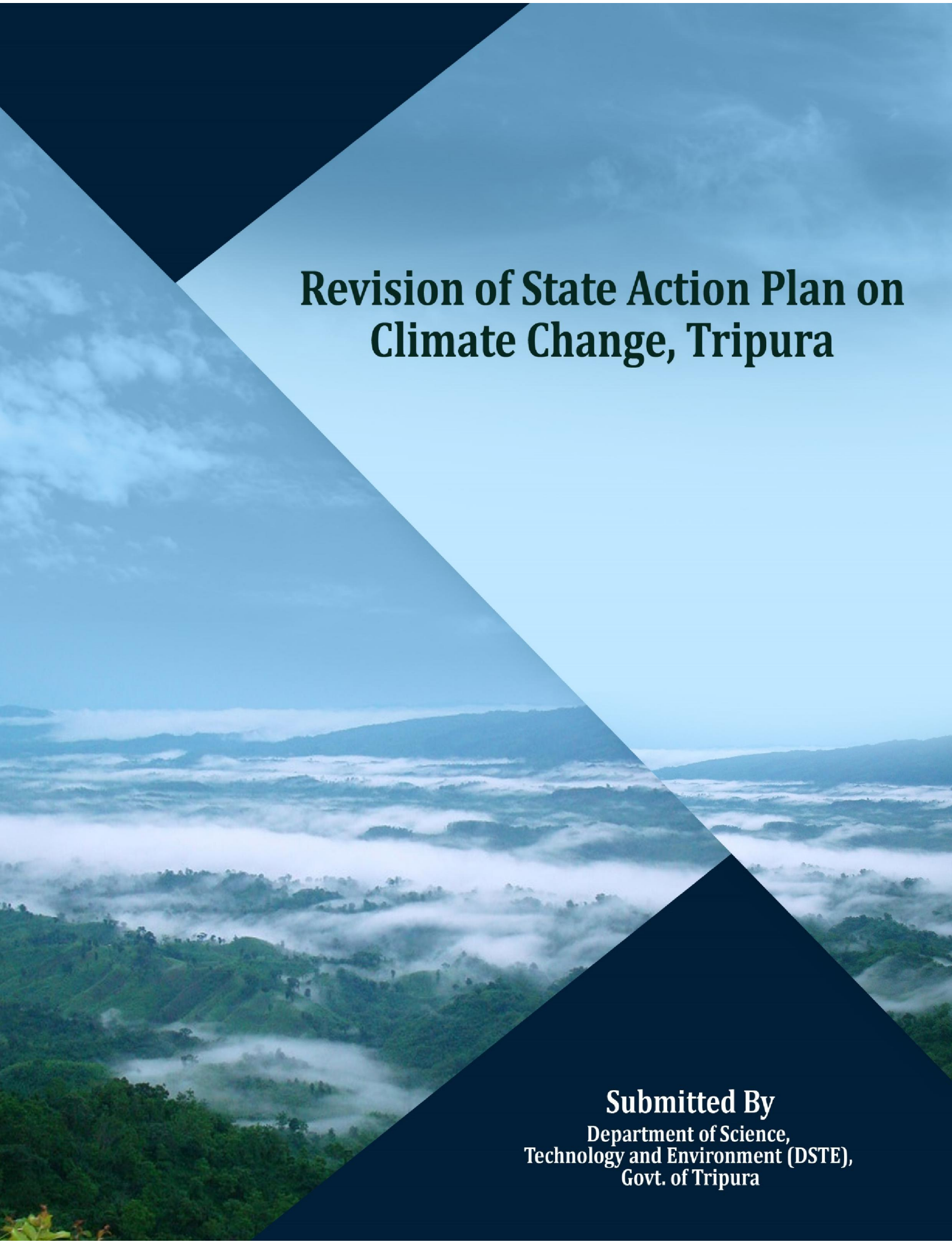

Revision of State Action Plan on Climate Change, Tripura

Submitted By

Department of Science,
Technology and Environment (DSTE),
Govt. of Tripura

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Technical Support

CTRAN Consulting Ltd, Bhubaneswar

Abbreviations

ADB	Asian Development Bank
AFOLU	Agriculture, Forestry & Other Land Use
AGMC	Agartala Medical Government College
AIBP	Accelerated Irrigation Benefit Program
AMC	Agartala Municipal Corporations
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
API	Annual Parasite Incidence
ARDD	Animal Resources Development Department
ARI	Acute Respiratory Illnesses
ARIMA	Autoregressive Integrated Moving Average
ASHA	Accredited Social Health Activists
AT&C	Aggregate Technical and Commercial
BCM	Billion Cubic Metre
BEE	Bureau of Energy Efficiency
BLBH	Block Level Brooder House
BMC	Bulk Milk Cooler
BPL	Below Poverty Line
C&D	Construction and Demolition
CAAQMS	Continuous Ambient Air Quality Monitoring System
CAGR	Compound Annual Growth Rate
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CAP	Community Awareness Programme
CAPEX	Capital Expenditures
CCA	Climate Change Adaptation
CCGT	Combined Cycle Gas Turbine
CDR	Complex, Diverse and Risk
CEA	Central Electricity Authority
CFL	Compact Fluorescent Lamp
CGWB	Central Ground Water Board
CHC	Community Health Centres
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
CSS	Centrally Sponsored Scheme
CT	Community Toilets
DAY-NULM	Deendayal Antyodaya Yojana-National Urban Livelihoods Mission
DBT	Directorate of Bio-Technology
DDG	Decentralized Distributed Generation
DDUGJY	Deen Dayal Upadhyaya Gram Jyoti Yojana
DFID	Department for International Development
DISCOM	Distribution Companies
DRR	Disaster Risk Reduction
DSM	Demand Side Management
DSTE	Department of Science, Technology & Environment
DWS	Drinking Water and Sanitation
ECBC	Energy Conservation Building Code
EESL	Energy Efficiency Services Limited
FDA	Forest Development Agency
FHTC	Functional Household Tap Connection
FPC	Farmer Producer Company
FS	Frozen Semen
FSI	Forest Survey of India
GCF	Green Climate Fund

GCF	Green Climate Fund
GHG	Green House Gas
GIM	Green India Mission
GIS	Geographic Information System
GSDP	Gross State Domestic Product
Ha	Hectare
HMNEH	Horticulture Mission for North East & Himalayan States
HRIDAY	Heritage City Development and Augmentation Yojana
IAY	Indira Awaas Yojana
ICDS	Integrated Child Development Services
ICDS	Integrated Child Development Schemes
IDDP	Intensive Dairy Development Programme
IDSP	Integrated Disease Surveillance Programme
IDWH	Integrated Development of Wildlife Habitats
IEC	Information, Education and Communication
IFS	Integrated Farming System
IHCAP	Indian Himalayas Climate Adaptation Programme
IHHL	Individual Household Latrine
IMCP	Intensified Malaria Control Project
IMD	India Meteorological Department
IMR	Infant Mortality Rate
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPDS	Integrated Power Development Scheme
IPHC	Indian Public Health Standards
ISFR	India State of Forest Report
IWMP	Integrated Watershed Management Programme
JE	Japanese Encephalitis
JFMC	Joint Forest Management Committee
JICA	Japan International Cooperation Agency
JJM	Jal Jeevan Mission
JNNSM	Jawaharlal Nehru National Solar Mission
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
JSSK	Janani Shishu Suraksha Karyakaram
JSY	Janani Suraksha Yojana
KGBV	Kasturba Gandhi Balika Vidyalaya
KPSY	Kasturba Poshan Sahay Yojana
KSY	Kishori Shakti Yojana
kWh	Kilowatt Hour
LED	Light-emitting diode
LGBR	Load Generation Balance Report
M&E	Monitoring and Evaluation
MAP	Management Action Plan
MDF	Moderately Dense Forest
MEEP	Model Energy Efficient Programme
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MIDH	Mission for Integrated Development of Horticulture
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment Forests & Climate Change
MOVCD-NER	Mission Organic Value Chain Development for North Eastern Region
MT	Metric Tonnes
MW	Megawatt
NABARD	National Bank for Agriculture and Rural Development

NADP	National Agricultural Development Program
NAMA	Nationally Appropriate Mitigation Action
NAPCC	National Action Plan on Climate Change
NBMMP	National Biogas & Manure Management Programme
NDA	National Designated Authority
NDCs	Nationally Determined Contributions
NERSIP	North-Eastern Region Power System Improvement Project
NFHS	National Family Health Survey
NFSM	National Food Security Mission
NHIDCL	National Highways and Infrastructure Development Corporation Limited
NHM	National Health Mission
NHM	National Horticulture Mission
NITI	National Institution for Transforming India
NLM	National Livestock Mission
NMAET	National Mission on Agriculture Extension and Technology
NMBP	National Mission on Bovine Productivity
NMSA	National Mission for Sustainable Agriculture
NMSHE	National Mission for Sustaining the Himalayan Ecosystem
NMSKCC	National Mission on Strategic Knowledge of Climate Change
NNBOMP	New National Biogas & Organic Manure Programme
NPBB	National Programme for Bovine Breeding
NPCCHH	National Program on Climate Change and Human Health
NPDD	National Programme for Dairy Development
NRDWP	National Rural Drinking Water Programme
NRHM	National Rural Health Mission
NRSE	New and Renewable Sources of Energy Policy
NTFPs	Non-timber forest products
NUHM	National Urban Health Mission
NWQMP	National Water Quality Monitoring Programme
O&M	Operations and Maintenance
ODF	Open Defecation Free
OF	Open Forest
OMC	oil marketing companies
OT	Open Toilets
PCU	Power Conditioning Unit
PFA	Power for All
PHC	Primary Health Centres
PM KUSUM	Pradhan Mantri Kisan Urja Suraksha Utthan Mahabhiyan
PMAY	Pradhan Mantri Awas Yojana
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMGSY	Pradhan Mantri Gram Sadak Yojana
PM-JAY	Pradhan Mantri Jan Arogya Yojana
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PMMSY	Pradhan Mantri Matsya Sampada Yojana
PMSBY	Pradhan Mantri Suraksha Bima Yojana
PNG	Piped Natural Gas
PRI	Panchayati Raj Institution
PV	Photovoltaic
PWD	Public Works Department
RADP	Rainfed Area Development Programme
RAY	Rajiv Awaas Yojana
RCM	Regional Climate Models
RCPs	Representative Concentration Pathways

RDA	Rudrasagar Development Authority
RES	Renewable Energy Source
RESCO	Renewable Energy Service Company
RET	Renewable Energy Technology
RGM	Rashtriya Gokul Mission
RGSEAG	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls
RKSK	Rashtriya Kishor Swasthya Karyakaram
RKVY	Rashtriya Krishi Vikas Yojana
RKVY	Rashtriya Krishi Vikas Yojana
RRC	River Rejuvenation Committee
RTS	Rooftop Solar
RUMSS	Rudrasagar Unbastu Matasya Samabay Samiti
SAGY	Saansad Adarsh Gram Yojna
SAPCC	State Action Plan on Climate Change
SBM	Swachh Bharat Mission
SC	Scheduled Caste
SDGs	Sustainable Development Goals
SDP	State Domestic Product
SDS	Special Development Scheme
SHCs	Soil Health Cards
SHGs	Self Help Groups
SMAM	Sub Mission on Agricultural Mechanization
SNP	Supplementary Nutrition Programme
SOC	Soil Organic Carbon
SPEED	State Partnership for Energy Efficiency Demonstration
SRS	Sample Registration System
ST	Scheduled Tribe
SWM	Solid Waste Management
T&D	Transmission and Distribution
TBB	Tripura Biodiversity Board
TCCC	Tripura Climate Change Cell
TFR	Total Fertility Rate
TLDA	Tripura Livestock Development Agency
TREDA	Tripura Renewable Energy Development Agency
TSECL	Tripura State Electricity Corporation Limited
TSGHS	Tripura State Government Housing Scheme
TSPCB	Tripura State Pollution Control Board
TTAADC	Tripura Tribal Areas Autonomous District Council
TUEP	Tripura Urban Employment Programme
UCA	Unnat Chulha Abhiyan
UDD	Urban Development Department
ULB	Urban Local Bodies
UNDP	United Nations Development Programme
UNFCC	United Nations Framework Convention on Climate Change
UPHC	Upper Primary Health Centres
USD	United States dollar
UT	Union Territory
VDF	Very Dense Forest
VRA	Vulnerability and Risk Analysis
WB	The World bank

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EXECUTIVE SUMMARY

The State Action Plan on Climate change (SAPCC) for the State of Tripura was first formulated in the year of 2010 under the Expert Committee of the Tripura State Planning Board. The Action Plan was made with the efficacy of India's National Action Plan on Climate Change (NAPCC), to achieve the mitigation targets and adaptation agenda of Sustainable Development Goals (SDGs), in line with the Intended Nationally Determined Contributions (INDC).

Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, has urged the States to re-examine and update their climate actions and carry out assessment of actions/strategies contributing to the INDC. Also, recommendation of activities to be carried out in line with INDC for the time period 2021-30.

The persisting human influence on the climate system is evident from the hiked anthropogenic emissions of greenhouse gases in recent times compared to pre-industrial periods. According to the AR5, IPCC, the global climate change phenomenon has a widespread impact not only on natural systems but human beings as well. The continuous emission will further stimulate atmospheric warming and cause an irreversible prolonged change in various components of the ecosystem. Biodiversity loss, deterioration of ecosystem and ecosystem services, sea level rise, melting of glaciers and several other impacts are observed to increase as a result of climate change. Limiting the change demands a significant and sustained drop in greenhouse gas emission together with complementary adaptation and mitigation strategies. Reductions in coming decades is a potential way to reduce climate risks in 21st century and beyond, along with increased prospects for effective adaptation and reduced costs of long-term mitigation plans. The actions will contribute towards a climate-resilient pathway for sustainable development. Climate proofing of vulnerable sectors would require an amalgamation of adaptation and mitigation strategies, integrated in planning, policy and coordination at all levels.

Need for Revision of State Action Plan for Tripura

Addressing the impacts of climate change is the need of the hour and actions must be taken at National level. The Climate change action plans is a repository of strategies for improving the climate resilience and adaptation capacities of the vulnerable communities. With technological advancements in production and consumption sectors, new mechanisms or strategies must be introduced on a sub-national level in order to meet the Intended Nationally Determined Contributions (INDCs) as well as Sustainable Development Goals (SDGs). The adaptation feedbacks and mitigation co-benefits are critical components in enhancing the implementation effectiveness. The actions taken up at State level will percolate to grass-root levels as well as showcase in overall country level performance in terms of SDG and NDC commitment. The Government has identified the Department of Science, Technology and Environment (DSTE), Tripura as the Nodal Agency for updation/ revision of Tripura SAPCC and coordination and implementation responsibilities with various line departments and relevant stakeholders.

Solar Mission and Non- Conventional Energy

The State of Tripura has a total potential of 2132MW energy from various sources, Solar, small hydro and Bio energy and total installed capacity of around 25.42 MW. Tripura has envisaged in achieving target of 105 MW of solar power by the year 2022. Solar Street Lights and Solar Study Lamps have been allocated in Tripura under Off-grid and Decentralized Solar PV Applications Programme. estimated potential of small hydel projects in Tripura is 46.86 MW from 13 sites located in the State. The State Government has focused on wind resource measurement and as on 31.12.2019, a total 11 numbers of Wind Resource Assessment stations at 25 m & 50 m above ground level have been installed in the State and currently 4 numbers of Wind Resource Assessment stations are operational.

The State Nodal Department for the Sector is TREDA.

Solar Mission and Non- Conventional Energy- Key Priorities
1. Promotion and facilitation of Off-grid or decentralized renewable energy generation for electrification, cooking and other thermal energy requirement
2. Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants
3. Installation of agricultural waste-based Biogas Plants under Waste to Energy & Biomass based Co-generation
4. Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura- 150 KWp
5. Installation of Solar Drier cum Smoke House for Rubber Processing Center in Tripura- 3950 numbers
6. Installation of Off-grid/ Hybrid Solar Power Plants (Maximum Capacity- 25KWp)

Energy Efficiency

Tripura has three generating stations- Gomuti Hydro-electric Project, Baramura Gas Thermal Power Station and Rokhia Gas Thermal Power Station. In addition to this, it has diesel based generating station also.Total electricity generation utility for the state of Tripura during 2018-19 is 630.55 Gwh. Out of total, about 93.18% (587.57 Gwh) is from Gas based Thermal and balance 6.82% (42.98 Gwh) is from Renewable Energy Sources. The State observed increased growth in per capita energy consumption of 714 kWh during 2017-18 which reduced to 425 kWh during 2019-20. Out of total installed capacity, the share of state sector is 24%, private sector is 1% and that of central sector is 75%. The current demand is projected to increase several folds in coming years and further exacerbate the demand-supply challenge and energy security issues. In 2019, aggregate technical and commercial losses for Tripura was 35.48 %.

The State Nodal Department is TSECL.

Energy Efficiency- Key Priorities
1. Energy Audit
2. Distribution of LED bulbs
3. Retrofitting of the drinking water pumping system
4. Retrofitting of electrical appliances
5. Door to door campaign, rally on energy conservation
6. Replacement of agriculture pump sets
7. IEC Activities
8. Training Programmes and Capacity Building

Sustainable Habitat

About 26.17% of Tripura's population resides in urban areas as per 2011 Census which was significantly lower than that of all India's urban population 31.2%. The state has registered remarkable urban growth of about 76.17 percent during 2001–11, and the urban population has grown from 5.46 lakh to 9.6 lakh during this period. The State has 20 Urban Local Bodies (ULBs)- 1 Municipal Corporation (Agartala), 13 Municipal Council and 6 Nagar Panchayats. It is estimated that by 2021, the urban population growth in Tripura has been estimated to be 35.8% and due to this, there will be many major policy and managerial challenges in coping with the increased demand for urban infrastructure.

The State Nodal Departments are Urban Development Department (UDD), Agartala Municipal Corporation (AMC), PWD (R&B), Transport Department.

Sustainable Habitat- Key Priorities
1. Promoting eco-friendly methods of road construction
2. Construction of Pilot waterproof Road
3. Green Buildings
4. Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel in Secretariat
5. Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel in Legislative Assembly
6. Renovation of Bituminous concrete road
7. Solid Waste Management
8. Construction of Toilets
9. Covered Storm Water Drainage

Sustainable Agriculture

Agartala is an Agrarian State and has favorable climate for cultivation of various fruits and horticulture crops. Paddy is grown in 55% of gross cropped area in three seasons viz. Aush (pre Kharif), Aman (Kharif) and Boro (Summer) whereas pulses and oilseeds and other crops altogether cover about 5% area. Fruits and vegetables are covered in 21% of gross cropped area, 10% area is under rubber and 9% under other miscellaneous crops like tea, medicinal plants. Rice is the major crop of the state and is cultivated in 91 per cent of the cropped area.

The State Nodal Departments are Department of Agriculture and Farmers Welfare, Directorate of Horticulture and Soil Conservation, Directorate of Fisheries, Animal Resources Development Department along with Tripura Livestock Development Agency (TLDA) and Directorate of Biotechnology.

Sustainable Agriculture- Key Priorities
1. Crop Insurance
2. Breeding studies on major crops for tolerance/resistance
3. Organic Farming
4. Soil Testing
5. Farm mechanization and creation of irrigation sources
6. Developing sustainable soil, water and crop management practices
7. Increasing Cropping Intensity in Traditional Conventional Land
8. Artificial Insemination
9. Distribution of Day-Old Chicks (LIT Birds)

10. Capacity Building and trainings of farmers
11. Market Development
12. Skill Development
13. Assistance to the FPO/FPC
14. Fruits & commercial plantation crop
15. Vegetable Cultivation
16. Cultivation of spices
17. Cultivation of open field flowers
18. Mushroom cultivation
19. Support for composite fish farming
20. Support for Integrated Pig cum fish farming
21. Ranching of Fish seed in natural and open water bodies
22. Training/ Awareness programme including fixing of hoardings
23. Reclamation of old ponds
24. Development of Bio villages
25. Establishment and strengthening of College biotech clubs
26. Setting of DNA clubs

Sustaining Himalayan Ecosystem and Green Tripura Mission

a total area of 10,491.69 sq. km, forested area is constituted of 6294.29 sq km. Bamboo is a key resource, a total of 19 species occurring over an area of 3617 sq km in the government forests of the State with a manifold increase in related economic activities. 2 species of cane are found in the State, with a major contribution to the State Domestic Product (SDP). The State has 6 Protected Areas, including 4 Wildlife Sanctuary and 2 National Parks encompassing deciduous to semi evergreen forests and species of Bamboo, medicinal herbs and shrubs as well as wide faunal diversity.

The State Nodal Department is the Forest Department.

Sustaining Himalayan Ecosystem and Green Tripura Mission- Key Priorities
1. Facilitating greater investment for realizing true potential of rubber wood
2. Bamboo Resource Development
3. Facilitation of inoculation of agar trees on private lands
4. Green Corridor Development
5. Agroforestry plantation on RoFR land
6. Silvipasture/ fodder trees development, along with plantation of NTFP and RET species
7. Soil and moisture conservation along with optimum utilization of check dams
8. Forest protection with community involvement
9. Intensive management of eco-parks and protected areas

Water Mission

The State has a total area of 24704.03 ha under culturable water area. The State geographically are intersected by river channels, Gomati, Howrah, Dhalai, Muhuri, Feni, Manu and Muhuri are the major rivers of the state. Average unit area of water bodies is 0.10 ha. The soil is mostly acidic red laterite sandy in nature having high load of iron and aluminum. Water holding capacity of the water bodies in the state are poor. The unique water bodies available in Tripura are mini barrages, which are situated mostly between hillocks by allowing rainwater to accommodate in the barrage from micro catchment and used for recharge of ground water and fish farming as well as irrigation.

The State Nodal Department are PWD (DWS), PWD (WR), TSPCB and AMC.

Water Mission- Key Priorities
1. Creation of new minor storage/ irrigation tanks
2. Protection and Conservation of large wetlands/ waterbodies
3. Installation of SBTW and DTW for irrigation
4. Setting up Iron removal plants to remove excessive presence of iron in water
5. Setting up Surface Water Treatment Plant
6. Assessment of arsenic contaminated water areas
7. Installation of SBTW/DTW /Spot Sources for drinking water
8. Flood Protection/Anti erosion at vulnerable locations along rivers and streams
9. Flood Protection/Anti erosion
10. Raising & strengthening of Existing Embankment
11. Creation of New embankment
12. Cane/Bamboo plantation along embankments

Health Mission

Health plays an important role in the societal development and environment and is constantly affected by the rising temperature. As climate change affects air and water quality, it becomes necessary to focus on adapting to the health effects. Many of the major killers are highly climate sensitive with respect to temperature and rainfall, including Cholera and the diarrheal diseases, as well as diseases including malaria, dengue and other infections carried by vectors. The natural growth rate in the state is 7.5 against the National value of 13.8 and the Existing Maternal Mortality Ratio (per one lakh population) in the State is 87 in 2016. The State has 2 Medical Colleges, 6 State Hospitals, 6 District Hospitals, 12 Sub-Divisional Hospitals, 22 CHCs, 107 PHCs, 6 UPHCs, 35 Ayurvedic Government Dispensary, 73 Homeopathic Government Dispensary and 1020 Health Sub-Centers.

