW micro hydel project in Tuichang river which is located in north of Champhai District
 - Setting up of 100 kW micro hydel project in Tuiriza river which is located in Aizawl District (MI, H, A, ST - PS/IP)
- 8. Life cycle analysis of existing hydro power plant and implementation of R&M measures. (AD, M, A, LT - RS/PS/IP)
- 9. Survey and investigation of 7 hydro projects namely - Ngengpui, Hnahtial & Piva, Marlui, Tuisalui, Ngengrual III, Tuiphal and Sekulhlui. (AD, M, A, MT - RS/PS)
- 10. Deployment of improved chulha in rural households for efficient energy consumption and reduce deforestation through enabling policy and subsidy framework. (MI, M, S, MT - PS/IP)
- 11. Engage with bilateral and multi-lateral fund managers for project report preparation for funding in pilot implementation project and also undertake CDM activities. (AD/MI, M, S, LT - PA/CB/PS)

Energy Efficiency

SAPCC

12. Promotion and implementation of energy efficient pumps in agriculture and urban sector for drinking water supply through introduction of comprehensive scheme.
(MI, M, S, MT - PA/IP)
13. Enactment of mandatory use of energy efficient lights by reviewing standards & rules for public lighting, bill boards or hoardings for advertisement, commercial area lighting such as shopping malls, shops, etc. (MI, M, S, MT - PA/CB/PS)
14. Formulation of Demand side management projects in P&E Department.
(AD/MI, M, S, LT - PA/IP)
15. Efficient cooking practice in rural areas and conservation of forest wood.
(AD/MI, M, S, LT - PA/IP/OM)

Water Mission

SAPCC

Water is one of the prime natural resource and an indispensable component for sustenance of all life forms. Climate change is likely to impart formidable challenge to the water sector and the adversity may increase due to the location of the state in a fragile ecosystem. The impact of climate change on water sector is likely to be drastic due to erratic precipitation creating variability in river flow and increased intensities of extreme events. The water mission is established to ensure conservation of water, minimize wastage and ensure its equitable distribution across and within states through integrated water resource management. The following are the key priorities and activities :-

1. Climate Change impact assessment of present status of water resources like river, wetland, streams & lakes. - Water Resource Dept/PHED (AD, H, S, ST - RS/PS)
2. Finalization of plan for conservation and preservation of water resources
- WRD/PHED (AD, H, S, MT - RS/PS/DP/IP)
3. Formulation of state water policy. - WRD/PHED (AD, H, S, MT - PA)
4. Catchment & command area treatment through riverine afforestation.
- WRD/PHED (AD, H, S, MT - DP/IP)
5. Capacity building of Water Resources department/Mizoram PHED for integrated water resources management. - WRD/PHED (AD, H, S, ST - CB)
6. Expansion of hydrometric network and establishment of micro weather station for regular monitoring. - WRD/PHED (AD, H, S, ST - IP)
7. Community tank management for combating water borne diseases.
- WRD/PHED (AD, H, S, ST - DP/IP)
8. Promoting zero energy water purification for domestic water supply.
- WRD/PHED (AD, H, S, ST - DP/IP)
9. Renovation & development of traditional water harvesting system with scientific intervention in district level. - WRD/PHED (AD, H, S, ST - OM/IP)
10. Capacity building of communities on adaptation options required for integrated demand side as well as supply side strategies during climate stressed conditions.
- WRD/PHED (AD, H, S, ST - CB)

Water Mission

SAPCC

11. Impact assessment study of climate change on aquatic ecosystem.
- WRD/PHED (AD, H, S, ST - RS)
12. Assessment of climate change impact on food security due to water stress.
(AD, M, S, ST - RS)
13. Assessment of ground water availability in usage and conservation plan.
(AD, M, S, MT - RS)
14. Mandating water harvesting and artificial recharge in water stressed area.
(AD, M, S, MT - PA)
15. Enhancement of recharge of the source and recharge zone of deeper ground water aquifers. (AD, M, S, MT - DP/IP/OM)
16. Institutional development of ground water board. (AD, M, S, MT - CB)
17. Capacities (storage) through multipurpose hydro projects and integration of drainage with irrigation infrastructure. (AD/MI, M, S, MT - DP/IP)
18. Awareness generation of local communities on importance of aquatic ecosystem.
(AD, L, S, ST - CB)

Strategic Knowledge Mission

SAPCC

The mission on strategic knowledge for climate change is framed under NAPCC to bridge up, assimilate and upgrade information and knowledge available on climate variability and vulnerability with an objective to forecast as well as appraise for strategic development towards low carbon inclusive growth. This mission is not only limited to reduction of green house gases but include the coping capacity of vulnerable population to include challenge of innovative capacity building for sustainable development. The state mission has considered the following activities and key priorities :-

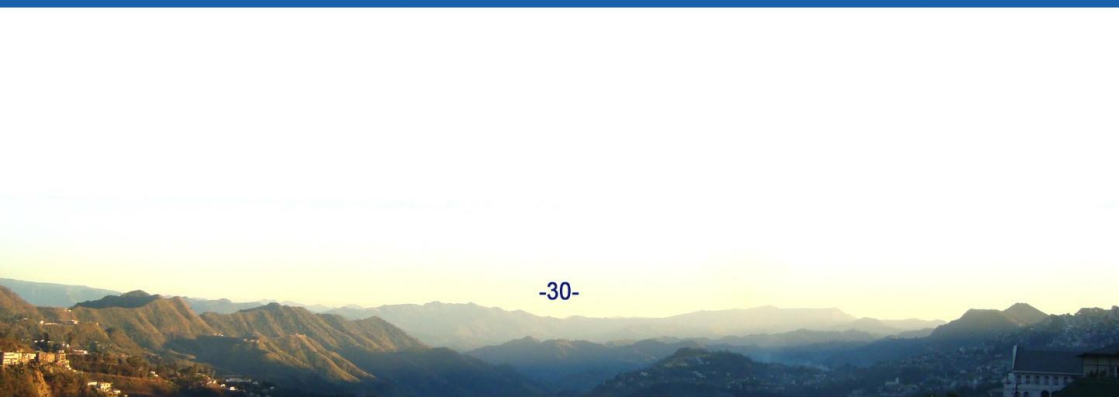
1. Development of Knowledge Management on Climate Change and facilitating its operation for initial period. - S&T (AD, H, S, ST - RS)
2. Capacity building on Climate Change :
 - (a) Capacity building of personnel in the service department
 - (b) Exposure visit for capacity building - S&T (AD, H, S, ST - PA/CB)
3. To install Automatic Weather stations in strategic areas for better localized climate information. - S&T (RS)

Remnants of tenderness



Photo : SL

The five billion years old mass above the western sky



Chapter 3

Climate Change Scenario In Mizoram

A storehouse of natural beauty and endless variety of landscapes, flora and fauna. Perched on the high hills of the south-eastern corner of the great Himalayan range. Blessed by a pleasant climate, generally cool in summer with a mild winter. This is a brief definition of the land.

The earth's climate has undergone a series of changes as part of the natural process of its immediate environments. However, with generations of increased global carbon dioxide concentrations and building up of other green house gases (GHGs) primarily due to excessive use of fossil fuels and drastic land use changes, the issues with climate change has now become a serious global environmental concern. Climate change may thus be defined as a change of climate that is attributed directly or indirectly to human activities which alter the composition of the atmosphere and which are in addition to the inherent natural variability of climate observed over comparable time periods.

Climate change being a global issue has its interconnected affect even on remotely located regions of the world. India as a whole is also one of the countries most affected by this phenomenon. Studies on climate change impact in Northeastern India has also highlighted that the region is expected to be highly prone to the consequences of climate change due to its geo-ecological fragility, strategic location, trans-boundary river basins and its inherent socio-economic instabilities.

As such, climate change in hilly regions like Mizoram can have dramatic impacts on natural resources, economic activities, food security, health and physical infrastructure. The threat could even be accelerated in communities and areas where people's lives and livelihoods are highly dependent on natural resources. Environmental security and sustainability of the region will be greatly challenged by these impacts.

Jhum (shifting) cultivation is a dominant cropping pattern characterized as rain-fed, labour intensive and low production but highly diverse food basket.

From climate change perspective, the scenario in Mizoram is more or less at critical stage as most of the population in the region is basically rural and depend on climate sensitive livelihood mainly agriculture. Besides agriculture, a substantial proportion of the people are dependent on forests based livelihoods. Jhum (shifting) cultivation is a dominant cropping pattern characterized as rain-fed, labour intensive and low production but highly diverse food basket. The factors behind low productivity of agriculture are paucity of land actually available for cultivation, small holdings, shift in rainfall patterns, temperature regime, shortening of Jhum cycle, etc. Climate change is a major concern for sensitive areas like Mizoram which has been considered highly vulnerable to climate variability and change. Studies on rainfall and the temperature regimes indicate that there is no significant trend in rainfall for the region as a whole.

Like other States of NER, Mizoram is pre-dominantly agricultural based and more than 70% of the total work force engaged either directly or indirectly in agriculture and allied sectors (forestry, horticulture, and fisheries). Mizoram witnessed increase in precipitation (entire state), high rainfall (Southern & Western District) increase in extreme rainfall days, and increase in temperature-affecting fish, agriculture and livestock (source: State Action Plan of Climate Change).