The State Nodal department is the Health Department.

Health Mission- Key Priorities
1. Health Sector Plan for Heat and Air Pollution
2. Sensitization workshops
3. Training of medical officers, health workers
4. Greening of Health sector
5. Extension of existing roof top off grid solar power plant
6. Disease Vulnerability Assessment relevant to Climate Change
7. IEC Activities

Strategic Knowledge Management

Knowledge dissemination is an essential part for the vulnerable sectors in order to combat climate change impacts and carry out adaptation and mitigation activities. The state is a repository of an array of natural resources harnessed by different sectors for their economic development and livelihood generation. The State knowledge centre have carried out studies on impacts of the unprecedented climate change events, district level vulnerability assessment. The state has identified the major departments which will face the negative impacts and the vulnerable sectors. The sectors are: Sustaining Himalayan Ecosystem, Green Tripura,

Agriculture and allied, Water mission, Solar Mission, Energy Efficiency, Sustainable Habitat, Health and Strategic Knowledge Management.
The State Nodal Department is the Department of Science, Technology and Environment (DSTE).

Strategic Knowledge Management- Key Priorities
1. Strengthening of the State Climate Change Cell
2. Mass awareness programs
3. Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling
4. Spatial temporal surveys for monitoring
5. Develop a Centre for Excellence

CHAPTER 1: INTRODUCTION

1.1 Background

Climate change is one of the most serious global threats to mankind in the modern times. It has far-reaching implications for environment, agriculture, water availability, natural resources, ecosystem, biodiversity, economy and social well-being. Owing to India's federal structure, and introduction of India's National Action Plan on Climate Change (NAPCC) in 2008, State Governments were also encouraged to prepare their own State Action Plan on Climate Change (SAPCC) consistent with the strategies in the NAPCC. States/UTs were encouraged to integrate state-level variations in ecosystems, geographic conditions, socio-economic scenario, and other factors, while converging with the existing policies and ongoing programmes and schemes being implemented. 33 SAPCCs of States and Union Territories have been approved and are operational. Dedicated climate change institutions/cells have been established in most of the States/UTs to coordinate activities related to climate change. States/UTs have initiated capacity building actions and demonstration projects to implement SAPCCs since the formulation of SAPCCs. Tripura had formulated the Tripura State Action Plan on Climate Change (TSAPCC) in 2012.

Since the formulation of SAPCCs, the National and International Climate Action and Policy Landscape have evolved. In the year 2015, the Paris Agreement has been agreed upon to limit global mean temperature within 2 degree and working towards to limit 1.5 degree Centigrade.Nationally Determined Contributions (NDC) goals has been submitted by India for post-2020 focusing eight different goals including three major quantifiable goals related to emission reduction, renewable energy and forestry. Over the years, India has pursued major domestic policies and schemes in areas of climate change mitigation and adaptation actions, particularly in the fields of clean and renewable energy, enhancing energy efficiency, development of less carbon-intensive and resilient urban development, promotion of waste to wealth, electric vehicles, etc.

Over the past few years, the scientific and socio-economic understanding and knowledge on climate change have also advanced. State's dedicated climate change institutions/cells, with the active support of scientific, academic and research institutions, carried out several regional and sectoral vulnerability studies highlighting the impacts of climate change. The enhanced capacities and improved understanding of sectoral and regional climate variabilities and projections, Green House Gas Emissions (GHG), long-term vulnerabilities, mapping vulnerable regions/ social groups/sectors, etc. will help in the identification and prioritization of mitigation/ adaptation strategies and refining regional specific action plans and strategies.

In this context, SAPCCs need to be revised and strengthened further considering the evolving context of climate science, policy and actions. Ministry of Environment Forests &Climate Change, Government of India requested States to initiate the process of revision of the SAPCCs in January 2018 considering the principles enlisted in Section 1.1.2

1.1.1 National and State-level Climate Policy and Planning

The revision of SAPCC revision is thus intended to:

1. Better align National and sub-National adaptation and mitigation planning and
2. Enhance the evidence-based character and effectiveness of climate policy and planning by integrating recent advancements in knowledge and understanding.

1.1.2 National-level Climate Policy and Planning Frameworks

The broad guidelines for the revision of SAPPCs as enlisted by Ministry of Environment Forests & Climate Change, Government of India are:

Principle 1

- SAPCCs should b e a policy document of the States/UTs outlining the major initiatives and strategies reflecting the commitments and proposed actions in the state to tackle the vulnerabilities and impacts of climate change across the socio-economic sectors.

Principle 2

- SAPCCs should envisage an inclusive, sustainable and climate resilient low carbon development pathways with a focus on climate change adaptation and mitigation within the key sectors in the States/UTs and should protect the poor and vulnerable sections of society from adverse effects of climate change.

Principle 3

- SAPCCs should take into account recent scientific assessments and projections on global warming; vulnerability; and impacts.

Principle 4

- SAPCCs should synergise with the goals of NDCs under the Paris Agreement, though the targets under NDCs are national targets. It should also contribute towards achieving other development goals including Sustainable Development Goals (SDGs).

Principle 5

- SAPCC should highlight the links with national missions related to climate change.

Principle 6

- SAPCC should also be built on the evolving socio-economic development context and priorities of the state.

Principle 7

- States/UTs can strengthen existing climate action measures as well as launch new initiatives in their priority sectors. Some of the initiatives can be introduced in the areas of efficient and cleaner technologies, promoting renewable energy generation, reducing emissions from transport sector, afforestation and greening activities and standardizing knowledge management system for adaptation and mitigation.

Principle 8

- Time period of the implementation of SAPCCs should be clearly brought out starting with the implementation cycle of NDCs i.e. 2021-2030 and beyond.

Principle 9

- Financial resources required for the implementation of the action plan should primarily be leveraged from the existing budget of the State Governments and convergence with the relevant schemes and programs.

Principle 10

- SAPCCs should set out the institutional mechanism for implementation including stakeholder engagement ensuring inclusiveness along with the mechanism for capacity building and monitoring and evaluation with clear indicators for reporting.

Figure 1: Guiding Principles, from Ministry of Environment, Forest and Climate Change, "A Common Framework for revision of State Action Plan on Climate Change", 2018

The NAPCC established 8 National missions "representing multipronged, long term and integrated strategies for achieving key goals in the context of climate change" as listed:

Table 1: Eight Missions of the National Action Plan on Climate Change (NAPCC)

Mission Name	Goals
National Solar Mission	Increase the share of solar energy in the total energy mix
National Mission for Enhanced Energy Efficiency	Enhance energy efficiency through market-based certification mechanisms, cost reductions through R&D, demand-side financing mechanisms, and fiscal instruments
National Mission on Sustainable Habitat	Improvements in energy efficiency in buildings, solid waste management and modal shift to public transport
National Water Mission	Ensure integrated water resources management helping to conserve water, minimize wastage and ensure more equitable distribution both across and within States
National Mission for Sustaining the Himalayan Ecosystem	Evolve management measures for sustaining and safeguarding the Himalayan glacier and mountain ecosystem
National Mission for a Green India	Enhance ecosystem services including carbon sinks
National Mission for Sustainable Agriculture	Devise strategies to make Indian agriculture more resilient to climate change
National Mission on Strategic Knowledge for Climate Change	Enhance the understanding of challenges of climate change and also the response to climate change

A refinement of India's National mitigation and adaptation goals is provided by the mentioned Nationally Determined Contribution submitted to the UNFCCC. The NDC, initially formulated as the "Intended Nationally Determined Contribution" (INDC) in 2015, sets out eight different goals for the post-2020 period, out of which three are quantitative. These goals are listed in table below:

Table 2: India's NDC Goals

NDC Goals	Qualitative/Quantitative
To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation.	Qualitative
To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development.	Qualitative
To reduce the emissions intensity of its Gross Domestic Product by 33 to 35 percent by 2030 from 2005 level.	Quantitative
To achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030 with the help of transfer of technology and low-cost international finance including from Green Climate Fund (GCF).	Quantitative
To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.	Quantitative
To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.	Qualitative
To mobilize domestic & new and additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.	Qualitative
To build capacities, create domestic framework and international architecture for quick diffusion of cutting-edge climate technology in India and for joint	Qualitative

collaborative R&D for such future technologies.	

Moreover, the NDC goals are strongly linked to the Sustainable Development Goals (SDGs) which is illustrated in figure below that shows the number of actions of relevance to a particular SDG in the Indian NDC.

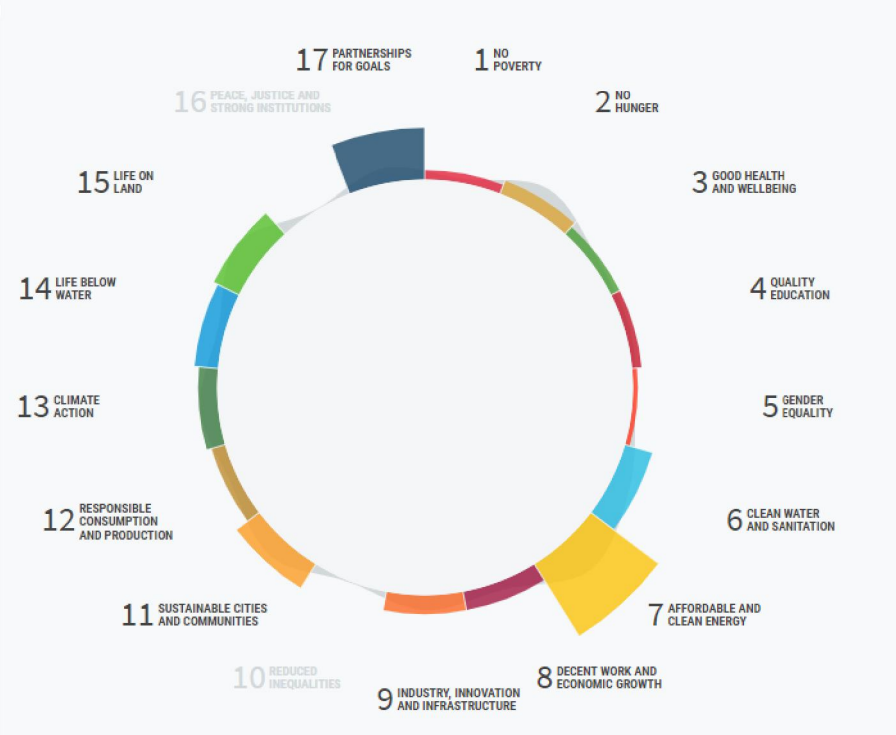


Figure 2: SDG- NDC Linkages for India's First NDC

Note: The size of the coloured bar indicators the number of actions of relevance to a particular SDG that are Mentioned in India's NDC, with bigger bars meaning more mentions.[1]

1.1.3 National-level Climate Policy and Planning Frameworks in Tripura

In accordance with the mandate for the SAPCCs, in Tripura formulated eight vulnerable Sectors that has grouped the proposed actions and strategies into clusters and thus extended the eight National missions. The Sectors in Tripura SAPCC that are aligned with Government of India Missions are as follows:

1. Sustainable Agriculture
2. Water Resources
3. Forest and Biodiversity
4. Sustaining the Himalayan Ecosystem
5. Strategic Knowledge for Climate Change
6. Solar Mission
7. Enhanced Energy Efficiency
8. Sustainable Habitat

[1]German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE) and Stockholm Environment Institute (SEI) (https://klimalog.die-gdi.de/ndc-sdg/country/IND)

The eight State sectors identified in the Tripura SAPCC also form the basis for the refined strategy packages of the Tripura SAPCC 2.0 (see Chapter 5: Climate Change Strategy - **Mitigation** and Chapter 6: Climate Change Strategy - **Adaptation**). In the Tripura SAPCC 2.0 the following sectors are under **adaptation category**:

1. Sustainable Agriculture
2. Water Resources
3. Forest, Biodiversity and Himalayan Ecosystem
4. Strategic Knowledge for Climate Change
5. Health (State's Additional sector)

The State Sectors for Enhanced Energy Efficiency, Solar Mission and Sustainable Habitat are under **mitigation category**.

1.2 Objectives

The State Action Plan on Climate Change needs to be revised and strengthened considering the evolving context of climate science, policy and actions. Therefore, the objective of this document is to identify and prioritise mitigation and adaptation strategies in the light of such developments, and to refine the regional specific action plans and strategies. More specifically, Tripura SAPCC2.0 aims to increase the level of ambition, accuracy, specificity and practicality of the mitigation and adaptation actions proposed and facilitate progress from planning to action. In order to do this, this document tries to:

- Assess the achievements made under proposed actions in previous SAPCC and aligns & redefines the goals & targets in light of the NDCs (Nationally Determined Contributions) & SDGs (Sustainable Development Goals).
- Updates forward-looking plans, strategies and actions for ambitious, workable mitigation and adaptation actions and strategies for 2021-30

1.3 Approach and Methodology

The Tripura SAPCC 2.0 builds on the developments at the national level, various policies and programmes and the national and international commitments by India on the issues of climate change adaptation and mitigation. The steps taken for the revision of SAPCC are depicted below in the Figure 3. Vulnerability Assessment is included that provides current and future climate projections. Key priorities have been outlined both in adaptation and mitigation segments. Synergy has been established with the International climate goals like NDCs and SDGs. National policies and programmes for each sector have been in line with the State adaptation and mitigation strategies. Capacity needs in the form of multi stakeholder consultations have been achieved abiding COVID19 protocols for proper implementation. Institutional arrangement has been set up so that the responsibility for various missions will rest under individual departments, which shall strive to attain all listed objectives within stipulated time frames and ensure their vertical integration with the National Missions and objectives of the NAPCC. Chapter on Monitoring and evaluation will help to monitor the progress of the State in coping with climate change.

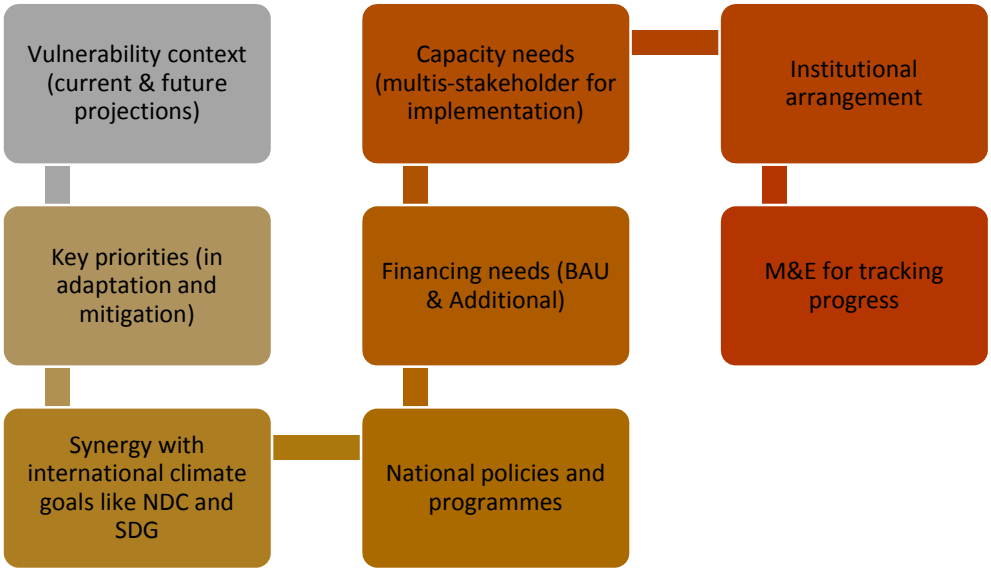


Figure 3: Approach and Methodology

Using the approach and referring to the climate policy context introduced in this chapter, this document aims to achieve its two-fold purpose by proceeding in the following structure. **Chapter 2** introduces the State profile, circumstances, resource endowments, economic and social sectors, using the latest scientific assessment, **Chapter 3** then presents Tripura's Climate profile including historical conditions and observed trends and projected climatic changes. **Chapter 4** deals with the vulnerability assessment of the State and also presents key observed projected sectoral impacts. **Chapter 5** includes both (a) stocktaking and b) planning by- (i) comprehensively assessing progress towards State targets set out in the Tripura SAPCC and barriers related to their achievement and (ii) identifying forward- looking strategies for the identified key Mitigation areas (Enhanced Energy Efficiency, Solar Mission & Non-Conventional Energy and Sustainable habitat)**Chapter 6** focuses the same aforementioned steps for key adaptation areas namelyAgriculture, Water Resources, Forestry & Biodiversity, Knowledge Management, Disaster Management and Health).. **Chapter 7** focuses on Cross-Cutting issues like gender. Out of the identified adaptation and mitigation strategies, **Chapter 8** highlights the financial mechanism on how the strategies and activities prioritized will be funded. **Chapter 9** then details the institutional mechanisms involved in the implementation of the SAPCC 2.0 and **Chapter 10** concludes by identifying the monitoring and evaluation framework to be followed for monitoring and evaluating the implementation of the plan.

CHAPTER 2: STATE PROFILE

2.1 Location, Demography, Economy

2.1.1 Location, Geography and Size

Tripura extends from 22°56'N to 24°32'N latitude and between 91°10'E to 92°20'E longitude with a total area of 10, 491.69 sq. km. It accounts for about 0.32 percent of the total area of the country. Being a landlocked state in the North-East region, Tripura is surrounded by Assam to the north east, Mizoram to the east and Bangladesh to the west, north and south. Tripura ranks third in smallest states in the country after Goa and Sikkim.

2.1.2 Demographic Profile

As per the Census of India 2011, the State has a population of 36.74 lakh, an increase from 32 lakh in 2001 Census. The State accounts for 0.30 percent of India's population. The share of urban population in the State is 26.17 percent whereas the share of rural population is 73.83 percent. The decadal population growth rate of Tripura is estimated at 14.84 percent whereas the national rate of growth during the last ten years was 17.6 percent. The State has a population density of 350 persons per sq. km. as per the Census 2011, whereas India has only 382 persons per sq. km. In 2011, out of the 36.74 lakh population, the Scheduled Caste population constituted 17.83 percent and the Scheduled Tribe population constituted 31.76 percent of the total population of the State. The effective literacy rate of Tripura as per Census 2011 is 87.22 percent (Rural- 84.90 percent, Urban- 93.47 percent) while in 2001, literacy rate of the State was 73.19 percent. As per Census 2011, the sex ratio of the State of Tripura is 960F/1000M. When compared to 2001 Census, sex ratio has increased by 12 points. The demographic profile of the State is outlined inTable 3.

Table 3: Demographic Profile of Tripura

Particulars	Tripura		India	
	2001	2011	2001	2011
Population (in Crore)	0.32	0.3674	102.86	121.08
Urban Population (%)	17.06	26.17	27.82	31.14
Rural Population (%)	82.94	73.83	72.18	68.86
Population Decadal Growth Rate (%)	15.74	14.84	17.60	21.50
Population Density (person per sq. km)	305	350	324	382
Sex Ratio (Per 1000 Males)	948	960	933	943
Literacy Rate (%)	73.19	87.22	64.83	74.04
Male Literacy Rate (%)	81.02	91.53	75.26	82.14
Female Literacy Rate (%)	64.91	82.73	53.67	65.46

There are few important indicators that must be analysed for gender integration into Natural Resources Management and Climate change. Some of them have been highlighted in the section below.

Sex Ratio

The overall Sex Ratio in the State is 960 females per 1000 males which is higher than that of India (943 females per 1000 males). The urban sex ratio is 973 females per 1000 males whereas rural is 955 females per 1000 males.

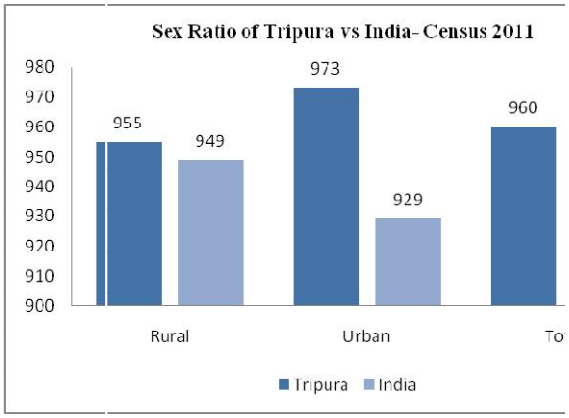


Figure 4: Comparison of Sex Ratio of Tripura and India

Female Literacy Rate

Female literacy plays an important role in contributing toHuman Development that helps in the fulfilment of Sustainable Development Goals and several National strategies. Increase in female literacy results in decreased maternal mortality, better health and education and reduction in poverty and hunger on a regular basis. Increase in female literacy can also lead to reduced child mortality, improved child nutrition and health and the overall development. Enhanced educational support to females may also increase productivity, skills and innovation, which directly affects economic growth.

The female literacy rate has increased from 64.91 to 82.73 percent in Tripura when compared to all India levels which saw a rise from 53.7 to 64.6 according to the census 2001 and 2011, respectively. The overall female literacy rate of Tripura is higher than that of the average of all over India.

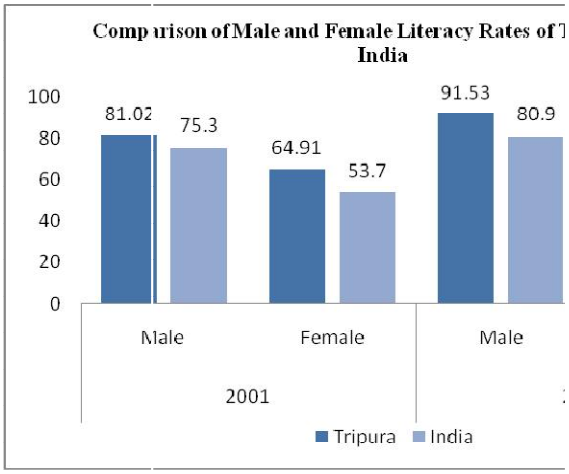


Figure 5: Comparison of Male and Female Literacy Rates of Tripura and India

Employment Status

Average wage earning, Labour force participation and Proportion of unemployment are some important indicators which help to study the employment status. The average wage earning (in Rs.) received per day by Casual laborers of Age 15-59 years in specified works (2018-19) is shown in below table.In Tripura, the average wage earning of females in rural areas and urban areas is Rs 262.75 and Rs 255.25, respectively. This proportion is higher than the overall average of India, which is Rs 186.25 in rural areas and Rs 223.75 in urban areas.

Table 4: Average Wage Earning of Males and Females in Specified Works (2018-19)

	Rural		**Urban**	
	Works other than Public Works		Works other than Public Works	
	Female	Male	Female	Male
Tripura	262.75	291.25	255.25	322.5
India	186.25	287.00	223.75	354.25

Source:Women and Men in India 2020, Participation in Economy

For an inclusive and sustainable development, women's labour force participation and access to decent work is an important element. In Tripura, the proportion of women involved in contributing to economy through their labour activities in rural areas and urban areas are 15.8 percent and 20.1 percent, respectively. This proportion is less than the overall average of India, which is 26.4 percent in rural areas and 20.4 percent in urban areas.