Overall, these factors resulted into dwindling of natural resources, drying of surface water bodies, affecting sowing and harvesting of crops and contributing to livelihood and food security of the population. Significant change in high surface temperature has also been observed in the region.



Like all other states of the country as well as abroad, Mizoram also has been experiencing the spells and consequences of global climate change. Although temperature is usually the first variable considered in assessments of climate change, it is important to consider other data that integrate the state of the climate system over space and time. These include such climate parameters like rainfall and humidity. As per the data collected, there has been a prediction in the change occurring which has been experienced even by the common man either in the form of rise in temperature or increase or decrease in rainfall. However, to get a better picture on the climate change in Mizoram the data of the climate elements namely rainfall, temperature and humidity of Aizawl City for a period of twenty six years (1986 – 2011) were analyzed. The data were compared and analyzed for two decades taking an average data for 10 years interval (1986-1995 & 1996-2005) and the remaining 6 years interval (2006-2011) to arrive at brief conclusive results on the overall climate change in Mizoram.

Temperature

Temperature of Aizawl has been analyzed using 26 years temperature data collected and studied at three consecutive year-intervals. The average monthly maximum temperature taken during the decade of 1996-2005 shows an increase over the previous decade of 1986-1995, during the early part (January-February) as well as later part (November-December) of the years.

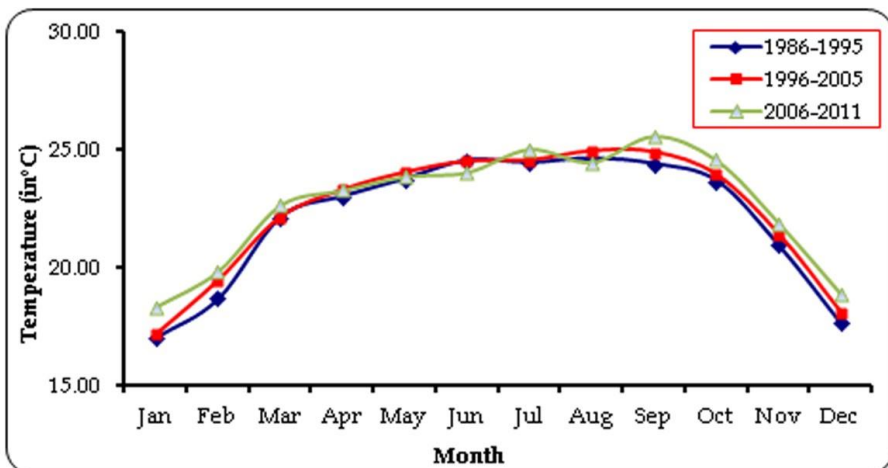


Fig.1. Average Mean Monthly Temperature (in °C) of Aizawl City (1986-2011)

However, the half-decade analysis (1996-2011) shows a higher level of temperature difference when compared to the previous decade. The overall trend in temperature i.e. average mean monthly temperature shows a gradual increase during the 1996-2005 decade and continues on during the 6 years interval of 2006-2011 by a factor of 0.33°C (Fig.1). The increase in temperature as per the data indicates that there might be further rise in the heat wave in the consequent years to come.

Humidity

The humidity levels indicate the amount of water/moisture content in the atmosphere and have a close relation to temperature and rainfall variations, thus playing a role in affecting the climate of the region. Average data on humidity for 26 years was collected and analyzed as per intervals done for temperature data. The results studied for each interval clearly indicated that there was a gradual and progressive increase in humidity during a span of 20 years and is expected to increase consequently for the next decade as reflected in the 6 year interval (2006-2011) data.

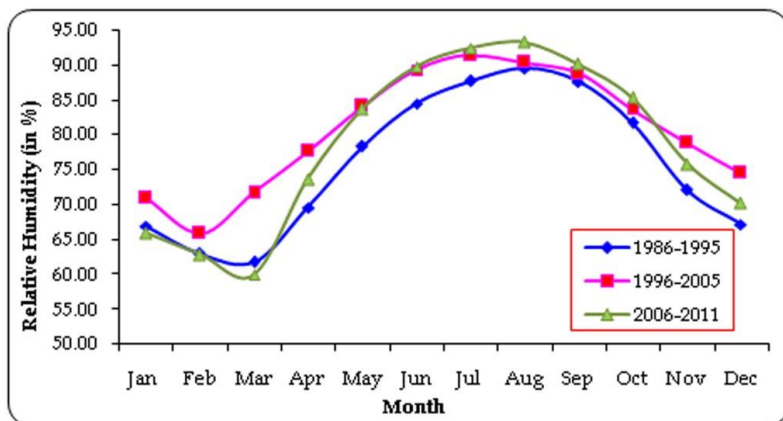


Fig.2. Average Monthly Humidity (in %) of Aizawl City (1986-2011)