Table 5: Labor Force Participation Rate for persons aged 15 years and above (2018-19)

	Rural			**Urban**			**Total**		
	Female	Male	Person	Female	Male	Person	Female	Male	Person
Tripura	15.8	76.8	47.0	20.1	70.3	45.0	16.6	75.6	46.6
India	26.4	76.4	51.5	20.4	73.7	47.5	24.5	75.5	50.2

Source: Women and Men in India 2020, Participation in Economy

In terms of unemployment, 28.3 percent women are unemployed in rural areas compared to 30.1 percent in urban areas. This proportion is much more than the overall average of India, which is 3.5 percent in rural areas and 9.8 percent in urban areas.

Table 6: Proportion Unemployed for persons aged 15 years and above (2018-19)

	Rural			**Urban**			**Total**		
	Female	Male	Person	Female	Male	Person	Female	Male	Person
Tripura	28.3	5.5	9.3	30.1	8.3	13.2	28.8	6.0	10.0
India	3.5	5.5	5.0	9.8	7.0	7.6	5.1	6.0	5.8

Source: Women and Men in India 2020, Participation in Economy

2.1.3 Economic Profile

The Gross State Domestic Product (GSDP) of the State at current price was Rs 49,845.47 crore in 2018-19 which increased to Rs 55,358.08 crore during the financial year 2019-20. The GSDP of the State at constant price during the base year 2011-12 was Rs 36,962.78 crore in 2018-19 which rose to Rs 40526.83 during 2019-20. The GSDP of the State increased at a compound annual growth rate (CAGR) of 14.15 percent from financial year 2012 to financial year 2019. According to economic survey of the State, the per capita income rose to Rs 123630 in 2019-20 from Rs 112849 in 2018-19 marking an increase of 9.55 per cent in 2019-20 compared to the previous year.

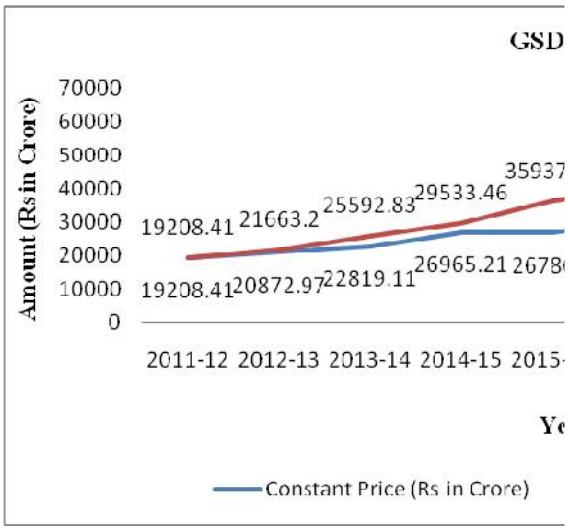


Figure 6: GSDP of Tripura (Constant Price and Current Price)

Source: Director of Economics and Statistics, Planning (Statistics) Department, Govt. of Tripura

2.2 Natural Resources in State

Tripura has total geographical area of 1049169 Ha and the land use pattern for the State is given below:

Table 7: Land Use Pattern of Tripura

Sl. No	Details	Area (in 000 Ha)	% with reference to geographical area
1	Forest Area	629.426	59.99
2	Land not available for agriculture use	148.304	14.10
3	Land under Misc. tree Crops, groves not including in net area sown	10.125	0.99
4	Permanent pasture & other grazing land	0.944	0.09
5	Culturable Waste land	2.578	0.27
6	Current fallow	1.055	0.08
7	Fallow land other than current fallow	1.189	0.15
8	Net Cropped Area	255.548	24.31
9	**Total Geographical Area**	**1049.169**	**100.00**
10	Cropping Intensity	191%	

Source: Land Use Statistics, Economic Review of Tripura 2019-20

Physiographically, the State is divided into 3 Physiographic Zones namely hill ranges, undulating plateau land and low-lying alluvial land. The State's geology is represented by sedimentary rocks ranging in age from Miocene to loosely consolidated sediments of recent age. Tripura has humid sub-tropical climate characterized by high rainfall. The terrain of the State includes parallel hills and ridges alternated with narrow valleys. The State has five major hill ranges which traverse in north-south direction. Tripura comes under one Agro climatic zones which is called as "Mild Tropical Plain Zone". Tripura is blessed with surface water resources. There are 10 major rivers in the state that originate from hill ranges and they are rain-fed and ephemeral in nature.

As per the Forest Survey of India Report 2019, the forest cover in Tripura is 7,725.59 sq. km of which 653.51 sq. km is very dense forest, 5,236.19 sq. km is moderately dense forest whereas 1,835.89 sq. km is open forest. The forest cover in the State constitutes 73.68% of the State's geographical area. The total Carbon stock of forest in the State is 76.06 million tonnes (278.89 million tonnes of CO_2 equivalent) which is 1.07% of total forest carbon of the country.

2.3 Agriculture and Livestock

Tripura has an agrarian economy and more than 42% of population of the state depends on agriculture & allied activities. The Net cropped area of Tripura is 255 thousand hectare which is 24.31 percent of the State's geographical area. Gross cropped area is 487 thousand hectare which is 46.4 percent of the state's geographical area. The Cropping Intensity of the State is 191 percent. As per Census 2011, the number of operational land holders in Tripura is 5.78 lakh whereas operating cultivable land is 2.85 lakh hectares. Small and marginal holders account for 96 percent of the total holdings operating 76 percent of the area occupied. Tripura has an average size of the land holding of 0.49 hectare which is lower than the average size of land holding of the country which is 1.15 hectare.[2] The net irrigated area is 1.17 lakh hectares. The total food grain production in the State is 8.4 lakh Metric Tonnes in 2019-20.[3]

State's total livestock and total poultry population as per 2019 Livestock Census are 13.18 lakh numbers and 41.68 lakh numbers respectively and as per 2012 census are 19.36 lakh numbers and 42.73 lakh numbers, respectively. There are 458 veterinary sub-centres, 60 veterinary dispensaries, 16 veterinary hospitals and 11 artificial insemination centres. Using these veterinary services, 38.61 lakh cases were treated in the year 2017-18.[4]

Table 8: Statistics of Animal Husbandry

Parameters	Unit	Base year (2006-07)	Latest year (2019-20)
Meat Production	Metric Tonnes (MT)	12,637	50,835
Milk Production	Metric Tonnes (MT)	88, 683	1, 97, 268
Egg Production	Crore Numbers	11.93	29.50
Per capita availability of meat per day	kg/year	3.65	12.83
Per capita availability of milk per day	gm/day	70.30	136
Per capita availability of egg per day	numbers/year	35	74

Source: Economic Review Tripura 2019-20

Per capita availability of meat increased in the period 2006-07 to 2018-19 from 3.65 to 12.83 kg/year. In respect of Egg and Milk that has also grown over in the same period from 35 to 74 numbers/year and 70.3 to 136 gm/day, respectively.

[2] Agriculture Census 2015-16
[3] Tripura at a Glance 2019
[4] Economic Review 2018

2.4 Energy Profile

The total installed capacity of the State during 2018-19 was 752 MW. Per capita availability of power in 2018-19 was 500.4 kWh. During 2018-19, power requirement in the State was 186 Net Crore Units whereas power availability was 184 Net Crore Units.

Table 9: Energy Profile of Tripura

State	Installed Capacity of Power (MW)	Per Capita Availability of Power (KWh)	Energy Required (MU) in 2019-20	Energy Supplied (MU) in 2019-20
Tripura	756.46	500.4	1538	1515

Source: CEA Installed Capacity Report Jan 2021, RBI Publications-Energy 2018-19, LGBR Report 2020

2.5 State Development Issues and Priorities

State's development has been studied with the help of some key policies which are in place and the performance of the State against the same. Highlights of the State performance against the key policy elements are depicted in below table:

Key Policy Elements	State Performance
National Action Plan on Climate Change	The State has all the eight missions aligned to NAPCC
State Action Plan on Climate Change	The State has prepared SAPCC and duly endorsed by the State and submitted to MOEFCC in 2012
Sustainable Agriculture	• National Mission for Sustainable Agriculture • National Mission on Agriculture Extension and Technology • Rashtriya Krishi Vikas Yojana (RKVY) • Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) • National Agricultural Development programme (NADP) • Annapurna Scheme • Pradhan Mantri Fasal Bima Yojana • Paddy Procurement Programme • Management of Soil Health (Soil Health Card Scheme) • National Food Security Mission • Tripura State Horticulture Mission • Mission for Integrated Development of Horticulture • National Livestock Mission • Livestock Health and Disease Control • National Programme for Bovine Breeding and Dairy Development • Dairy Development Programmes • Fisheries programmes • Development of Inland Fisheries and Aquaculture
Water	• The Water (Prevention and Control of Pollution) Act, 1974 • Jal Jeevan Mission • Integrated Watershed Management Programme • Jal Jeevan Mission • Accelerated Irrigation Benefit Program (AIBP) • Flood Management Programme • Rainwater Harvesting Programme
Green Tripura Mission	• National Afforestation Programme (NAP) • CAMPA (Compensatory Afforestation Fund Management and Planning Authority) • Sustainable Catchment Forest Management in Tripura (SCATFORM) • Indo-German development Cooperation (IGDC)

Solar Mission & Non-Conventional Energy	• Jawaharlal Nehru National Solar Mission (JNNSM) • Special Area Demonstration Programme • Development of Solar Cities Programme • Solar Photovoltaic Water Pumping System • Policy on net metering for Grid Interactive Roof- • Solar Thermal Programme • Solar Photovoltaic Programme • Suryamitra Training Programme • New and Renewable Sources of Energy Policy (NRSE) 2012 • New National Biogas & Organic Manure Programme (NNBOMP) • National Biogas & Manure Management Programme (NBMMP) • Unnat Chulha Abhiyan (UCA) Programme • Information and Public Awareness Programme
Energy Efficiency	• Remote Village Electrification Programme • Integrated Power Development Scheme (IPDS) • Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) • Decentralized Distributed Generation (DDG) under DDUGJY • Ujjwal DISCOM Assurance Yojana • Rajiv Gandhi Grameen Vidyutikaran Yojana • SAUBHAGYA Scheme • North Eastern Region Power System Improvement Project (NERSIP) • LED village campaign
Sustainable Habitat	• Pradhan Mantri Awas Yojana (PMAY) • Deendayal Antyodaya Yojana-National Urban Livelihoods Mission (DAY-NULM) • Indira Awas Yojana (IAY) • Rajiv Awas Yojana (RAY) • Smart City Mission • Atal Mission for Rejuvenation and Urban Transformation (AMRUT) • Heritage City Development and Augmentation Yojana (HRIDAY) • Swachh Bharat Mission (SBM) • Jawaharlal Nehru National Urban Renewal Mission (JNNURM) • Tripura Urban Employment Programme (TUEP) • Tripura State Government Housing Scheme (TSGHS) • Special Development Scheme (SDS) • Tripura Solid Waste Management Policy • Urban Infrastructure Development Fund • Integrated Solid Waste Management • Swachh Bharat Mission (Urban) • Urban Sewerage Scheme

2.6 Sectoral Highlights

2.6.1 Agriculture and Allied

Tripura is an agrarian state, and a large portion of the population is dependent on agriculture. Agriculture is an important sector for the economy which provides livelihoods, reduces poverty and ensures food security. The agriculture sector of Tripura broadly comprises agriculture, horticulture, and related activities. Agriculture sector is highly vulnerable to climate change. Increasing agricultural production and productivity is necessary for ensuring food security, livelihood security, and nutritional security. Agricultural production and productivity can be improved through better land and water management, a greater reliance on rain-fed agriculture, expansion of agricultural markets, better technology, higher public and private investments, and effective implementation of the ongoing programs in agriculture and

allied sectors better contingency planning and risk transfers with expanded coverage under crop and weather insurance. Fishery and animal resources are fully integrated into the agriculture system of the country. Animal husbandry is an integral component of diversified agriculture system as it is a source of employment and livelihood for rural population. State's total livestock and total poultry population as per 2019 Livestock Census are 13.18 lakh numbers and 41.68 lakh numbers, respectively.

Table 10: Agriculture Profile of Tripura

Gross Cropped Area (in '000 Ha)	**487**
Net Sown Area (in '000 Ha)	255
Cropping Intensity (2017-18)	191%
Total food-grain production as on 2019-20 (in lakh MT)	8.5
Operational Land Holders (in lakh)	5.73
Productivity of food-grain in kg/ha (2019-20)	2770
Total Livestock	1317892
Total Poultry	4168246
Total Fish Production (in MT) 2019-20	77630
Total Milk Production in '000 MT (2019-20)	197.27
Egg Production in Crore numbers (2019-20)	29.50
Total Meat Production in '000 MT (2019-20)	50.84

(Source: Economic Review Tripura 2019-20, Tripura at a Glance 2020, Livestock Census 2019)

2.6.2 Forest

Forest has an important role not only from the economic perspective but also from the ecological perspective. Climate change threatens forest health and productivity, but deforestation and forest degradation significantly contribute to greenhouse gas (GHG) emissions. This makes the sector key for both climate change mitigation and adaptation. There is a need and opportunity for climate adaptation through sustainable forest management, forest restoration and conservation, and livelihood security. The State's Forest area is classified as Reserve Forest (RF), Proposed Reserve Forest(PRF), Protected Forest(PF) and Unclassed Government Forest(UGF).

Table 11: Forest Profile of Tripura

Total Forest Cover	**7,725.59 sq. km**
Percentage of State area under forest	73.68 %
Area under VDF (Very Dense Forest)	653.51 sq. km
Area under MDF (Moderately Dense Forest)	5,236.19 sq. km
Area under OF (Open Forest)	1,835.89 sq. km
Scrub	0.28% of total forest cover
Total tree cover (under forest cover outside recorded forest area)	2275 sq. km
Recorded Forest Area	6,294 sq. km of which the Reserved, Protected and Unclassed forests are 66.33%, 0.03% and 33.64% of the recorded forest area in the State respectively
Bamboo bearing area within forest area of state	3783 sq. km
Total carbon stock of forest	76.06 million tonnes (278.89 million tonnes of CO equivalent) which is 1.07% of total forest carbon of the country
Total volume of Growing Stock	26.50 m. cum

(Source: ISFR 2019 Volume II Tripura)

2.6.3 Water

India faces the challenge of supplying water to a rapidly growing population while promoting water conservation and optimum resource use. Climate change is also critically threatening the water sector, primarily manifesting itself through changes in the hydrological cycle. Adaptation to climate change is a critical need for the water sector. Adaptation measures should build on existing water resource management practices that have the potential to create climate resilience, as well as enhance water availability and distribution. The movement of water in the climate system is essential to life on land because much of the water that falls on land as precipitation and supplies the soil moisture and river flow has been evaporated from the ocean and transported to land by the atmosphere.

Table 12: Water Profile of Tripura

Annual Precipitation per year (in mm)	**2361**
Total Annual Replenishable Ground Water Resource (in BCM)	2.471
Net Annual Ground Water Availability (in BCM)	2.269
Annual Ground Water Draft (in BCM)	0.165
Stage of Ground Water Development (in %)	7.3

(Source: Groundwater Yearbook 2017-18)

2.6.4 Health

Good health is an essential component for wellbeing of people. A healthy populace can contribute productively to the overall economic growth of the country. The State is taking initiatives in building a healthy society by making quality medical facilities available and reachable to the people and by focusing on preventive health care. The State's Vision aims to ensure access to safe sanitation including open defecation free and garbage free environment.

Table 13: Health Profile of Tripura

Birth Rate 2018	**13.0**			
Death Rate 2018	5.5			
IMR (per 1000 live births) 2018	27.0			
Natural Growth Rate 2018	7.5			
Maternal Mortality Rate	4.00			
Total Fertility Rate, NFHS-4	1.7			
Health Infrastructures (2015-16)	24 Hospitals	22 CHCs	116 PHCs	1117 Sub-Centres

(Source: Tripura Economic Review 2019-20)

2.6.5 Solar Mission and Non-Conventional Energy

Ensuring access to equitable, reliable, affordable and sustainable energy is imperative for achieving economic development, driving social growth; alleviate poverty and ensuring prosperity of any economy. To drive economic well-being, alleviate poverty, reduce human drudgery and sustain environmentally sound socio-economic development; access to reliable, equitable, clean and affordable energy services are fundamental. The objective of the situational analysis is to map the State's access to its renewable energy. Tripura has envisaged in achieving target of 105 MW of solar power by the year 2022. The status of potential and grid connected installed renewable energy capacity in Tripura as on 31st December 2019 is given in the table below:

Table 14: Non-Conventional Energy Profile of Tripura

Potential of Solar	**2080 MW**
Installed Capacity of Solar	9.41 MW
Potential of Small Hydro Power	46.86 MW
Installed Capacity of Small Hydro Power	16.01 MW
Potential of Biomass Power	5 MW
Installed Capacity of Renewable Energy	25.42MW
Capacity Addition during 2019-20	4.32 MW

(Source: MNRE Annual Report 2019-20)

2.6.6 Energy Efficiency

Improving the energy efficiency meets the dual objectives of promoting sustainable development and of making the economy competitive. Recognizing the formidable challenges of meeting the energy needs and providing adequate and varied energy of desired quality in a sustainable manner and at reasonable costs, improving efficiency have become important components of energy policy. Though access to electricity (100% household electrification) is being ensured till the last mile under Saubhagya scheme, challenge persists towards ensuring affordable and reliable electricity. The State achieved 100% electrification and all the rural households in Tripura have been saturated i.e.100 percent villages have been electrified.

Table 15: Energy Profile of Tripura

Total Installed capacity (as on Jan 2021)	**756.46 MW**
Per Capita Availability of Power (2018-19)	500.4 kWh
Energy Requirement 2019-20	1538 MU
Energy Supplied 2019-20	1515 MU
Per Capita Energy Consumption (2018-19)	514 kWh
Electricity Demand (2018-19)	906.66 GWh
Thermal Installed Capacity	662.55 MW
Hydro Installed Capacity	68.49 MW
Renewable Energy sources	25.42 MW
Households Electrified by all sources (Saubhagya)	7,88,871
% of Village electrified from all sources	100%

(Source: CEA Installed Capacity Report Jan 2021, Saubhagya Dashboard, MNRE Annual Report 2019-20, PIB Electrification of Villages Report 2019, RBI Publications-Energy 2018-19, LGBR Report 2020)

2.6.7 Sustainable Habitat

The true elucidation of urbanisation lies in the rapid growth of urban population and the expansion of economic activities. Urban regions are most vulnerable to the impacts of climate change because of the rising issues like food insecurity, inequitable water supply, improper sewerage, more accumulation of solid wastes, health issues, vehicular growth, pollution, etc. The most important factor of urbanisation is the migration of people from rural to urban areas. Rapid process of urbanization along with higher concentration of population creates pressure not only on the access but also on the quality of basic amenities. Such expeditious urbanization means that the Government must constantly analyse and upgrade policies and regulations for urban areas to allow them to grow as feasible and vibrant growth regions, while continuing to be liveable and inclusive. About 26.17% of Tripura's population resides in urban areas as per 2011 Census which was significantly lower than that of all India's urban population 31.2%. The state has registered remarkable urban growth of about 76.17 percent during 2001–11, and the urban population has grown from 5.46 lakh to 9.6 lakh during this period.

Table 16: Urban Profile of Tripura

Total Population 2011	**36,73,917**
Urban Population 2011	9,61,453

Urban Male Population 2011	4,87,203		
Urban Female Population 2011	4,74,250		
Urban Pop Growth Rate 2011	76.17%		
Urban Sex Ratio 2011	973		
Urban Literacy Population 2011	8,12,010		
Urban Literacy Rate 2011	93.47%		
Urban Male Literacy Rate 2011	95.51%		
Urban Female Literacy Rate 2011	88.70%		
Urban Local Bodies	Municipal Corporations- 1	Municipal Council- 13	Nagar Panchayats- 6

(Source: Census 2011)

2.7 Contribution to NDCin Terms of Key Indicators

GSDP and emissions of the State has a strong correlation. Tracking of indicators like GSDP growth is an important NDC requirement in terms of moderation of emission intensity by switching to alternative sources of energy. State's per capita energy consumption and forest carbon sink has been compared with national value in the table below to analyse where the State stands in terms of fulfilling its NDC targets.

Table 17: Key Indicators with respect to NDC

Indicators	Unit	2019-20	2030	Remarks
GSDP at current prices	In Rs Lakh	55,35,808	1,01,12,113 92,23,904 (lower bound)	ARIMA Model
Population (Census 2011)	In lakh	36.74	44.69	ARIMA Model
Urban population (Census 2011)	In lakh	9.61		
Per capita GSDP	In Rs	1,37,981	3,08,254	
Electricity demand	In GWh	906.66	4159.22	
The status of energy consumption and carbon sink as of 2019				
		Tripura	**All India**	
Per capita energy Consumption	In kWh	514	1181	Source- CEA 2019-20
Forest carbon sink	In million tonnes	76.06 278.89 CO_2 equivalent	7124.68 26076.33 CO_2 equivalent	Source- ISFR 2019

Source: Census 2011, CEA Report, ISFR Report

2.8 State SDG Performance

The Sustainable Development Goals (SDGs) are set of 17 global goals that are set by the United Nations General Assembly in 2015 for the year 2030. After coming into force as Global Goals in 2016, many countries have taken proactive measures so as to achieve the targets on time. India's commitment to achieve SDGs interprets into transforming this country by improving its social, economic and environmental indicators.

According to SDG India Index Baseline Report 2019-20 of National Institution for Transforming India (NITI) Aayog, the performance of Tripura towards the SDG goals is shown in table below. The composite score for the State is 58.

Table 18: Performance of Tripura under SDG Goals

	SDG Goal	Score	Performance Category	Rank among States
Goal 1	No Poverty	70	Front Runner	2
Goal 2	Zero Hunger	49	Aspirant	9
Goal 3	Good Health & Well Being	61	Performer	14
Goal 4	Quality Education	55	Performer	16
Goal 5	Gender Equality	32	Aspirant	27
Goal 6	Clean Water & Sanitation	69	Front Runner	28
Goal 7	Affordable & Clean Energy	56	Performer	25
Goal 8	Decent Work & Economic Growth	63	Performer	21
Goal 9	Industry Innovation & Infrastructure	48	Aspirant	15
Goal 10	Reduced Inequalities	45	Aspirant	26
Goal 11	Sustainable Cities & Communities	31	Aspirant	25
Goal 12	Sustainable Consumption and Production	92	Front Runner	2
Goal 13	Climate Action	37	Aspirant	22
Goal 15	Life on Land	88	Front Runner	17
Goal 16	Peace, Justice & Strong Institution	73	Front Runner	14
	Composite Score	58	Performer	17

Source: NITI Aayog SDG India Index Baseline Report 2019-20

The relative performance of Tripura with respect to other states in the listed sectors in table below has been analysed for the base year and recent year to understand the progress achieved in the indicators over the period. The percentage change over the time period has also been calculated.

Table 19: Sectors and SDGs

Sectors included in revised SAPCC	Sustainable Development Goals being supported
Sustainable Agriculture	
Forest and Biodiversity	
Water	
Health	

Solar Mission & Non-Conventional Clean Energy	
Energy Efficiency	
Sustainable Habitat	
Himalayan Ecosystem	
Gender	

Table 20: State wise ranking according to performance

	Unit	Year	Tripura	India	Rank	Year	Tripura	India	Rank
Energy									
Capacity addition[5]	Mega Watt	2012-13	412	223344	24	2015-16	677	298060	23
Electrification (village electrification)[6]	Percentage	2011-12	88.27	93.75	28	2014-15	98.67	96.69	20
Forest									
Enhancement of Forest Cover[7]	Area in sq. km.	2013	7866	697898	24	2019	7725.59	712248.42	24
Urban									
Slum population accommodation (year-wise house completed under PMAY-Gramin)[8]	Numbers	Till 2013-14	3604	871676	16	Till 2016-17	27535	9099808	16
Health									
Reduction in vector borne diseases (No. of Malaria cases)[9]	Numbers	2012	11565	1067824	16	2017	7040	842095	11
Reduction in IMR [10]	Rate	2014	21	39	26	2018	27	32	15
Water									
Area irrigated/cultivable area (Net Irrigated Area)[11]	000 hectare	2011-12	72	65707	22	2015-16	81	67300	23
Agriculture									
Food grain production[12]	000 Tonnes	2013-14	726.7	265047.7	21	2018-19	836.3	285209.4	21
Horticulture production[13]	000 MT	2012-13	1503.49	268847.45	21	2018-19	1430.47	310738.2	22
Livestock[14]	Numbers	2012	6208912	1241266621	20	2019	5486138	1385178527	24

[5] NITI Aayog State Statistics, Installed Capacity
[6] NITI Aayog State Statistics, Village Electrification
[7] ISFR Report
[8] PMAY-Gramin Website
[9] NHM Statistics
[10] RBI, Handbook of Statistics on Indian States
[11] RBI, Handbook of Statistics on Indian States
[12] RBI, Handbook of Statistics on Indian States
[13] http://agricoop.nic.in/statistics/horticulture
[14] Livestock Census

2.9 SDG and NDC Linkages of Sectoral Schemes

Sector	Schemes	Linkage to SDG Goals	Linkage to NDC
Sustainable Agriculture	National Mission for Sustainable Agriculture	2, 14, 15	• To better adapt to climate change by enhancing investments in development programs in sectors vulnerable to climate change, particularly agriculture.
	National Food Security Mission	2	
	Mission for Integrated Development of Horticulture	2	
	National Mission on Agriculture Extension and Technology	2	
	Rashtriya Krishi Vikas Yojana (RKVY)	2	
	National Livestock Mission	2	
	Livestock Health and Disease Control	2	
	National Programme for Bovine Breeding and Dairy Development	2	
	Annapurna Scheme	2	
	Pradhan Mantri Fasal Bima Yojana		
	Paddy Procurement Programme		
	Management of Soil Health (Soil Health Card Scheme)	2, 15	
Solar Mission & Non-Conventional Clean Energy	National Policy on Biofuels	7, 12	• Reduction of Emission intensity by 33-35% by 2030 from 2005 level National target of achieving 40% cumulative electric power installed capacity from non-fossil-based energy resources by 2030
	National Clean Energy Fund	7, 12	
	Jawaharlal Nehru National Solar Mission (JNNSM)	7, 11, 12	
	Development of Solar Cities Programme	7, 11	
	National Biogas & Manure Management Programme (NBMMP)	7, 12	
	Unnat Chulha Abhiyan (UCA) Programme	7	
	Solar Photovoltaic Water Pumping System	7, 12	
	Solar Thermal Application	7	
	Standalone Systems	7, 11	
Energy Efficiency	Remote Village Electrification Programme	7	• To better adapt to climate change by enhancing investments in development programs in sectors vulnerable to climate change, particularly agriculture and allied
	Deen Dayal Upadhyaya Gram Jyoti Yojana	7	
	Ujjwal DISCOM Assurance Yojana	7, 11	
	Rajiv Gandhi Grameen Vidyutikaran Yojana	7	
	Integrated Power Development Scheme (IPDS)	7, 11, 12	
	SAUBHAGYA Scheme	7,11	
	North Eastern Region Power System Improvement Project (NERSIP)	7	
	LED village campaign	7, 12, 13	

Forest	National Afforestation Programme	13, 15	• To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030 • To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change
	National Bamboo Mission	13, 15	
	Integrated Development of Wildlife Habitats (IDWH)	15	
	Forest Fire Prevention and Management	13, 15	
	Rudrasagar Wetland	13, 15	
	Conservation, Development & Sustainable Management of Medicinal Plants	13, 15	
	Project Elephant	15	
Health	National Health Mission	3,5	• To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation
	National Vector Borne Disease Control Programme	3	
	National Ayush Mission	3	
	Ayushman Bharat- Pradhan Mantri Jan Arogya Yojana	3	
	Janani Suraksha Yojana	3	
	Janani Shishu Suraksha Karyakaram	3	
	Mukhyamantri Matru Pushti Uphaar		
	Asha Incentives	3	
	Intensified Malaria Control Project (IMCP)	3	
	Integrated Child Development Services (ICDS)	3	
	Integrated Disease Surveillance Programme	3	
	Integrated Disease Surveillance Programme	3	
Sustainable Habitat	Pradhan Mantri Awas Yojana (PMAY)	11	• To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation • To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development
	Deendayal Antyodaya Yojana-National Urban Livelihoods Mission (DAY-NULM)	11	
	Indira Awas Yojana (IAY)	11	
	Rajiv Awas Yojana (RAY)	11	
	Smart City Mission	11	
	Atal Mission for Rejuvenation and Urban Transformation (AMRUT)	6, 11	
	Heritage City Development and Augmentation Yojana (HRIDAY)	11	
	Swachh Bharat Mission (SBM)	3, 6, 11	
	Jawaharlal Nehru National Urban Renewal Mission (JNNURM)	6, 11	
	Tripura Urban Employment Programme (TUEP)	8, 11	
	Tripura State Government Housing Scheme (TSGHS)	11	
	Special Development Scheme (SDS)	11	
	Tripura Solid Waste Management Policy	6, 11	
	Urban Infrastructure Development	11	

	Fund		
	Swachh Bharat Mission (Urban)		
	Urban Sewerage Scheme	6, 11	
	Urban Sewerage Scheme	6, 11	
Water	Jal Jeevan Mission	3, 6, 12, 13	• To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health, and disaster management (better water use efficiency)
	Accelerated Irrigation Benefit Program (AIBP)	6, 13	
	Flood Management Programme	6, 13	
	Rainwater Harvesting Programme	6, 13	
	Rainwater Harvesting Programme	6, 13	
Gender	Beti Bachao Beti Padhao	4,5	• To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation
	Tripura Rural Livelihood Mission	5,8	
	Tripura Commission for Women	5	
	Livelihoods of Women Through SHGs	5,8	
	Janani Suraksha Yojana (JSY)	3,5	
	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG) - SABLA	3,5,8	
	Strengthening Education among Girls in Low Literacy Pockets	4,5	
	National Commission for Women	5	

2.10 Performance of the State under Key NDC Areas: Adaptation Strategy

Some important NDC areas that need to be focused and prioritised for achieving the targets which have been detailed in this section and State's performance has been noted in each area.

2.10.1 Poverty and Food Security

Poverty can be defined as a state when a person is not able to take part in economic activities, to earn sufficient income or unable to sustain the cost of a healthy living. In such a situation, a person is not only deprived of a healthy living but is also not able to make use of opportunity because of lack of adequate resources.

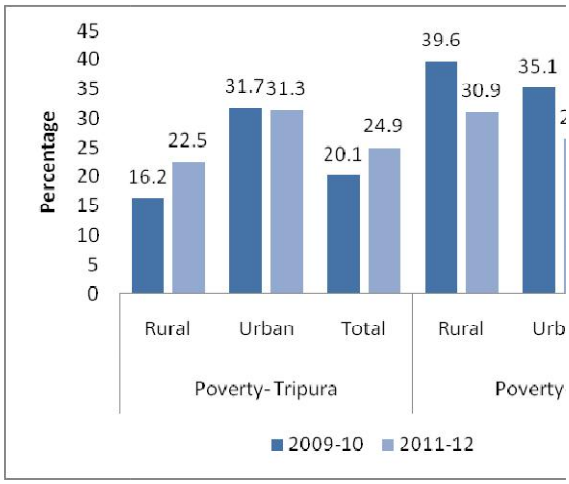


Figure 7: Percentage of people below poverty line

(Source: Report of the expert group to review the methodology for measurement of poverty, Government of India Planning Commission June 2014)

The trend in the poverty level across rural and urban regions of Tripura is shown the figure above. In rural areas, the percentage share of population below poverty line increased from 16.2 to 22.5 whereas in urban regions, the percentage share of population below poverty line had declined from 31.7 to 31.3. The percentage of poverty is lower in Tripura with value of 24.9 when compared to India's percentage of poverty 29.5.

National Food Security Mission (NFSM) focuses on improving the production by expanding area, productivity enhancement, restoring soil fertility and creation of employment opportunities. This has become an important investment with an objective for improving the adaptive capacity in the vulnerable areas and is being implemented in the State.

Figure below shows the allocations, release and expenditure under National Food Security Mission (NFSM) for Tripura and India, respectively.

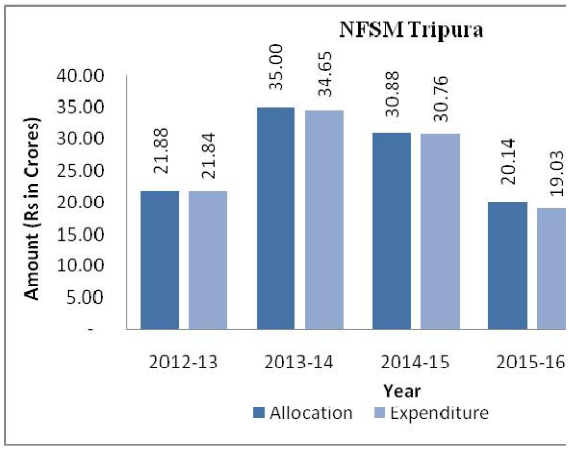


Figure 8: Allocations, Release and Expenditure under National Food Security Mission, Tripura
(Source: Allocation and Release under NFSM)

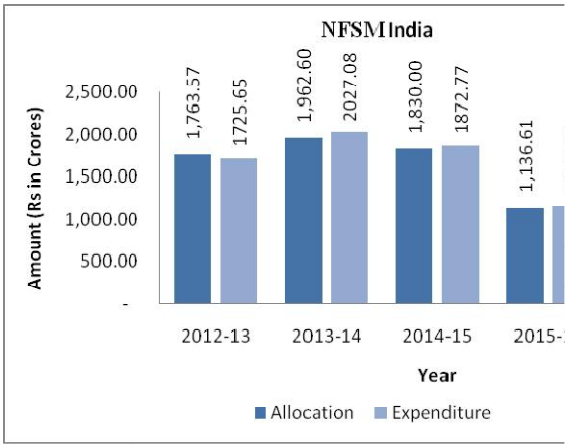


Figure 9: Allocations, Release and Expenditure under National Food Security Mission, India
(Source: Allocation and Release under NFSM)

2.10.2 Sustainable Agriculture (NMSA)

Tripura has an agrarian economy and agriculture acts as the backbone of the economy by providing food and livelihood security. The State has shown accelerated growth in food grain production during 2014-15 (761.5 thousand Tonnes), 2015-16 (818.3 thousand Tonnes), 2016-17 (859.6 thousand Tonnes), 2017-18 (855.4 thousand Tonnes) and 2018-19 (836.3 thousand Tonnes).

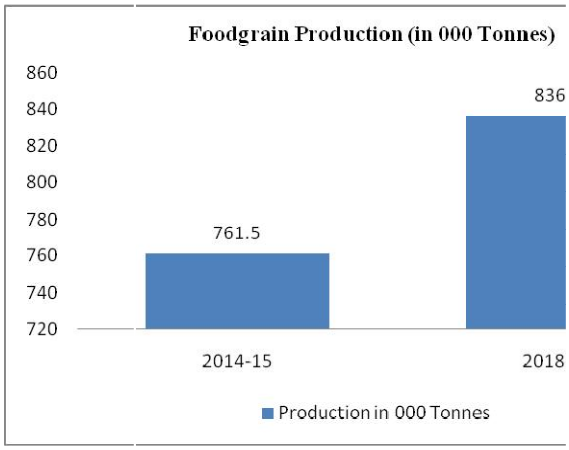


Figure 10: Food Grain Productions
(Source: RBI Handbook of Statistics)

National Mission for Sustainable Agriculture (NMSA) aims to increase agricultural productivity and focuses on soil health management, farmland management and indigenous farming techniques for resource conservation, water use efficiency and making agriculture more sustainable. NMSA has a strong adaptation linkage to NDC because NDC clearly defines the appropriate climate resilient farming systems and allied activities for income generation and value addition. Rainfed Area Development and National Bamboo Mission are the components implemented under this scheme.

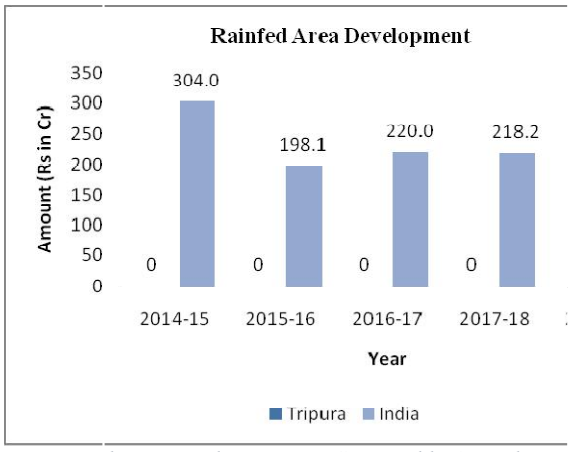


Figure 11: Allocations under National Mission on Sustainable Agriculture, Rainfed Area Development
(Source: National Mission on Sustainable Agriculture)

The figure above represents the allocation under Rainfed Area Development in the State. The objective of Rainfed Area Development Programme (RADP) is to promote Integrated Farming System (IFS) with importance on multi-cropping, rotational cropping, inter-cropping, mixed-cropping practices with allied activities like horticulture, livestock, fishery, agro-forestry, apiculture, conservation/promotion of NTFPs etc. so as to enable farmers not only in increasing the farm returns for sustaining livelihood, but also to mitigate the impacts of drought, flood or other extreme weather events.[15]

[15]National Mission for Sustainable Agriculture (NMSA), Operational Guidelines

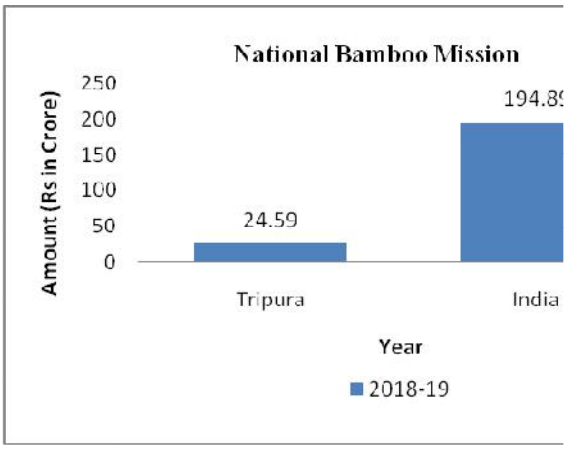


Figure 12: Allocation under National Bamboo Mission
(Source: National Mission on Sustainable Agriculture)

Figure above shows the allocation under National Bamboo Mission in the State. This Mission aims to promote holistic growth of bamboo sector through area-based, regionally differentiated strategy and also focuses on increasing the area under bamboo cultivation and marketing. The State had fund allocation for National Bamboo Mission only during 2018-19.

Rashtriya Krishi Vikas Yojana (RKVY)

The objective of **Rashtriya Krishi Vikas Yojana** (RKVY) is to help the States in preparing agriculture development plans and attain sustainable growth in agriculture sector. It acts as an important contributor in reducing poverty and attain food security.

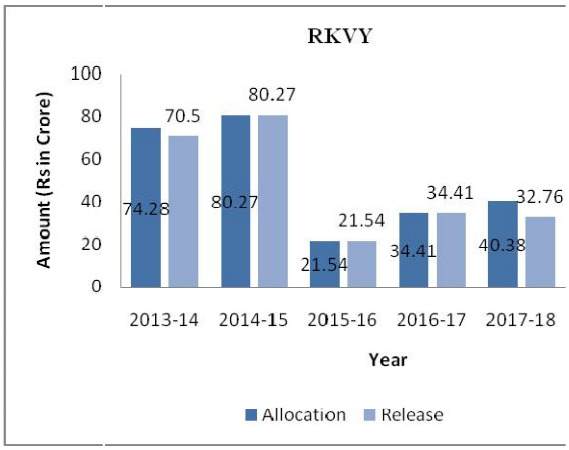


Figure 13: Allocation and Release under Rashtriya Krishi Vikas Yojana, Tripura
(Source: Statement Showing allocation release and expenditure)

The figure above shows the allocation and release of the State under RKVY for different years. The activities of RKVY are associated with agriculture, horticulture and allied sectors that have strong linkage to livelihood and employment generation.

Soil Health

Soil Health Management aims to promote location as well as crop-specific sustainable soil health management. Soil Health becomes an important component for sustainable profitability of the farmers.

Soil testing plays a major role in climate resilient agriculture by examining nutrient status of the soils and by giving suggestions on judicious use of fertilizers.

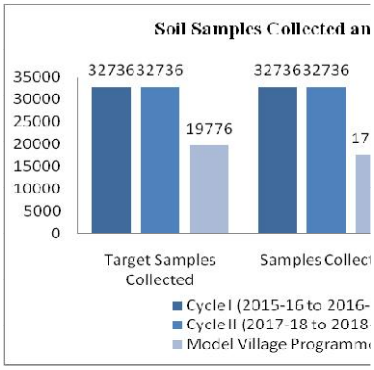


Figure 14: Soil Samples Collected and Tested

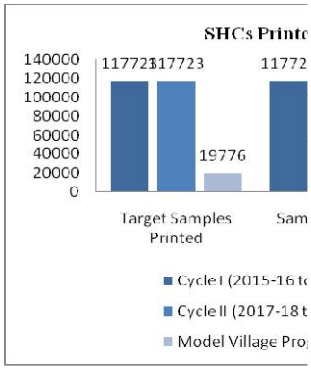


Figure 15: Soil Health Cards Printed and Dispatched

(Source: Soil Health Card Website, Scheme Progress)

In the first and Second cycle, 100% of the target soil samples was collected and tested. In Model Village Programme (2019-20), 88.99% of the target soil samples were collected and 85.54% were tested. In the first cycle, 100% of the SHCs were printed and dispatched whereas in the second cycle, only 85.2% of the SHCs were printed and only 82.9% of the SHCs were dispatched. In Model Village Programme (2019-20), 68.33% of the SHCs were printed and 68.33% of the SHCs were dispatched.

2.10.3 Enhancement of Carbon Sink and Green India Mission

The objective of Green India Mission is to protect, restore and enhance forest cover. The mission also involves adoption of adaptation and mitigation measures to respond to climate change. This mission focuses on expansion of forest and tree cover to the extent of 5 Mha, increase the quality of existing forest and tree cover, development of eco system services like carbon sequestration and storage, biodiversity, hydrological services and provision of fuel, fodder and Non-Timber Forest Products (NTFPs); and to increase forest-based income.

Compensatory Afforestation Management and Planning Authority (CAMPA) have been formed to monitor the effective implementation of the compensatory afforestation efforts in the country. The main objective for allocation of funds under CAMPA was to reduce the impact of diversion of forest land for non-forest purpose. Figure below shows the allocation of funds to the State under CAMPA scheme.

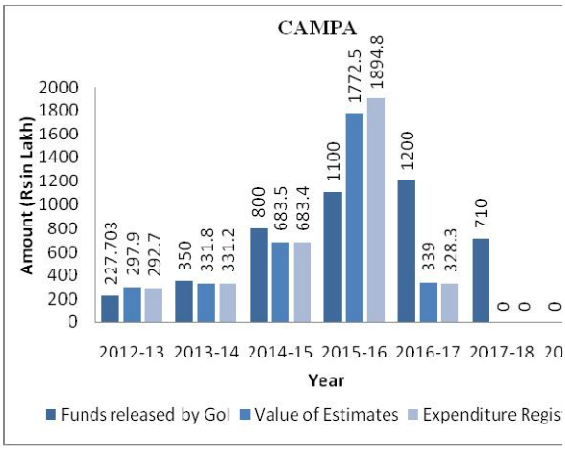


Figure 16: Allocations under Compensatory Afforestation Management and Planning Authority (CAMPA)

(Source: e-Green Watch)

As per the ISFR 2019 by FSI, the forest cover in the State is 7,725.59 sq. km, out of which 653.51 sq. km is Very Dense Forest (VDF), 5,236.19 sq. km is Moderately Dense Forest (MDF) and 1,835.89 sq. km is Open Forest (OF). Forest Cover is 73.68 percent of the State's geographical area. State's forest Cover has decreased by 0.41 sq. km when compared to the ISFR 2017 assessment report. The total carbon stock in the forest of Tripura is 76.06 million tonnes (278.89 million tonnes of CO_2 equivalent) which is 1.07 percent of the total forest carbon stock of the country.

2.10.4 Water Resources and Water Use Efficiency

The objective of National Water Mission is to conserve water, minimizing its wastage and ensuring its equitable distribution. The Mission also focuses on improving water use efficiency by 20 percent. In order to achieve the goal, several schemes like more crop per drop (micro-irrigation), har khet ko pani, watershed activities, plantation and farm ponds, etc. were implemented.

Table 21: Total Cropped Area, Gross Irrigated and Un-Irrigated Area in Tripura

Year	Net Cropped Area (000 Ha)	Gross Cropped Area (000 Ha)	Cultivable Land (000 Ha)	Cropping Intensity (%)
2014-15	255.36	483.48	273.58	189
2015-16	255.49	485.67	272.86	190
2016-17	255.49	490.54	272.33	192
2017-18	255.09	486.77	271.76	191
2018-19	255.55	487.00	271.39	191

Source: Department of Agriculture and Farmers Welfare, Govt. of Tripura

The percentage of gross irrigated area to gross cropped area in the State ranges between 22-24 percent as shown in the table above.

Table 22: State-wise ground water resources availability

(In BCM)

State	Annual Replenishable Ground water Resource				Total	Natural Discharge during non-monsoon season	Net Annual Ground Water Availability
	Monsoon Season		Non-monsoon				
	Recharge from rainfall	Recharge from other source	Recharge from rainfall	Recharge from other source			
Tripura	1.141	0.000	0.738	0.593	2.471	0.202	2.269

(Source: Groundwater Yearbook 2017-18)

Table 23: State-wise ground water resources utilization and stage of development

(In BCM)

State	Annual Ground Water Draft			Projected Demand for Domestic and Industrial	Ground Water Availability for future irrigation	Stage of Ground Water Development (%)
	Irrigation	Domestic and industrial uses	Total			
Tripura	0.093	0.072	0.165	0.200	1.976	7.3

(Source: Groundwater Yearbook 2017-18)

As per Central Ground Water Board (CGWB) estimate, the annual replenishable ground water resource of the State has been estimated as 2.471 BCM and net annual ground water availability is 2.269 BCM as shown in the table. The annual ground water draft is 0.165 BCM and stage of ground water development is 7.3 percent.