The trend seemed to decrease during the month of February but then gradually increased till August where it reached its maximum and then decreased during the end of each year. All the data recorded were within the wide range of +55% to +95% relative humidity, with the highest percentage recorded during June to August. Taken as a whole, the average relative humidity studied for a span of 26 years indicated a gradual increase from 75.78% in 1986-1995 to 80.55% in 1996-2005, a marked increase of 4.77% during last two decades. The further analysis of 6 years period also shows steady increase even during the half decade time span. (Fig.2)

Rainfall

The pattern of rainfall in Aizawl during the past 26 years follows the trend in which maximum downpour occurred during the monsoon seasons and declines during the rest of the seasons. When analyzed on an average monthly basis for the time intervals adopted during this study, the trend shows a gradual decline and then a sudden increase during the time period of 1986-1995 and 1996-2005, particular during peak monsoon season - July to August (Fig.3). During the span of the study period, the decade of 1996-2005 recorded the highest annual rainfall of 2855.49 mm, with a total increase of 123.63 mm of annual rainfall compared to the previous decade. Following this trend, the rainfall data analysis for consequent years from 2006-2011 indicates a gradual increase as well and is crossing the threshold of 2000 mm annual rainfall during the half decade.

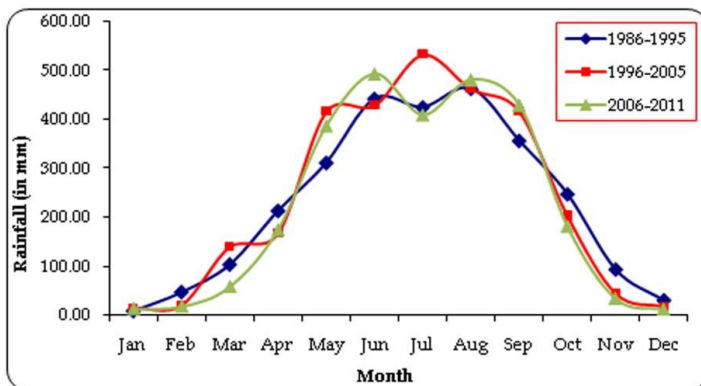


Fig.3. Average Monthly Rainfall of Aizawl City (1986-2011)

Thus, it can be said that there is change in the rainfall trend when analyzed and compared between the two decades, but not on an extremely large scale which again shows that this trend can further change the pattern for the consecutive 10 years rainfall data. If this usual small scale change in trend continues, then Mizoram is not expected to experience a sharp decrease in rainfall unless there are other climatic elements that unexpectedly alter the usual trend, which is mostly above the 2000 mm mark.

Conclusion

The climate data that have been used to study climate change in this context are necessarily simplified representations of the climate system prevailing during 1986-2011. Despite the inevitable limitations, the climate data analysis more or less reproduces the large-scale seasonal distributions of pressure and temperature. In addition, the large-scale structure of precipitation (rainfall) and heat flux (temperature variations) also closely resembles the observed estimates on a global scale.

Considering all the results obtained from the study, it can be said that the climate parameters studied, have either direct or indirect relation to increased atmospheric concentrations of the principal anthropogenic greenhouse gases (CO₂, CH₄, N₂O, CFCs) which have subsequently increased in significant amount during the last two decades. Elevated concentrations are predicted to persist in the immediate atmosphere for years to come if we do not reduce emissions of greenhouse gases by the end of the next decade. Moreover, the increased atmospheric levels of these gases, especially CO₂, increase the IR (Infra-red) energy absorbed by the atmosphere, thereby producing a warming influence at the ground level and sub-surface as a result raising the mean temperatures by a few more degrees.

Projections of greenhouse gas emissions vary over a wide range, depending on both socio-economic development and climate policy. The most commonly considered indicator of climate change is the surface air temperature. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.

Climate Change Programme in Mizoram : A reflection ■■■■■■



DST-SDC Workshop on Adaptation Planning and Implementation in the Indian Himalayan Region
Technical Support for State Climate Change Cells under NMSHE
28-30 January 2015, New Delhi



5th Meeting of National Steering Committee
on Climate Change - 31st March 2015



CSO & Member Secretary, Exe. Council on Climate
Change with Dr. S.Satapathy, Director, Climate
Change Division, MoEF&CC & Dr. Nisha Mendiratta
Director, Climate Change Programme, DST



Regional Consultation on State Action Plan on Climate Change : Himalayan Region
18th-19th September 2013, New Delhi

CLIMATE CHANGE

Climate Change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. (UNFCC)

Adverse effects of climate change means change in the physical environment or biota resulting from climate change which has significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare. (UNFCC)