Integrated Watershed Management Programme

Watershed development programmes aims to optimize rainwater utilization, control soil erosion; promote sustainable land use pattern, cropping and other farming practices that will enhance the production potential in an integrated way by considering all categories of land in a watershed. The watershed structures include farm ponds, nala bund, percolation tanks and water recharge structures.

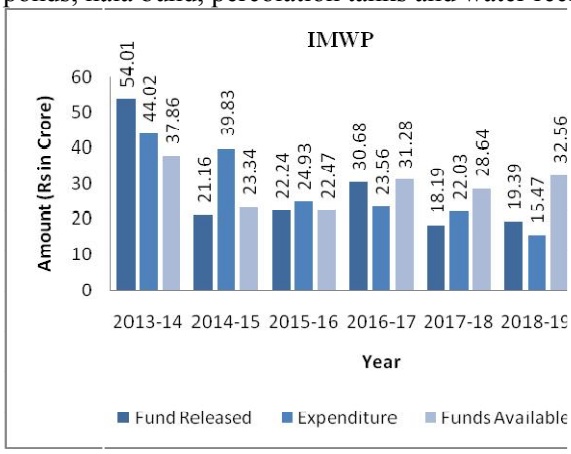


Figure 17: Financial Allocations under Integrated Watershed Management Programme
(Source: IWMP)

2.10.5 Drinking Water and Sanitation

Central Government has started taking special efforts to revamp the conditions of water and sanitation in India. Swachh Bharat Mission is constituted which acts as a transformational step in this pathway. The Mission aims to make the villages open defecation free. The Mission has numerous social benefits like reduction in emission and disease burden, and also livelihood improvement. The number of households with toilets in the State as per Swachh Bharat Gramin including baseline survey is 6, 45,659[16](till 2019-20).

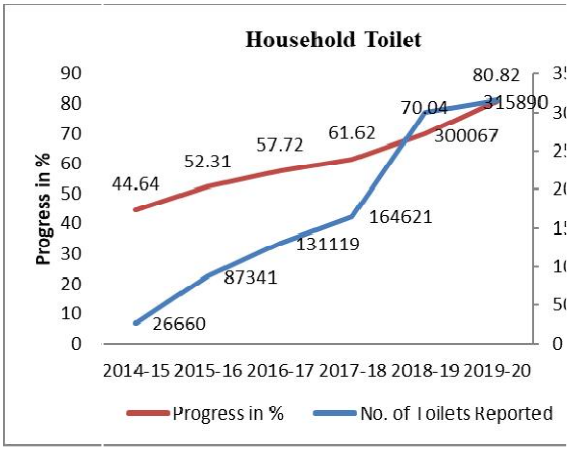


Figure 18: Trend of Household Toilet Coverage in Tripura (BSL)
(Source: Swachh Bharat Mission Gramin MIS)

[16]Swachh Bharat Mission Gramin MIS

As per Swachh Bharat Mission (Gramin), total number of villages declared ODF in Tripura is 1178[17]. The progress in ODF across the State is given below:

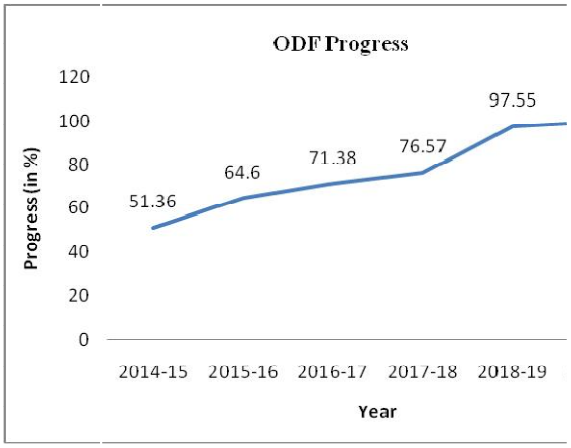


Figure 19: Trend of ODF in Tripura
(Source: Swachh Bharat Mission Gramin Dashboard ODF)

Central Government of India started helping the States for rural water supply since 1972 with the launch of Accelerated Rural Water Supply Programme. In 2009, this was renamed as National Rural Drinking Water Programme (NRDWP), a centrally sponsored scheme, with fund sharing between the Centre and the States.

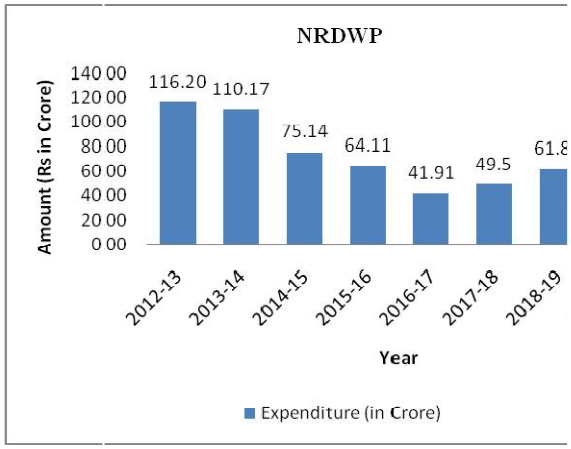


Figure 20: Performance of drinking water supply
(Source: Ministry of Drinking water and Sanitation, NRDWP)

The figure above shows year-wise expenditure in National Rural Drinking Water Programme. NRDWP aims to enable all households to have access to and use safe and adequate drinking water within premises. The goal was proposed to achieve by 2030 following UN's Sustainable Development Goals but now through Jal Jeevan Mission (JJM) the goal is proposed to achieve by 2024.

[17] Swachh Bharat Mission Gramin Dashboard

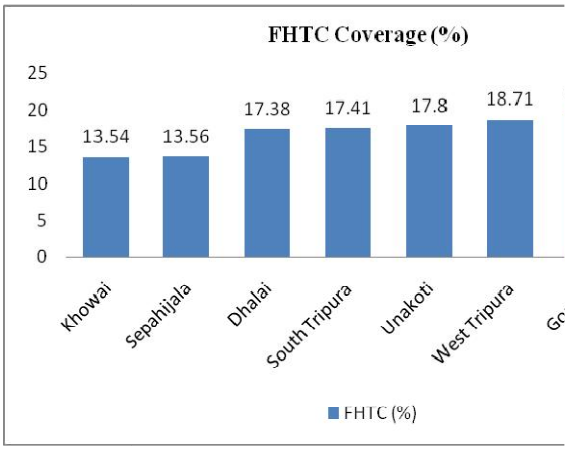


Figure 21: Coverage of Functional Household Tap Connection (till Nov 2020)
(Source: Jal Jeevan Mission Dashboard)

The figure above shows coverage of Functional Household Tap Connection in Tripura till November 2020. Jal Jeevan Mission has been designed with an integrated approach with end-to-end measures; that is from source to supply to reuse and recharge. The 'Har Ghar Jal' programme has been proposed as a 'Jan Aandolan' - people's movement. The objective of Jal Jeevan Mission is to enable every rural home in the villages to have Functional Household Tap Connections (FHTC) by 2024.

2.10.6 MGNREGA and Climate Benefits

The key activities of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and the climate benefits helping in adaptation and reduction of vulnerability in the State is:

Table 24: MGNREGA and Climate Benefits

Key activities	Key benefits helping in adaptation and vulnerability reduction
Water Resources	Implementation of MGNREGS works such as water conservation and harvesting works, drought proofing, irrigation provisioning and improvement works, and renovation of traditional water bodies have contributed to improved ground water levels
Land Resources	Land development works such as land levelling, conservation bench terracing, contour and graded bunding, field bunding, pasture development, silt application and drought proofing have contributed to improved soil organic carbon (SOC) content, reduced surface runoff and reduction in soil erosion
Carbon Sequestration	Several MGNREGS works leading to increase in soil organic carbon, and increasing tree plantations and fruit orchards leading to carbon sequestration in biomass and soil, potentially contribute to mitigation of climate change
Plantations	Drought proofing works such as afforestation and reforestation, Soil quality improvement with increase in soil organic carbon, carbon sequestration, soil moisture retention, reduction in diurnal variability in temperature, biodiversity(reduced risk), biomass production (fuel wood)
Livelihood	Wage employment and social protection for the poor
Overall	MGNREGS works related to water and land development have contributed to generation of environmental benefits such as ground water recharge, increased water availability for irrigation, increased soil fertility, reduction in soil erosion, and improved tree cover. These environmental benefits derived from MGNREGS works have contributed to reducing the agricultural and livelihood vulnerability in the post-MGNREGS implementation period, compared to the pre-MGNREGS period and further have the potential to not only build resilience to cope with current climate risks but also build long-term resilience to projected climate change.

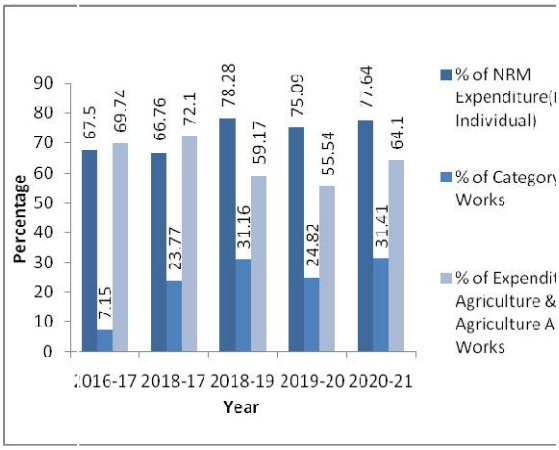


Figure 22: Expenditure of Major Works taken up under MGNREGA
(Source: MNREGA Official Website)

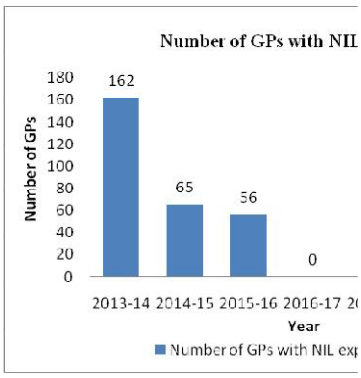


Figure 23: Number of GPs with Nil Expenditure

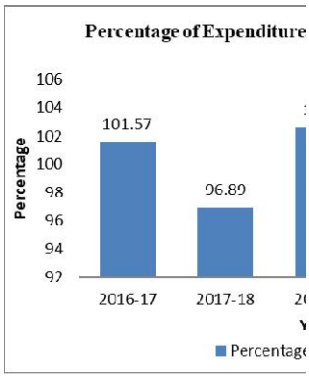


Figure 24: Percentage of Expenditure against Available Fund
(Source: MGNREGA Official Website)

The State has 58 blocks and 1178 Gram Panchayats. Under MGNREGA, total job cards issued in Tripura till November 2020 were 6.42 lakh which covered 11.14 lakh workers. Of the total job cards issued, total active job cards were 6.18 lakh.

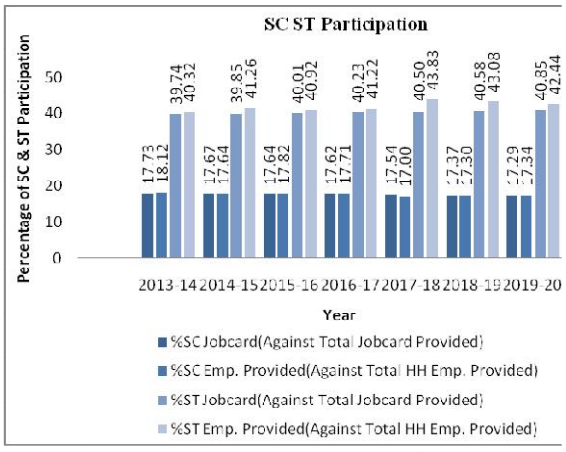


Figure 25: SC& ST Participation in MGNREGA in Tripura
(Source: MGNREGA Official Website)

The figure shows the participation of SC and ST workers in MGNREGA in the State. The total number of active workers in the State is 9.58 lakh, out of which the percentage of SC workers against active worker is 13.82 whereas the percentage of ST workers against active worker is 35.97.

2.10.7 Health Outcomes

Tripura has suffered due to infrastructure and other bottlenecks because of its location in south-west corner of the North-Eastern Region. Climate Change affects the basic requirements for maintaining health, clean air and water, sufficient food, adequate shelter and also causes new challenges in controlling infectious diseases. The State Health department of Tripura coordinates with TCCC as a line department to combat CC in line with NDC & SDGs goals.The State is having 6 District Hospitals, 12 Sub-Divisional Hospitals, 22 CHCs and 113 PHCs[18]. In case of Infant Mortality Rate (IMR), the State has achieved 27 per 1,000 live births as per Sample Registration System (SRS) 2016.

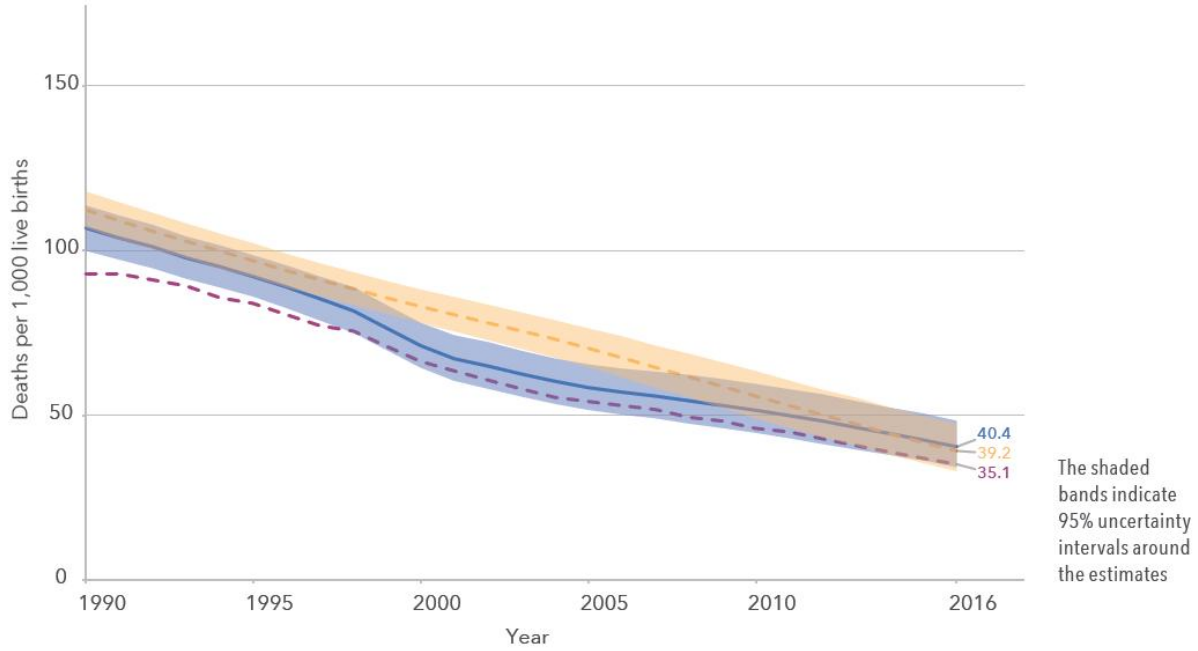


Figure 26: Under five mortality rates from 1990-2016 for Tripura and all-India
(Source: India- Health of the Nation's States Report 2017)

[18] Economic Survey 2018-19

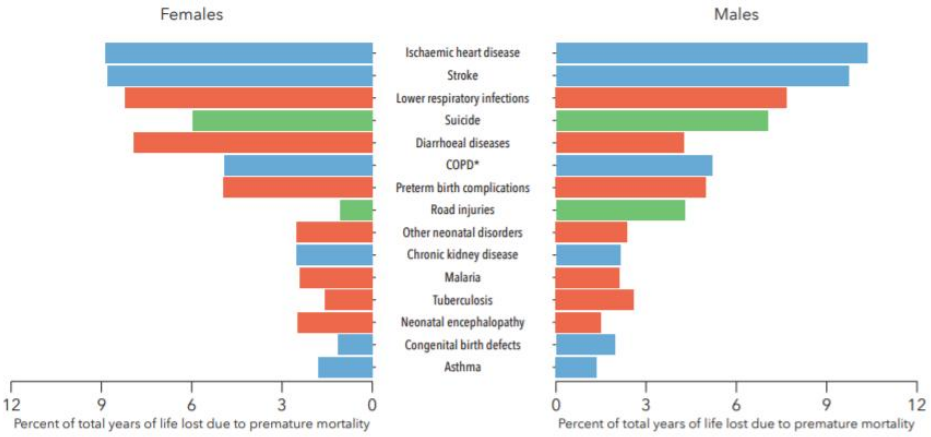


Figure 27: Pattern of disease burden in Tripura
(Source: India- Health of the Nation's States Report 2017)

Diseases contributing to loss in maximum years due to premature mortality in 2016 are Heart diseases, respiratory diseases and diarrhoeal diseases. Some major risk factors are high blood pressure, dietary risk, air pollution and malnutrition. Most of the risk factors have strong association to climate and other environmental changes. Reasons for water borne diseases can be because of non-availability of safe drinking water and increase in water pollution.

National Health Mission aims to reduce health related vulnerability. Major objectives of NHM are as follows:

- To provide accessible, affordable, accountable effective and reliable primary health care facilities, especially to the poor and vulnerable sections of the population
- To bridge the gap in Rural Health Care services through creation of a cadre of Accredited Social Health Activists (ASHA) in certain pockets like the tribal areas and improved hospital care, decentralization of programme to district level to improve intra and inter-sectoral convergence and utilisation of resources
- To provide overarching umbrella to the existing programmes of health and family welfare including Malaria, blindness, iodine deficiency, filaria, kalaazar, TB, leprosy and rural disease surveillance

Financial allocation, release and expenditure of the State under National Rural Health Mission (NRHM) and National Urban Health Mission from 2014 to 2018 is given in figure below:

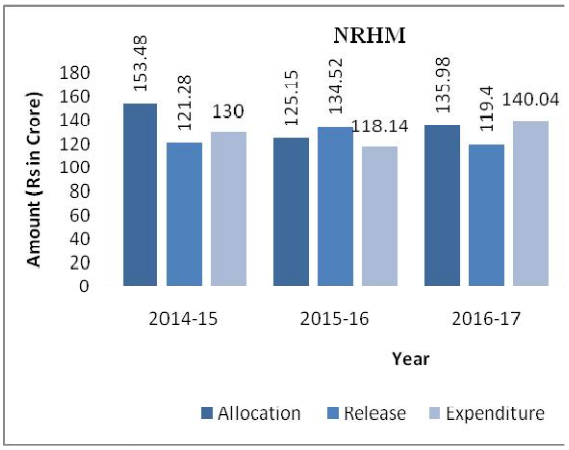


Figure 28: Financial allocation, release and expenditure of the State under NRHM
(Source: Achievements under NRHM and NUHM, Published- 06-February-2018)

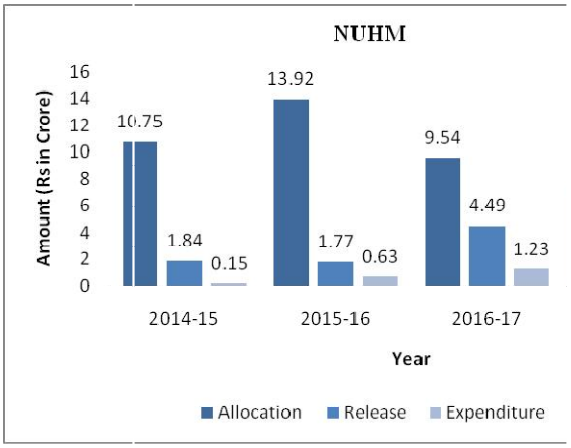


Figure 29: Financial allocation, release and expenditure of the State under NUHM
(Source: Achievements under NRHM and NUHM, Published- 06-February-2018)

2.10.8 Strategic Knowledge for Climate Change

While dealing with development of plans, vulnerability assessment and measures for adaptation and mitigation, State mission on strategic knowledge for climate change for the state of Tripura plays an important role. Strategic Knowledge for Climate Change focuses on formulating a dynamic knowledge system that would help in attaining the objective of ecologically sustainable development and in developing a better understanding by reducing knowledge gaps and upgrading the information available related to climate science and its impacts. Strategic Knowledge for Climate Change aims to address several issues by identifying different climate sensitive actions and educating on activities with the objective of development, adaptation and mitigation.

The State developed a State Action Plan on Climate Change (Tripura SAPCC-I) for assessment, adaptation and mitigation measures with objective to examine the targets and achievements of the National Missions specified by the National Action Plan on Climate Change (NAPCC). The primary aims of Strategic Knowledge for Climate Change for the State are:[19]

- To monitor climate variability and make climate change projections for the state
- To build GHG inventory

[19] Tripura SAPCC-I

- To plan for the climate sensitive regions, to analyze the vulnerability of regions/districts
- To integrate the processes of assessment of vulnerability, knowledge and data of natural resources, institutions and capacities with the bottom up approach to enable the planning of adaptation and mitigation projects
- To enable government including its policymaking bodies in the climate reslient policy-formulation function
- To inform and assist the development agencies to evolve suitable adaptation and mitigation measures
- To empower and upgrade the capabilities of people to take appropriate steps at their own level for the reduction of risk
- To strengthen regional cooperation through the establishment of mechanisms for exchanging information with regions sharing the borders and ecology of the state of Tripura

2.11 Performance of the State under Key NDC Areas: Mitigation Strategy

2.11.1 Sustainable Habitat

Central Government of India has launched two important Missions, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and Smart City that focuses on urban habitations, waste management and emission reduction in the cities. Besides this, the State has also Deendayal Antyodaya Yojana-National Urban Livelihoods Mission (DAY-NULM). In Tripura, Agartala has been selected under the Smart City Mission. Atal Mission for Rejuvenation and Urban Transformation (AMRUT) aims to provide basic services (that include water supply, sewerage facilities, storm water drainage; non-motorized transport and upgrade green spaces).

Table 25: Sector Wise Proposed Total Project Fund and Sharing Pattern for the year 2017-20 in AMRUT

(Amount in Crore) Year 2017-20

Sl. No	**Sector**	**No of Project**	**GoI**	**State**	**Total**
1	Water Supply	3	52.43	5.82	58.25
2	Sewerage & Septage Management	1	2.25	0.25	2.50
3	Drainage	-	-	-	-
4	Urban Transport	-	-	-	-
5	Green Spaces & Parks	1	1.40	0.16	1.56
	Grand Total	**5**	**56.08**	**6.23**	**62.31**

For 2017-20, allocation of funds for AMRUT under Central Share is Rs 56.08 Crore, allocation of funds for Administrative and Office Expenses is Rs 1.63 Crore, allocation of funds under State is Rs 6.23 Crore. The total AMRUT fund allocated to the State during 2017-20 is Rs 62.31 Crore.

2.11.2 Energy Efficiency and Solar Mission

India has targetted to achieve 175 GW of installed capacity from renewable energy which includes 100 GW of solar energy generation, 60 GW of wind energy generation, 10 GW of small hydro and 5 GW of biomass power project. The State would implement 24x7 'Power for All' (PFA) programme with the objective of connecting the unconnected areas before 2030. The State Government with schemes like SAUBHAGYA and Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUY) etc. focuses on 24x7 quality powers.

Table 26: Renewable Energy Potential in Tripura

Energy (MW)	Solar	Biomass Power	Waste to Energy	Small Hydro Power	Total
Tripura	2080	3	2	46.86	2131.86

Source: MNRE Annual Report 20219-20

Tripura has solar potential of 2.08 GWp. Cumulative Capacity added till 2019 through grid connected solar projects is 9.41 MW.

2.12 Trend Analysis of GHG Emissions in Tripura

Analysis of Tripura's Greenhouse Gas (GHG) emissions have been done in three key sectors- Energy, Agriculture, Forestry & Other Land Use (AFOLU) and Waste.

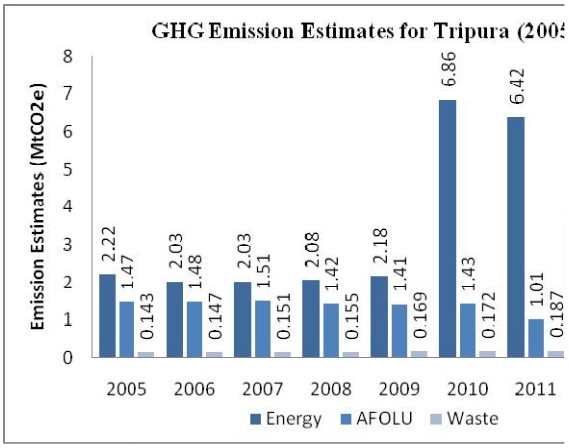


Figure 30: Sector-wise GHG Emission Estimates for Tripura (2005 to 2013)
(Source: Trend Analysis of GHG Emissions in Tripura, GHG Platform India)

The Energy sector constitutes 69% of the total emissions of Tripura in 2013. Emissions from the Energy sector comes from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. In 2013, around 85% of the total Energy emissions belonged to the Fuel Combustion sub-sector whereas the remaining 15% were Fugitive.

The AFOLU sector has a share 26% of the total emissions from Tripura in 2013. Emissions from the AFOLU sector comes from three main sub-sectors namely Livestock, Land and Aggregate Sources and Non-CO2 Emissions Sources on Land. Until 2010 all three sectors were net emitters but from the Land sub-sector acted as a net sink of GHG emissions. In 2011, There was a sudden fall in the overall AFOLU emissions because of transition of Land sub-sector from a net emitter to a net sink.

The Waste sector shared to 5% of the total emissions of Tripura in 2013. Emissions from the Waste sector comes from three main sources- Municipal Solid Waste, Domestic Wastewater and Industrial Wastewater. In 2011, an increase in emissions was observed which can be because of higher Domestic wastewater emissions.

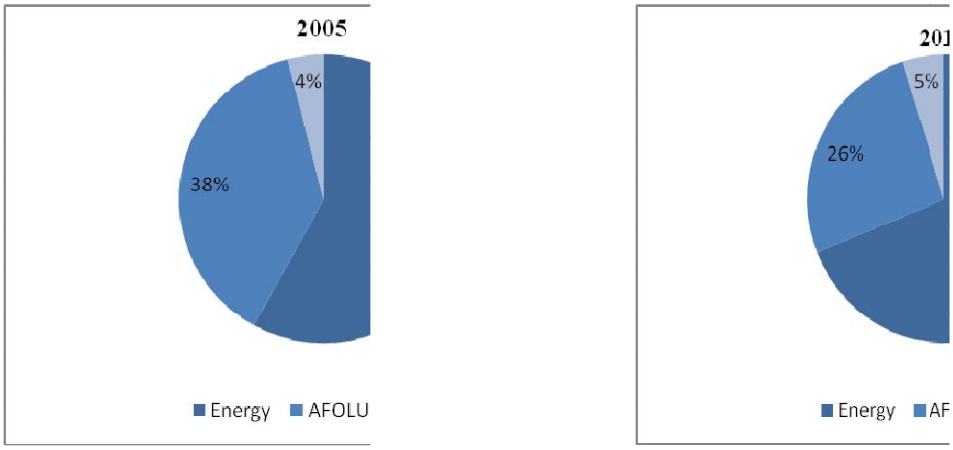


Figure 31: Sector Wise Contribution to Economy-wide GHG Emissions of Tripura
(Source: Trend Analysis of GHG Emissions in Tripura, GHG Platform India)

In 2005, Energy sector contributed around 58% in total emissions followed by the AFOLU sector (38%) and the Waste sector (4%) respectively. In 2013, the share of Energy sector increased to 69% whereas that of AFOLU sector decreased to 26%.

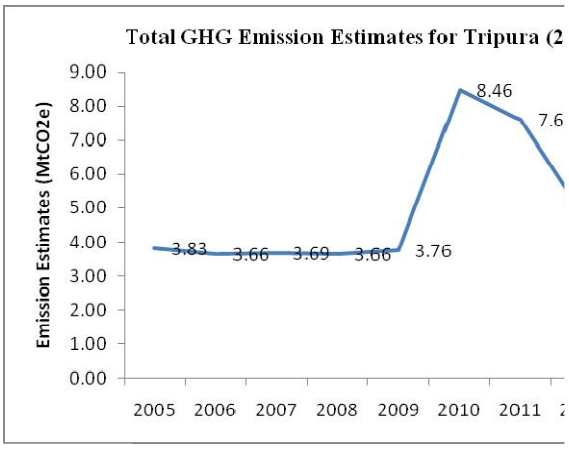


Figure 32: Trend Analysis of total GHG Emissions for Tripura (2005 to 2013)
(Source: Trend Analysis of GHG Emissions in Tripura, GHG Platform India)

Emissions of Tripura increased from 3.83 $MtCO_2e$ in 2005 to 3.84 $MtCO_2e$ in 2013. In 2010, there was a sudden increase in the total emissions when the emissions rose to a high of 8.46 $MtCO_2e$ because of increased emissions of the Energy sector and then declined steeply thereafter. By 2013, the emissions were backed down almost to 2005 levels.

CHAPTER 3: TRIPURA CLIMATE PROFILE

3.1 Climate Profile

Climate Change is generally defined as "a change in the state of the climate that can be identified (e.g., using statistical analysis) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer" (IPCC 2014). Anthropogenic climate change is defined as a change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere (e.g., increase in greenhouse gases due to fossil fuel emissions) or surface characteristics e.g., deforestation) and which is in addition to natural climate variability observed over comparable time periods. It is reported that, in India, the mean annual temperature is increased by 0.6 degree Centigrade over the last century; the monsoon rainfall is declined over the last three decades of the 20th century in many parts of the country, while some parts have showed an increasing trend in the observed frequency of heavy precipitation events.[20]

3.1.1 Past and ongoing climate trend

Tripura is in the north eastern region of India and lies between 22°56′ & 24°32′ north latitudes and 91°10′ & 92°20′ east longitudes. The State is part of the Himalayan Ecosystem and five major hill ranges- Hathai Kotor, Atharamura, Longtharai, Shakhan and Jampui run through the state from north to south. It has a humid tropical climate. It observes moderately warm temperatures during summer and moderately cold temperatures during winter. Spring season starts from late mid-February and continues till mid-March. The State experiences high humidity in summer season because of the presence of Bay of Bengal to its south. It sometimes experiences early winter if there is early rain around mid-February. Summer season starts from middle of March and lasts up to May. Monsoon season through is from June-September, rainfall is seen across the seasons. Annual rainfall ranges from 1922 mm to 2855 mm. The State experiences four seasons:

1. Winter- Winter starts from December itself. During winter, the state experiences moderate to dense fog and sometimes very dense fog. January remains the coldest month and average temperature remains around 10 degree Celsius.
2. Pre-Monsoon (Summer)- Temperature starts increasing from March which results in thunderstorms. These thunderstorms in this season are called "Kalbaisakhi" in local language. The average maximum temperature remains around 31 to 32 degree Celsius and minimum temperature around 24 to 25 degree Celsius. April remains the warmest month of the year.
3. Monsoon- South-west monsoon enters the State during first week of June. The State receives 60% of the annual rainfall during this period with average rainfall of more than 1300mm. June remains the rainiest season with more than 400mm of average rainfall.
4. Post-Monsoon- Rainfall and temperature starts decreasing in the State from October. The average maximum temperature remains around 26 degree Celsius and the average minimum temperature remains around 11 degree Celsius. The weather becomes dry from November, morning start becoming foggy from December and winter season commences.

Based on the latest Scientific understanding, this Chapter explains Tripura's Historical climate and climatic variability, based on IMD data for 1950-2013, observed trends and impacts within this period, as well as projected future climatic changes and related uncertainties.

[20] IPCC (2014) 'Summary for Policymakers', in Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Farahani, E., Kadner, S., Seyboth, K., Adler, A., Baum, I., Brunner, S., Eickemeier, P.,Kriemann, B., Savolainen, J., Schlömer, S., von Stechow, C., Zwickel, T. and Minx, J.C.(Eds.): Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK and New York, NY, USA

3.1.2 Temperature

Based on the historical IMD Gridded data on daily temperature (maximum and minimum) from 1951 to 2013 for the state of Tripura has been analyzed. This has been given in the table below.

Mean annual maximum temperature for Tripura is 28.1 degree Centigrade with arange varying from 27.9 degree Centigrade to 28.2 degree Centigrade. It is also observed that for annual maximum temperature, the highest value is attained for the districts- South Tripura, West Tripura, Gomati and Sepahijala. Mean annual minimum temperature is 17.9 degree Centigrade with a range varying from 17.8 degree Centigrade to 17.9 degree Centigrade.

Table 27: District-wise Temperature of Tripura

District	T_{max}	T_{min}
Dhalai	28.0	17.8
North Tripura	27.9	17.8
South Tripura	28.2	17.9
West Tripura	28.2	17.9
Khowai	28.0	17.8
Unakoti	27.9	17.8
Gomati	28.2	17.9
Sepahijala	28.2	17.9

(in degree C)

The lowest average minimum temperature was 17.8 ^{o}C in Dhalai, North Tripura, Khowai and Unakoti. The past trend shows that both average annual maximum temperature and minimum temperature are showing an increasing trend.

3.1.3 Precipitation

Based on the IMD gridded data, the precipitation trend (1951-2013) has been given below. Average annual rainfall of Tripura varies with a range from 2338 mm to 2519 mm over the period 1951-2013.

Table 28: District-wise Annual Precipitation of Tripura (in mm)

District	Average Annual Precipitation in mm
Dhalai	2472
North Tripura	2519
South Tripura	2415
West Tripura	2338
Khowai	2472
Unakoti	2519
Gomati	2415
Sepahijala	2338

(in mm)

From the above table is clear that North Tripura and Unakoti districts receive higher annual average rainfall than rest of the districts. The historical trend shows Dhalai, Khowai, North Tripura, Unakoti, South Tripura and Gomati, the precipitation is in a decreasing trend whereas West Tripura and Sepahijala is showing an increasing trend.

3.2 Representative Concentration Pathways (RCPs)

The IPCC scenarios provide a mechanism to assess the potential impacts on climate change. Global emission scenarios were first developed by the IPCC in 1992 and were used in global general circulation models (GCMs) to provide estimates for the full suite of greenhouse gases and their potential impacts on climate change. Since then, there has been greater understanding of possible future greenhouse gas emissions and climate change as well as considerable improvements in the general circulation models. The IPCC, therefore, developed a new set of emissions scenarios. The process by which these new scenarios are being produced differs from earlier scenario development.

The new process aims to both shorten the time required to develop and apply new scenarios, and to ensure better integration between Socio-Economic driving forces, changes in the climate system, and the vulnerability of natural and human systems. Rather than starting with Socio-Economic scenarios that give rise to alternative greenhouse gas emissions, the new scenarios take alternative futures in global greenhouse gas and aerosol concentrations as their starting point. These are called Representative Concentration Pathways (RCPs). The Representative Concentration Pathways (RCP) are based on selected scenarios from four modelling teams/models working on integrated assessment modelling, climate modelling, and analysis of impacts.

RCPs are four greenhouse gas trajectories adopted by the IPCC for its Fifth Assessment Report (AR5). The four RCPs; RCP2.6, RCP4.5, RCP6, and RCP8.5, are named after a possible range of radioactive forcing values in the year 2100.

Table 29: Overview of Representative Concentration Pathways (RCPs) adopted by IPCC AR5

RCP	Description	IA Model
RCP 8.5	Rising radioactive forcing pathway leading to 8.5 W/m2 in 2100.	MESSAGE
RCP 6	Stabilization without overshoot pathway to 6 W/m2 at stabilization after 2100	AIM
RCP 4.5	Stabilization without overshoot pathway to 4.5 W/m2 at stabilization after 2100	GCAM (MiniCAM)
RCP 2.6	Peak in radiative forcing at ~ 3 W/m2 before 2100 and decline	IMAGE

Resolution of the projected climate data is at a grid-spacing of 0.5°x0.5° for IPCC AR5 scenarios, namely, RCP8.5 (a scenario of comparatively high greenhouse gas emissions and does not include climate policy interventions) and RCP4.5 (moderate emission scenario and assumes climate policy intervention to transform associated reference scenarios). Ensembles mean of 3 regional climate models (RCM), namely, REMO (from MPI), RCA4 (from SMHI) and CCAM (from CSIRO) has been used for the analysis. Ensemble mean is chosen to reduce model related uncertainties and ensemble mean climate is closer to observed climate than any individual model.

3.3 Climate Projections & Analysis

For Tripura State and districts, IPCC AR5 RCP4.5 and RCP8.5 scenarios has been analyzed for the annual maximum and minimum temperature and precipitation.

Table 30: Summary of Climate Analysis

Observed Climate Data[21] (1951-2013): IMD Gridded Data		
Temperature	**Precipitation**	**Climate Extremes**
Increasing trends observed for both maximum and minimum temperatures (high confidence (for the entire region it is 0.1°C - 0.2°C per year).	Annual average precipitation showed a decreasing trend for most districts except for West Tripura where it is showing an increasing trend	Frequency of one day maximum precipitation is increasing in both mid-century and end-century scenarios as compared to baseline, warm nights and hot days increased (Medium confidence in RCP 4.5 scenario)
Projected Climate Data[22] (2021-50): RCP 4.5 and RCP 8.5		
Projected change in Temperature Under RCP 4.5 **T_{max}: 1.10°C** **T_{min}: 1.05°C**	Projected annual precipitation changes **Under RCP 4.5** Increase by 4%	Projected extreme events: The one-day maximum precipitation events may decrease by 2% by mid-century under RCP 4.5. However, floods and warm spells are likely to increase in future and will become increasingly challenging for disaster management authorities.
Under RCP 8.5 **T_{max}: 1.35 °C** **T_{min}: 1.30 °C**	**Under RCP 8.5** Increase by 13%	

[21] Based on IMD Gridded data for 63 years

[22] Based on 29 GCM CMIP simulated for Mid Century Scenario (near term to our NDC 2030) under RCP 4.5 and RCP 8.5 scenarios

3.3.1 Temperature

The following climate trends are available for the state of Tripura.

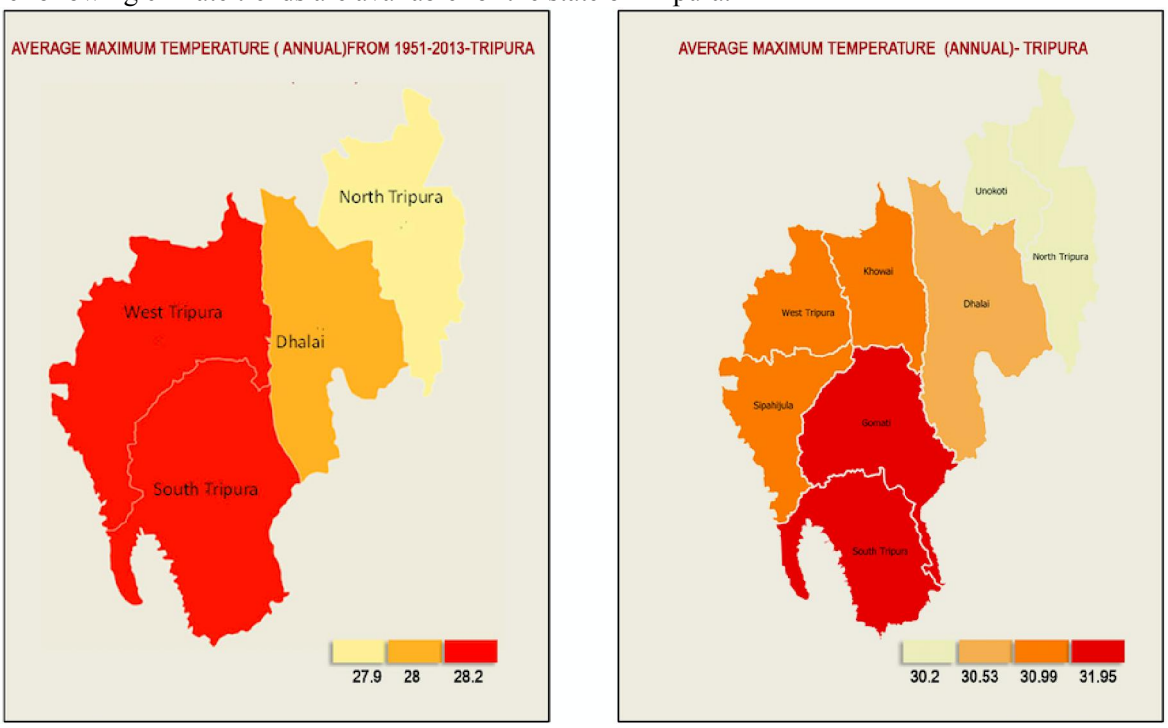


Figure 33: Average Annual Maximum Temperature of Tripura- Historical (Left); Average Annual Maximum Temperature of Tripura projected for 2021-50 under RCP 4.5 (Right)

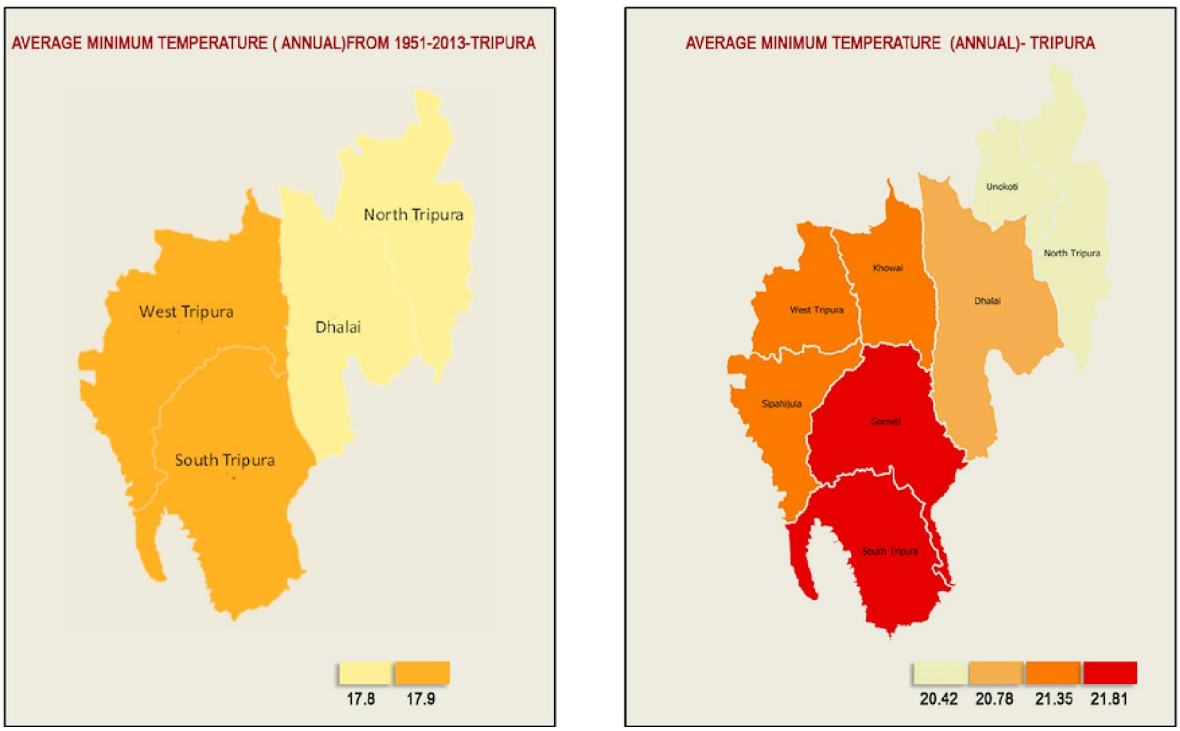


Figure 34: Average Annual Minimum Temperature of Tripura - Historical (Left), Average Annual Minimum Temperature of Tripura projected for 2021-50 under RCP 4.5 (Right)

Average Maximum and Minimum temperature for the Baseline has been taken from the year 1951-2013, showing 4 districts of the State. The projected Average maximum and minimum temperature has been done for 8 districts, since creation of New districts started on 21st January 2012.

The analysis[23] of the projected daily temperature under climate change scenario shows that:

- Mean annual maximum temperature for RCP 4.5 scenario is projected to increase by about 1.1 degree Celsius by mid-century. For RCP 8.5 scenario it is projected to increase by about 1.35 degree Celsius by mid-century for the state of Tripura.
- Mean annual minimum temperature for RCP 4.5 scenario is projected to increase by about 1.05 degree Celsius by mid-century. For RCP 8.5 scenario it is projected to increase by about 1.35 degree Celsius by mid-century.

3.3.2 Rainfall

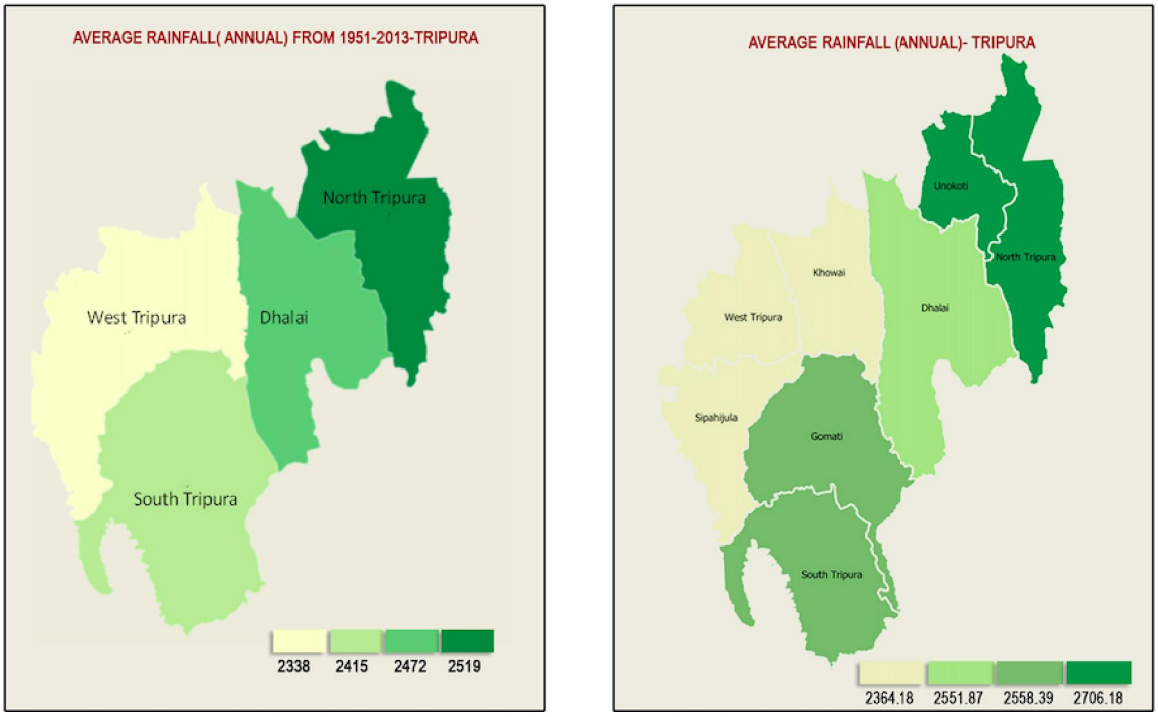


Figure 35: Mean Annual Rainfall of Tripura-Historical (Left); Annual rainfall of Tripura - projected for 2021-50 under RCP 4.5 (Right)

Average rainfall for the Baseline (1951-2013) shows 4 districts of Tripura, whereas the projected rainfall (2021-50) shows 8 districts, since creation of New districts started on 21st January 2012.

The analysis of annual rainfall reveals a negative trend indicating that, the total amount of rainfall received has been decreasing for some parts of the state in Tripura.

- However, mean annual rainfall for RCP 4.5 midcentury scenario is projected to increase by about 4% from baseline. For RCP 8.5 scenario rainfall is projected to increase by about 13% towards both mid-centuries.

[23] Analysis from IMD gridded data and climate projection data source INRM

General implications of temperature increase may include heat stress related health impacts, increase in energy demand for cooling, additional evaporation and evapotranspiration losses resulting in increase in water required for irrigation of crops. Considering increase in intensity of rainfall events may lead to floods, urban storms, vector borne diseases, loss of work, transport disruption, additional cost for flood proofing factories and warehouses. However, it is likely that one day maximum precipitation event may decrease towards mid-century. The cold spell events may decrease about 2/3rd towards mid-century.

3.4 GHG Inventory and GHG Plan

The action plans were proposed by the State through Departmental consultations. The actions plans were proposed in alignment under Nationally Determined Contributions (NDCs) and compliance made under COP 26 (Glasgow). The actions also comply with the International goals, the Sustainable Development Goals (SDGs). NDC encompasses national efforts to reduce emission as well as adapt or mitigate to the impacts of climate change. The NDC commitments under COP 26 are yet to be downscaled at State level, therefore, the state level targets are conceived in line with the national commitments. Quantifiable NDC targets are under NDC 3 (Reducing emissions intensity of its GDP by 33 to 35 per cent by 2030 from 2005 level), NDC 4 (Increasing the Share of Non-fossil fuel-based electricity, 40 per cent cumulative electric power installed capacity by 2030) and NDC 5 (Enhancing carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030).
SDG specific to NDC commitments are outlined under SDG 7 (Affordable and Clean Energy), SDG 13 (Climate Action), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production) SDG 15 (Life on Land). There is a strong integration of NDC and SDG agendas in the State Action Plan on Climate Change, which intends to hybridise the commitments and establish a synergy.

Carbon stock Forecast of the State- The Forest stock is forecasted to be 85.2 MT in the year 2030, from the current stock of 75 MT in 2022. With increase in population of the State, the forest share is observed to decrease and result in higher forest stock, a pathway of carbon sequestration and carbon storage to tackle climate change.

Emissions in the State-As per Emission models, the State will process a heavy load of Municipal Solid Waste from the baseline quantity of 2016. The amount of CO_2equivalent produced by Tripura will amount to 53630.4 tonnes in 2030. The actions taken in efficient management of Solid waste will reduce the carbon emission of the State.

3.4.1 Activity wise Carbon emission reductions and Carbon sequestration Potential

Renewable energy generation will help to improve the energy mix in the State and also create green jobs in the sector. Reducing GHG emissions in the energy sector yields a global impact, but the co-benefits are going to be experienced in the state too. Mitigation policies relating to the energy efficiency of plants, fuel switching from coal to biomass/ other renewable energy may have several objectives of co-benefits like reduction in air pollution (an environmental co-benefit), energy-supply security (by increased energy diversity) that enhances productivity and also has livelihood benefit. Investment in hydel will also help in some flood control measures as well as efficient use of water especially in the runoff the river project. Small hydro plants in the State with installed capacity of 16.1 MW has the potential of Emission reduction to 44318.24

tons of CO_2 per year. The State has a potential to carter 46.86 MW of Renewable energy from Small Hydro, which will result is emission reduction of 129715.98 tons of CO_2 per year.
The city development projects which are part of city's regular services have co-benefits in terms of climate and urban resilience. Amendment of building bylaws shall reduce the hazard and risk and it will also help in reduction of energy consumption, use of energy efficient lights and focusing on renewable energy will help in reducing the carbon footprint, solid waste management will help to reduce contamination of ground water and toxic particles, promotion of non-motorised transport will reduce air pollution, provision of drinking water to all will help in water security as well as conservation of ground water.
India has a vision to create an additional carbon sink of 2.5 to 3 billion tonnes of Carbon dioxide (CO_2) equivalent through additional forest and tree cover by 2030. To meet that vision rubber plantation could be considered as a Kyoto forest to harvest atmospheric CO_2. The rate of periodic annual CO_2 equivalent carbon sequestration was 11.67, 14.32, 12.33 and 5.89 megagram CO_2 equivalent per ha per year for tree aged HB05, HB10, HB15 and HB20 with a mean value 11.39 megagram CO_2 equivalent per ha per year. It shows a steady increase in the CO_2 sequestration and carbon stock in young and mid-age rubber plantations[24].

Sector	Strategic Actions in State Action Plan on Climate Change	Emission Reduction Potential (t CO_2 per year)
Solar Mission	SM/2- Installation of Biogas Plant	317840.03
	SM/2- Promotion and facilitation of Off-grid or decentralized renewable energy generation	44318.24
	SM/N/1- Solar Light installation	26818.10
	SM/N/2- Installation of agricultural waste-based Biogas Plants in the state of Tripura under Waste to Energy & Biomass based Co-generation	
	SM/N/3- Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages	77.86
	SM/N/4- Installation of Off-grid/ Hybrid Solar Power Plants	12.98
Energy Efficiency	EE/8- Distribution of LED bulbs in 16 villages	369.08
	EE/N/3- Replacement of agriculture pump sets by star labelled pump in 8 villages	826.32
Sustaining Himalayan Ecosystem	GTM/8- Facilitating greater investment for realising true potential of rubber wood	341700
	SHE/N/1- Bamboo Resource Development	102000

The actions supports the vision of the Country towards a carbon neutral and net zero future. However, more quantitative actions in different sectors can be taken up to achieve India's Intended Nationally Determined Contributions (INDCs).

[24]Carbon Sequestration Potential and Edaphic Properties Along the Plantation Age of Rubber in Tripura, North eastern India, https://www.readcube.com/articles/10.12944%2Fcwe.11.3.10

CHAPTER 4: CLIMATE CHANGE RISK AND VULNERABILITY ASSESSMENT

4.1 Vulnerability

The process of recognizing, measuring and prioritizing the vulnerabilities in a system is termed as Vulnerability Assessment. There are three key elements of vulnerability- (i) exposure (ii) sensitivity (iii) adaptive capacity. Vulnerability assessment helps in:

- Understanding present vulnerability
- Recognizing the factors that make some areas more vulnerable than others
- Inform and encourage the decision-making process
- Selection of adaptation strategies and practices

Risk is defined as the potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events (likelihood) multiplied by the impacts (or consequences) if these events occur. Risk results from the interaction of vulnerability, exposure, and hazard (IPCC, 2014)

4.2 Methodology

Vulnerability and Risk Analysis (VRA) is a baseline for climate impacts study which helps to prioritize climate actions as well as its integration in development planning. The VRA provides a top-down evidence base for climate-resilient planning, which is to be tightly aligned with a bottom-up community-level vulnerability to draw linkages between the impacts of climate change and current policies for ease of an inclusive policymaking.

The vulnerability study for Tripura is taken from **Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP)**. The present study used indicator-based approach to access the vulnerability. Following steps were followed[25]:

1. Scoping and objectives for Vulnerability Assessment
2. Selection of type of Vulnerability Assessment- Integrated vulnerability assessment is used in which both biophysical and Socio-Economic/institutional vulnerabilities are considered
3. Use of top-down approach largely based on secondary data
4. Present assessment is done at a macro-scale for short-term, i.e., district-level for 2030s. This was done so that the vulnerability amongst the districts can be compared across the state.
5. Identification, definition and selection of indicators for vulnerability assessment- While choosing the indicators, several things are considered, that is type of indicator (i.e., whether it captures 'sensitivity' or 'adaptive capacity'), nature of indicator ('biophysical' or 'Socio-Economic,' etc.)
6. Normalization of Indicators- To make the indicators unit-free, normalization of each indicator is done
7. Assigning weights to the Indicators- Weights are assigned to each indicator according to their importance in determining vulnerability of a system
8. Aggregation of Indicators and development of Vulnerability Index- The weights are multiplied with the normalized indicator value and aggregated. Normalized and weight values of indicators were aggregated to obtain the overall vulnerability index value for each district in the state

Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP).

9. Vulnerability Ranking and Representation of Vulnerability in spatial maps

4.3 District-level Vulnerability

A district-level vulnerability assessment has been carried out which followed an indicator-based approach and used secondary sources of information to quantify the indicators selected[26]. Selection of indicators and rationale is given the table below:

Table 31: List of indicators for vulnerability assessment, rationale for selection and weights assigned

Sl. No	Indicators	Rationale for selection	Weight assigned
1	% of area under slope >30degree	Higher the steep topographical feature means lack availability of flat land and difficulty in access; likely to be adversely affected during floods, landslide, cloudburst, etc. This increases sensitivity.	7
2	% of area under forest cover	Positive change in forest area helps in carbon sequestration and reduction in local climate variability. It enhances adaptive capacity.	20
3	Yield variability of food grains	High variability in yield indicates fluctuations in agro-climatic conditions over time. Agriculture sector has high contribution to the State Domestic Products and employment. High yield variability reflects lack of adaptive capacity.	28
4	Population Density	Higher the growth, higher the exposure and higher the vulnerability. Pressure on available natural resources increases sensitivity.	16
5	Female Literacy Rate	Higher the literacy of the exposed population they have better ability to cope with the risk due to climate change; Educated individuals and societies (especially with high female literacy) have better preparedness and response to disasters, suffer lower negative impacts, and can recover faster and hence have higher adaptive capacity.	6
6	Infant Mortality Rate	Infant Mortality Rate is an indicator of the overall state of the public health, access to improved water, sanitation and medical infrastructure. Higher value implies lack of adaptive capacity.	5
7	Below Poverty Line (BPL) Households/ Per Capita Income	Higher percentage of BPL indicates lesser adaptive capacity. A direct indicator representing the inherent sensitivity of people in a region.	14
8	Average man-days under MGNREGA	Provides alternate sources of income and enhances adaptive capacity.	4

Source: Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP)- Tripura

[26] Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP)- Tripura

Two types of district-level vulnerability maps were created- Vulnerability ranking of different districts of the state and categorizing the districts into high, moderate and low.

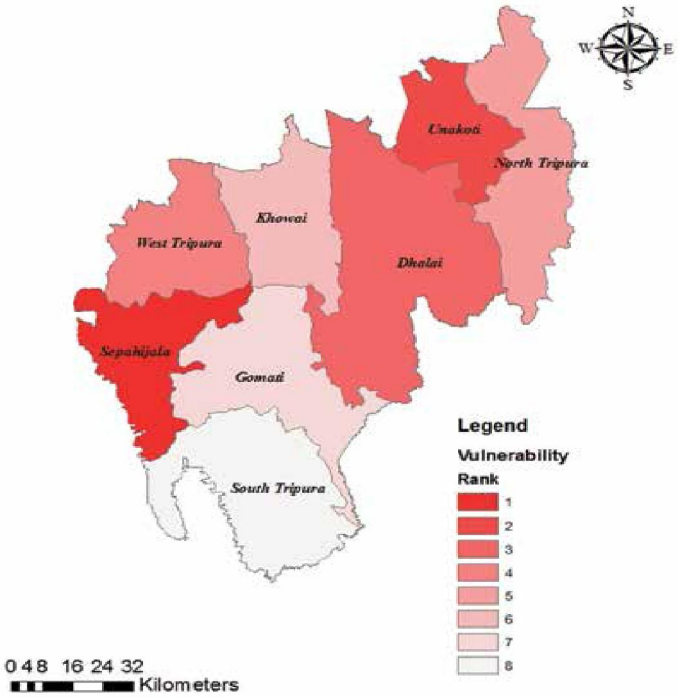


Figure 36: Vulnerability Ranking Map of Tripura

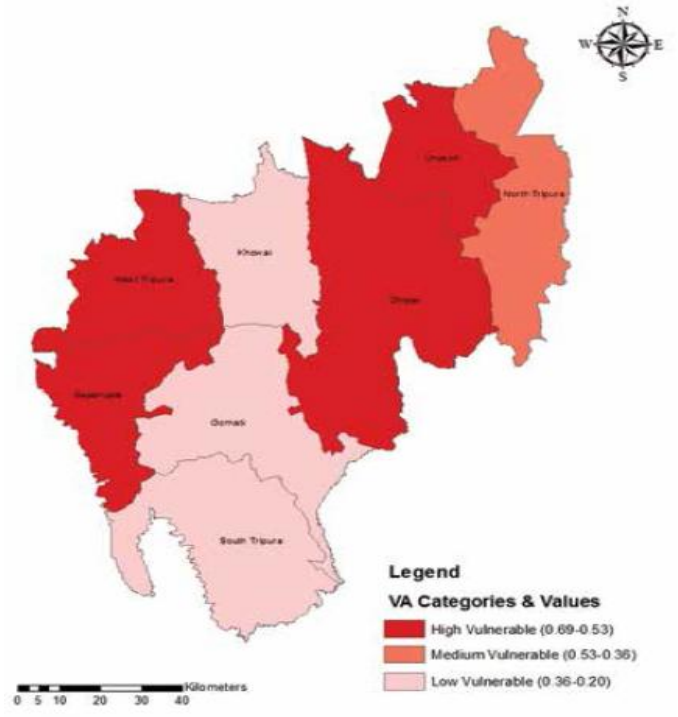


Figure 37: Vulnerability Category Map of Tripura

4.4 State-level Vulnerability

A state-level vulnerability assessment has also been carried out which followed an indicator-based approach and used secondary sources of information to quantify the indicators selected. Selection of indicators and rationale is given the table below[27]:

Table 32: List of indicators and sub-indicators for vulnerability assessment, rationale for selection, functional relationship with vulnerability

Indicators	Sub-Indicators	Rationale for selection	Functional relation with Vulnerability
Socio-economic, demographic status and health	Population Density (Total population of a state divided by the total geographical area)	Population density determines the extent of dependency and per capita availability of finite resources. High density could lead to degradation of resources, further increasing sensitivity. Further, higher the population density, higher the exposure of community to climatic hazards.	Positive
	Percentage of Marginal farmers	Marginal farmers (land holding <1 ha) are known to have low social and economic capital and thus are inherently more sensitive and have lower adaptive capacities.	Positive
	Livestock to human ratio (Total livestock population in a state divided by the total population of that state)	Livestock provides an alternate source of income and assists in crop production. Sale of livestock during distress also provides households with a coping strategy in the context of climatic hazards.	Negative
	Per Capita Income (2014-15) at current prices as on 31.03.2017	A direct indicator representing the inherent sensitivity of people in a region. Higher per capita income provides higher capacity to cope with any damage or loss arising out of climatic hazard.	Negative
	Number of Primary Health Centres per 1,00,000 Households (2017)	Access to primary health care centres is pivotal for the wellbeing of households. An indication of adaptive capacity.	Negative
	Percentage of women in the overall workforce	Women are known to be more sensitive to climate risks. Regions with a greater number of women in gainful employment would signify gender equality, enhanced purchasing power and independency, thus lower vulnerability due to reduced sensitivity of women in these regions.	Negative
Sensitivity of agricultural production	Percentage area irrigated (2010-11)	Crop production with irrigation is less sensitive to delayed rainfall or droughts.	Negative
	Yield variability of food grains (2005-2015) - Coefficient of variation calculated for 10-year food grain yield data	A stable food production system with little to no variation in yield is inherently resilient to climate shocks and thus has high adaptive capacity.	Positive

[27] Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP)- Tripura

	Percentage area under Horticulture Crops (2016)	Fruit trees are harder than field crops when sensitivity to climate shocks is considered. A larger area under horticulture tree crops providing an alternative source of farm-based income reduces sensitivity to climate variability and increases adaptive capacity.	Negative
Forest Dependent Livelihoods	Percentage area under open forest	Large tracts of open forests indicate a higher level of forest disturbance and degradation. Forest is a major source of livelihood in the Himalayan states. Forests provide vital environmental services and thus degradation of forests indicate higher sensitivity.	Positive
	Percentage area under forests per thousand rural households (2017)	Availability of alternate livelihood options through extraction of fodder, fuelwood, and NTFPs from forests.	Negative
Access to information services and infrastructure	Percentage crop area insured under all insurance schemes (2015-16)	Crop insurance helps farming households mitigate losses due to climate risks, thereby enhancing their adaptive capacity.	Negative
	Percentage farmers taking crop loans (2015-16)	Farmers with access to crop loans can invest in essential agronomic practices to lower yield variability, thus enhancing resilience of cropping systems.	Negative

Source: Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP)- Tripura

Table 33: Vulnerability index values of the four indicators, composite vulnerability index values

Indicator	Vulnerability Indicator Value
Social - economic, demographic status and health	0.81
Sensitivity of agricultural production	0.34
Forest dependent livelihoods	0.45
Access to Information Services and Infrastructure	0.27
Composite Vulnerability Index	0.501

Source: Climate Vulnerability Assessment for the Indian Himalayan Region using a Common Framework (IHCAP)- Tripura

4.5 Disaster Risk, Loss and Damage in Tripura

The State experiences varied natural hazards due to its geographical location. Tripura is prone to various natural disasters, particular to Earthquake. The State is situated in the most vulnerable earthquake prone Zone-V of India. The State is also affected by Cyclone, Flood and Drought. Man- made disasters include forest fires and accidents. The increased vulnerability can also be pointed towards the unscientific and unplanned expansion of the population on seismic zones and landslide-prone zones. The notified vulnerable zones are losing their carrying capacity, due to development in a haphazard manner without any consideration of disaster notifications.

Considering human vulnerability to such disasters, the socio-economically retarded segments of the population are highly affected, due to lack of coping or adaptation capacities. The elderly persons, women, children and disabled persons are the ones more exposed to the risks, amongst the vulnerable groups.

Table 34: Year-wise Type of Hazards and Losses in Tripura

Year	Location	Type	Loss due to Disaster
1822, 1845, 1869, 1898, 1918, 1924, 1949, 1950, 1950	Tripura	Earthquake (above 5 magnitude)	Loss of life and property
1994, 1997, 1998, 1999, 2001, 2002, 2003	Dhalai	Cyclone	Property damage
1997	South Tripura (all over District)	Cyclone	Loss of crop, infrastructure, human and bovine life, livelihood system, houses, Private and Public property
2002-2003	West Tripura (Teliamura & Sonamura)	Cyclone	• 28.9 ha. Horticultural area affected in Teliamura • 928.85 ha. Agricultural area affected in Sonamura • Non paddy area affected: Teliamura - 16600 ha. & Sonamura - 1112.585 ha • 124 cultivators affected in Teliamura
2005	North Tripura (Gournagar, Srirampur, Chandipur and some parts of Kumarghat)	Cyclone	2 life loss
1983, 1993, 2005, 2006 & 2008	North Tripura (Kailashahar & Dharmanagar)	Flood	• 3 life loss • 8 Livestock loss • Crops, fish seeds and food grains were badly affected
1983, 2004	South Tripura (All over the district)	Flood	Loss of crop, infrastructure, human and bovine life, livelihood system, houses, Pvt. Public property
1999, 2003	West Tripura	Flood	• Area damaged under Horticulture crops - 21 ha in Sadar and 200 ha in Melaghar • Total Paddy area affected - 4860 ha. • Total non-paddy area affected - 5939 ha. • Water area affected - 196.63 ha. • 115 GPs and 2NPs affected • Life loss
1962, 1984, 1993, 1997, 1999, 2001, 2003, 2004	Dhalai	Flood	• Crop Damage • No loss of life or livestock
2006	North Tripura (rural areas)	Drought	Loss of agricultural crops
Every year	Dhalai	Drought	Agricultural crops and livestock affected
2004, 2005	North Tripura	Fire	Loss of Property
1991, 1997, 2001, 2002	Dhalai	Fire	Loss of Property

Source: Tripura Disaster Management Authority (TDMA)

Table 35: Flood Prone areas in Tripura

Districts	Sub-Division
West Tripura	Sadar, Jirania, Mohanpur
Sepahijala	Bishlagarh, Sonamura
Khowai	Khowai, Teliamura
Gomati	Udaipur, Amarpur
South Tripura	Sabroom, Belonia, Santirbazar
Unakoti	Kailashahar
North Tripura	Dharmanagar, Kanchanpur
Dhalai	Ambassa, Gandacherra, Lt Valley, Kamalpur

Source: State Disaster Management Plan (2016-17)

Table 36: Hazard Risk Map of Tripura

Districts	Earthquakes	Floods	Cyclones	Landslides	Fires	Thundering
West	VH	H	H	M	M	M
Sepahijala	VH	VH	VH	M	L	L
Gomati	VH	H	H	M	M	H
South	VH	H	VH	M	L	H
Khowai	VH	VH	H	H	M	L
Dhalai	VH	H	VH	VH	M	L
North	VH	VH	H	H	M	L
Unakoti	VH	H	H	H	M	L

(VH- Very High, H- High, M- Medium, L- Low)

Source: State Disaster Management Plan (2016-17)

4.6 Socio-Economic Vulnerability

As clearly stated in every climate change discourse, high poverty level, and high percentage of indigenous communities with high natural resource dependency make the state extremely vulnerable to climate change. State's rapidly growing economy (above national average) and expanding urbanisation of many agglomerations too pose a challenge for mitigation.

Apart from the occurrence of hazards, the vulnerability of a region is also determined by its social, physical, environmental and economic structures to withstand and respond to hazards. An understanding of the socio-economic factors and the capability of the community to cope with disasters would provide an understanding to the development and disaster management for planning risk reduction against future hazards. In Tripura, the most vulnerable population are the economically and socially weaker segments of the population that comprises of SC & ST, Women, Children and differently abled population who nearly forms 50% of total population. In Tripura, a large share of the total rural families are living below poverty line and majority of the populations are farmers who depend upon cultivation. Due to this, majority of population is vulnerable to multiple hazards in the State.

4.6.1 Economy

Vulnerability of people is also determined by poor economy, low per capita income and poverty. Agriculture is the backbone of Tripura's economy and accounts for direct and indirect employment to around 66% of the total work force and contributes 33% of the Net State Domestic Product. Availability and access to food stand as a major factor determining the incidence of poverty. In rural areas, the percentage share of population below poverty line increased from 16.2% to 22.5% whereas in urban regions, the percentage share of population below poverty line had declined from 31.7% to 31.3%[28]. The

[28] Report of the expert group to review the methodology for measurement of poverty, Government of India Planning Commission June 2014

percentage of poverty is lower in Tripura with value of 24.9 when compared to India's percentage of poverty 29.5. Lack of purchasing power also determine the vulnerability of the population during disasters.

4.6.2 Urbanisation, Lack of access to infrastructure and Housing

The State is witnessing increasing trends of people migrating from rural areas to urban areas for livelihood. This increasing influx of poor immigrants to an area adds pressure on the existing infrastructure. Being poor, these immigrants settle in slums or areas vulnerable to disasters lacking in basic infrastructure like safe drinking water, sanitation and drainage facilities. Inadequate access to infrastructure increases the vulnerability of the population during disasters. Quality and design specifications, type of construction, materials used for housing for the walls and roofs helps to determine the vulnerability of houses and damage risk during earthquakes, cyclones, high wind, and flood.

4.7 Sectoral Vulnerability

Sectors	Vulnerability	Impacts
Agriculture and Food Security	• Erratic Rainfall • Shift in temperature pattern • Flood or Drought Conditions • Overutilisation of Ground water • Invasive alien species	• Crop productivity and crop water demand is likely to be affected • Soil nutrient loss, soil erosion, top / fertile soil loss • Decline in availability of food and increased incidence of malnutrition
Forest and Biodiversity	• Decline in open and moderately dense forest • Habitat degradation and loss • Invasive of species • Effect on regeneration	• Impact on ecosystems services • Impact on livelihood of people dependent on forest resources • Extinction of species • Change in vegetation composition
Health	• High temperature and high humidity • Vector borne diseases • Water logging and occurrence of water borne diseases • Availability of fresh water • Food and nutrition • Sanitation facilities	• Increased rate of mortality • Decline in ambient air and water quality leading to health hazards • Increased demand of health care infrastructures • Decline in ambient air and water quality leading to health hazards
Water Resources	• Reduced quality of available water resources • Decrease in groundwater recharge • Reduction in wetlands • Flooding conditions • Erratic rainfall and uneven stream flow	• Decrease in water table • Groundwater dependence and overexploitation • Increased demand of water • Uneven distribution of water • Reduced availability of water for industrial purposes

CHAPTER 5: MITIGATION FOCUSSED SECTORS

The Mitigation Strategies have been covered in four major chapters:

Chapter 5A: Solar Mission and Non- Conventional Energy

Chapter 5B: Energy Efficiency

Chapter 5C: Sustainable Habitat

CHAPTER 5A: SOLAR MISSION AND NON- CONVENTIONAL ENERGY

5A.1 Sectoral Overview

To drive economic well-being, alleviate poverty, reduce human drudgery and sustain environmentally sound socio-economic development; access to reliable, equitable, clean and affordable energy services are fundamental. The objective of the situational analysis is to map the State's access to its renewable energy. Tripura has envisaged in achieving target of 105 MW of solar power by the year 2022[29]. The status of potential and grid connected installed renewable energy capacity in Tripura as on 31st December, 2019 is given in the table below:

Table 37: Potential and Installed Capacity of Renewable energy in Tripura

Technology		Potential (MW)	Total installed capacity till December 2019 (MW)
Solar		2080	10.842
Small Hydro Power		46.86	16.01
Bio- Energy	Biomass Power	3	
	Waste to Energy	2	
Total		**2132**	**26.852**
Capacity Addition during 2019-20			4.32
Total as on 31.12.2019			**31.172**

Source: MNRE Annual Report 2019-20 & TREDA

As on December 2019, the State has subsidized solar rooftop system capacity of 2.94 MW and on-subsidized capacity of 0.02MW[30]. Under PM KUSUM Scheme following allocations have been made in Tripura:

Table 38: Allocations made under the Component of PM-KUSUM Scheme

State	Component-A Sanctioned Capacity (MW)	Component-B Sanctioned Quantity (Nos)	Component-C Sanctioned Quantity (Nos)
Tripura	5 MW [Under the scope of DISCOM (TSECL)]	3100	2600

Source: MNRE Annual Report 2019-20 & TREDA

Government of India has setup an ambitious target of achieving 100 GW of Solar Power by 2022 including rooftop solar (RTS) power plants. In order to achieve this task, MNRE is implementing Grid Connected rooftop and small solar power plants programme. As on March 2019, Ministry has sanctioned/approved RTS projects of 0.50 MWp capacities to Tripura. Solar Street Lights and Solar Study Lamps have been allocated in Tripura under Off-grid and Decentralised Solar PV Applications Programme.

Table 39: Allocation of SPV systems and standalone SPV power plants in Tripura

State	Solar Home Light (Nos)	Solar Lamp (Nos)	Solar Street Light (Nos)	Solar Pump (Nos)	Solar Power Plant (kW)
Tripura	32723	364282	35000	824	2473

Source: MNRE Annual Report 2019-20 &TREDA

[29]Report of the Expert Group on 175 GW RE by 2022
[30]MNRE Annual Report 2019-20

The estimated potential of small hydel projects in Tripura is 46.86 MW from 13 sites located in the State. As on December 2019, around 3 small hydropower projects aggregating to 16.01 MW have been set up in various parts of the State.

Table 40: Potential sites and installed projects SHP Projects in Tripura (as on 31.03.2019)

State	Total Potential		Projects Installed		
	Numbers	Capacity (MW)	Numbers	Capacity (MW)	
Tripura	13	46.86	3	16.01	

Source: MNRE Annual Report 2019-20

A village called Brajendranagar Bio-village under Pandabpur GP, Dukli RD Block, and West Tripura District has been adopted by The Directorate of Biotechnology, Government of Tripura to develop it as a Bio-Village by providing all types of bio-inputs for agriculture in the village. In this view and to achieve the objective, TREDA took initiative by covering 10 families of the village in first phase by installing family size biogas plants during 2018-19. This substituted the traditional cooking practice using firewood and the users are found very satisfied with these plants. In this way, the State Nodal Agency, TREDA targeted to develop the village as a model village in NNBOMP.[31]

Table 41: State-wise estimated potential and State/ UT wise achievements for family / small biogas plants from 1981-82 to 2017-18 under the National Biogas and Manure Management Programme (NBMMP) and targets 2018-19 and achievements under NNBOMP upto 31st March, 2021

State	Estimated Potential	Cumulative total achievement up to March 2018	Targets and achievements under national Biogas Programme (Nos. of Biogas Plants)	
			Target from 2018-19 to 2020-21	Achievements as on date
Tripura	50000	3663	1600	1527

Source: MNRE Annual Report and TREDA, Power Department, Tripura

The State Government has focused on wind resource measurement and as on 31.12.2019, a total 11 numbers of Wind Resource Assessment stations at 25 m & 50 m above ground level have been installed in the State and currently 4 numbers of Wind Resource Assessment stations are operational; also a total 6 numbers of Wind Resource Assessment stations at 50 m & 60 m above ground level have been installed in the State and currently 3 numbers of Wind Resource Assessment stations are operational.

Table 42: Wind Resource Assessment stations in Tripura

State	No. of Stations installed & commissioned	Level of Wind Resource Assessment stations	No. of stations in operation
Tripura	11	25m & 50m	4
Tripura	6	50m & 60m	3

Source: MNRE Annual Report 2019-20

5A.2 Impacts of Climate Change

- In case of hydro power projects, variation in temperature and precipitation could alter future hydro power condition including availability of water resources and impact hydro power generation. Climate extreme events like flood resulting in higher discharge might impact the infrastructure
- Increase in temperature has a dichotomous relation with increase in energy demand to meet up the cooling load

[31] MNRE Annual Report (March 2020)

- Climate extreme events might impose serious threat to energy access to far off remote villages
- Increase in electricity needs for pumping water for irrigation in agriculture due to rise in temperature and evaporation
- Increase in operation and maintenance cost due to higher rate of failures in extreme weather events such as windstorms and, floods

5A.3 Key Issues and Challenges

Table 43: Key Issues and Challenges of the Solar Mission and Non- Conventional Sector

Area	Issues/Challenges
Financial	• Renewable Energy Technology (RET) interventions depends on grants/aids like CFA and state fund • Lack of adequate infrastructure enhances state's budget in a state supported implementation project
Technical/Infrastructural	• Poor road infrastructure, inadequate transmission and distribution network • With the land area mostly being on hills, the CAPEX for setting up ground-mounted solar units become considerably higher
Institutional	• Limited human resource for facilitating and mainstreaming of the RET measures across rural and underprivileged areas
Sensitization	• Awareness generation among the consumers over the benefits of adoption of renewable energy and energy efficiency measures is the major barrier preventing the adoption and mainstreaming of technologies

5A.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Solar Mission and Non-Conventional Energy sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC):

Code	Activities	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Centre/External)		
					Central Scheme	State Scheme	External Aid
SM/1. Promotion of grid interactive power generation from Solar and other Renewable Energy sources through declaration of State Energy Policy							
1.1	Formulation & Declaration of state energy policy for power generation through renewable energy sources	Yes	Yet to be finalized				
1.2	Declaration of tariff policy by Tripura	Yes	Yet to be finalized				
1.3	Facilitating private sector participation in solar power generation under JNNSM and/or other schemes of Govt. of India through selection of private investors and other support activities through Single window clearance process.	Yes	Implemented				
SM/2. Promotion and facilitation of Off-grid or decentralized renewable energy generation for electrification, cooking and other thermal energy requirement							
2.1	Facilitating deployment of standalone off-grid solar power plant within 100 kW for fulfilling the power demand in dispersed locations under National Solar Mission with following target - a) Up to 2016-17 is 10 MW b) 2017-18 to 2021-22 is 10 MW c) 2022-23 to 2026-27 is 10 MW	Yes	82 KWp (Deposit Work)	183.00		183.00	NIL
			858 KWp (MNRE)	1447.00	1150.00	297.00	NIL
2.2	Facilitating deployment of 1000 No. Biogas plant (using cattle waste, household waste as well as water hyacinth) annually in 12th plan	Yes	244 numbers	76.00	43.93	10.00	22.07

	period and setting up of bottling unit at community level to use the biogas in agro based/ rural industries across the state under the Govt. of India programme.						
SM/7. Maximizing use of solar energy application for meeting up the community energy requirement and supplementing grid power demand							
7.1	Installation of grid connected Rooftop and small solar plant under National Solar Mission across the state - a) Up to 2016-17 is 5 MW b) 2017-18 to 2021-22 is 10 MW c) 2022-23 to 2026-27 is 10 MW	Yes	2.843 MW	175.00	118.00	57.00	NIL
SM/11	**Introducing course on Renewable energy technology and Energy management at under -graduate level engineering courses to achieve target of National Solar mission by increasing technically qualified manpower.**	Yes	90 numbers	36.00	36.00		NIL

5A.5 Gap/ Barrier Analysis

Type	Gaps
Financial	• Fund Requirement for implementation • Renewable Energy Technology mainstreaming are largely restricted due to limitation of external aid, limited state allocations & limited private sector investment/interest • Budgetary constraint forbids effective O&M of implemented Renewable Energy project
Policy & Regulatory	• Development of state energy policy for power generation through renewable energy sources
Institutional	• Lack of coordinated actions amongst the departments and agencies institutionalizing different developmental and climate resilient project in the state • Need of integration of the climate concern in departmental planning and budgeting • Need of more skilled resources across the state and amongst the implementing department in operationalization of renewable energy project or augmenting technology up-gradation
Socio-Economic	• Need to sensitize the people about the benefits of adoption of renewable energy

5A.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 3: To reduce the emissions intensity of its GDP by 33 to 35 per cent by 2030 from 2005 level	• Promote the use of solar pumps for agriculture • Solarization of existing grid connected Agriculture Pumps • Installation of new solar pumps under PMKUSUM Scheme • Distribution of solar study lamps under MNRE Scheme • Installation of SPV Street Lighting System • Installation of Biogas Plants • Installation of Off-Grid Solar power plants • Conversion of off-grid solar power plants to Hybrid solar power plants • Introduce time-of-day tariff to promote the use of renewable energy • Promote city gas distribution to provide piped natural gas (PNG) • Provide "priority sector" status for 2G bio- ethanol projects. The concept of 'solar parks' can be applied to biofuels; land can be leased by the Government to oil marketing companies (OMCs) for energy crops • Exploring of Hybrid renewable energy systems such as solar PV + biomass

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 7: Affordable and Clean Energy	• The State will ensure affordable & clean energy and achieve renewable energy generation capacity by 2022 • Remote areas will be covered by renewable energy sources and accordingly, the share of renewable energy will be increased • Proportion of households with reliance renewable energy share from 0.05% to 2.5% in total energy consumption will be increased	• The State Government's on-going energy sector policies aim "to provide access to affordable, reliable, sustainable and clean energy" • The State Government is putting thrust on renewable solar energy coverage particularly in remote areas. The Tripura Renewable Energy Development Agency will be strengthened to promote electricity generation from non-conventional sources • TREDA has completed implementation of LED solar lighting systems in semi-urban and rural areas, installation of Biogas plants under NBMMP,community type improved biomass cookstoves at different places under Unnat Chulha Abhiyan, installation of off-grid solar power plants, distribution of solar study lamp, installation of solar pump

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "**SM/N**" are transformative activities and other set of activities are named as "**SM**", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Solar Mission and Non-Conventional Energy Sector.

SM/2.2- Installation of 1000 numbers Biogas Plants

Description- Biogas plants help in reducing the causes of climate change. A biogas plant generates biogas from organic substances such as cattle-dung, and other bio-degradable materials such as biomass from farms, gardens and household wastes. The process of biogas generation is called anaerobic digestion and salient benefits of biogas technology are- provides clean gaseous fuel for cooking and lighting; digested slurry from biogas plants is used as enriched bio-manure to supplement the use of chemical fertilizers. TREDA has planned to install 1000 numbers Biogas Plants under MNRE/ New National Biogas and Organic Manure Programme (NNBOMP) or CSR Schemes.

Direct & Co-Benefits-

- Reduced GHG emission
- energy efficiency of plants
- Improvement in energy mix
- Resource utilization
- Cost saving from usage of LPG (approx., Rs 60,000 per household per year)

NDC Alignment- 3
SDC Alignment- 7, 13

SM/2.3- Installation of Solar Photovoltaic Street Lighting System at all marketplaces in Tripura

Description- Solar streetlights are independent of the utility grid resulting to lessened operation costs. These means that these are wireless lights and are not connected to the electricity provider. The lights are dependent of the heat energy given off by the sun, storing as much of it throughout the day. Solar streetlights require lesser maintenance than conventional streetlights and they have lower chances of overheating. With the installation of Solar Photovoltaic Street Lighting System in marketplaces, the state would be able to control the growing power demand upto very much extent in upcoming years.

Direct & Co-Benefits-

- Reduced GHG emission
- Improvement in energy mix
- Increased energy efficiency
- Creation of green jobs

NDC Alignment- 3
SDC Alignment- 7, 13

SM/N/1- Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants

Description- The solar system which is not connected to the utility grid and use a battery bank to complement solar power, are called off-grid Solar Power Plants. A Hybrid Solar Power Plant is one, which uses more than one source of power to complement solar power. Recently hybrid solar energy systems have changed their configuration. Now, they are often solar energy systems connected to batteries to store the energy that was generated. The advantages of Hybrid Solar Power Plants- Continuous power supply, low maintenance cost, high efficiency and load management.

Direct & Co-Benefits-

- Energy supply security
- Improvement in energy mix

NDC Alignment- 3
SDC Alignment- 7, 13

SM/N/2- Installation of agricultural waste-based Biogas Plants in the state of Tripura under Waste to Energy & Biomass based Co-generation

Description- Biomass based cogeneration is implemented with the main objective of promoting technologies for optimum use of biomass resources for power generation.Biomass materials used for power generation include bagasse, rice husk, straw, coconut shells, and other agricultural wastes. TREDA plans to install agricultural waste-based Biogas Plants in the state of Tripura under Waste to Energy & Biomass based Co-generation. Plans are:

a) 200 kg to 500 kg per day capacity- 50 numbers
b) 1000 kg per day capacity- 10 numbers

Direct & Co-Benefits-

- Reduction in air pollution

NDC Alignment- 3
SDC Alignment- 7, 13

SM/N/3- Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura

Description- TREDA plans to install 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura. Typical solar micro-grids consist of an array of photovoltaic (PV) cells that generates power and transmits to a central controller called the Power Conditioning Unit (PCU). The PCU then transmits electricity directly to homes, shops, offices, streetlights, etc. Further during the day, if the power generated is not used or surplus power is generated, the PCU directs this to the battery bank which stores power. This power can then be used after the sunset.

Direct & Co-Benefits-

- Clean energy provision
- Improvement in energy mix
- Energy supply security, by increased energy diversity

NDC Alignment- 3

SDC Alignment- 7, 13

SM/N/4- Installation of Solar Drier cum Smoke House for Rubber Processing Center in Tripura

Description- Drying of sheets in direct sunlight increases the chances of oxidation of sheets, especially when they are exposed to sunlight for longer periods. However, solar energy could be indirectly used for drying the sheets using flat plate solar collectors. In this system, hot air from the solar collectors is blown into the drying chamber in which the sheets are placed on reapers placed on trolleys. Compared to conventional smoke drying, the saving in firewood using the solar-cum-smoke drier is around 60 to 70 per cent and the quality of sheets is comparable to that of sheets prepared by conventional smoke drying.

Direct & Co-Benefits-

- Clean energy source
- Reduction in air pollution, an environmental co-benefit

NDC Alignment- 3

SDC Alignment- 7, 13

SM/N/5- Installation of Off-grid/ Hybrid Solar Power Plants (Maximum Capacity- 25KWp) at Government schools, hostels, police stations and other public service institutions in RESCO model

Description- RESCO model is a zero-investment model in which the consumer pays only for the electricity generated, while the solar system is owned by the developer. Under the phase III of "Off-grid and Decentralized Solar PV Applications" program of MNRE, off-grid solar power projects of individual sizes up to 25 KWp can be installed in areas where grid power has not reached or is not reliable. Such projects are mainly aimed at providing electricity to government schools, hostels, panchayats, police stations, and other public service institutions.

Direct & Co-Benefits-

- Improvement in energy mix

NDC Alignment- 3

SDC Alignment- 7, 13

5A.7 Key Priorities Synopsis: Implementation Arrangement and Budget

Table 44: Synopsis of Planned Activities for Solar Mission and Non-Conventional Energy Sector

Code	Activities/ interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed Budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Department
					Central scheme	State scheme	External Aid	
SM/2	2.2 Installation of 1000 numbers Biogas Plants	MNRE/ CSR Scheme	3	446.94	220	191.94	35.00	TREDA
	2.3 Installation of Solar Photovoltaic Street Lighting System at all marketplaces in Tripura on turn-key basis including 5 years warranty/ Guarantee and Operation & maintenance contract- 50000 numbers	NABARD Scheme	3	3300		3135.00	165.00	TREDA
SM/N/1	Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants including replacement of Off-grid Power Conditioning Units from Off-Grid to Hybrid Power Conditioning Unit, replacement of batteries, maintenance/ replacement of AC distribution Board, DC Distribution Board, Array Junction Box, electrical installations with Annual Maintenance Contract for five years trouble-free operation of the installed 223 numbers. Plants- 860 Kwp (aggregated capacity)	State Scheme	3	886.33		886.33		TREDA
SM/N/2	Installation of agricultural waste-based Biogas Plants in the state of Tripura under Waste to Energy & Biomass based Co-generation. a) 200 kg to 500 kg per day capacity- 50 numbers b) 1000 kg per day capacity- 10 numbers	CSR Scheme	3	1480.00			1480.00	TREDA
SM/N/3	Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura- 150 KWp	CSR Scheme	3	300.00			300.00	TREDA
SM/N/4	Installation of Solar Drier cum Smoke House for Rubber Processing Center in Tripura- 3950 numbers	State Govt. Fund/ Deposit Work/ CSR Scheme	3	2213.00			2213.00	TREDA

SM/N/5	Installation of Off-grid/ Hybrid Solar Power Plants (Maximum Capacity- 25KWp) at Government schools, hostels, police stations and other public service institutions in RESCO model- 700 KWp	MNRE Scheme	3					TREDA
Total (in Crores)				**86.2627**	**2.2**	**42.1327**	**41.93**	

CHAPTER 5B: ENERGY EFFICIENCY

5B.1 Sectoral Overview

Improving the energy efficiency meets the dual objectives of promoting sustainable development and of making the economy competitive. Recognizing the formidable challenges of meeting the energy needs and providing adequate and varied energy of desired quality in a sustainable manner and at reasonable costs, improving efficiency have become important components of energy policy. In addition, the environmental and health burdens arising out of the use of hydrocarbons may also force mankind towards energy efficiency and clean energy systems. Energy Conservation has also assumed enhanced importance with a view to conserve depleting energy resources.

Tripura has three generating stations- Gomuti Hydro-electric Project, Baramura Gas Thermal Power Station and Rokhia Gas Thermal Power Station. In addition to this, it has diesel based generating station also.Total electricity generation utility for the state of Tripura during 2018-19 is 630.55 Gwh. Out of total, about 93.18% (587.57 Gwh) is from Gas based Thermal and balance 6.82% (42.98 Gwh) is from Renewable Energy Sources.[32]

Table 45: Installed Capacity (in MW) of Power Utilities in Tripura as on 31.01.2021

State	Ownership/ Sector	Thermal (MW)					Nuclear (MW)	Hydro (MW)	RES (MNRE) (MW)	Grand Total (MW)
		Coal	Lignite	Gas	Diesel	Total				
Tripura	State	0.00	0.00	169.50	0.00	169.50	0.00	0.00	16.01	185.51
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.41	4.41
	Central	56.10	0.00	436.95	0.00	493.05	0.00	68.49	5.00	566.64
	Sub-Total	**56.10**	**0.00**	**606.45**	**0.00**	**662.55**	**0.00**	**68.49**	**25.42**	**756.46**

Source: Central Electricity Authority January 2021 Report

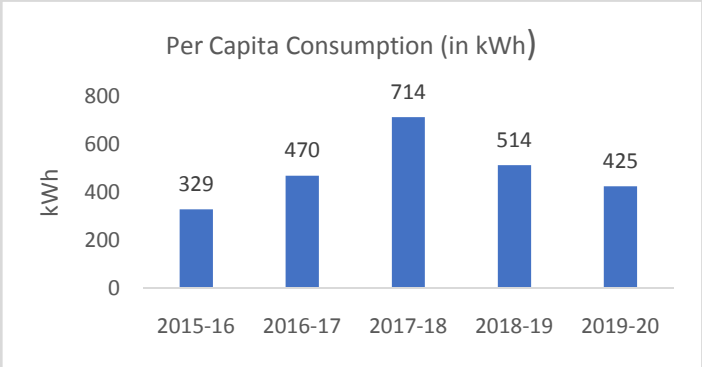


Figure 38: Per Capita Consumption (kWh) Tripura

Source: CEA Dashboard

The State observed increased growth in per capita energy consumption of 714 kWh during 2017-18 which reduced to 425 kWh during 2019-20. Out of total installed capacity, the share of state sector is 24%, private sector is 1% and that of central sector is 75%. The current demand is projected to increase several folds in coming years and further exacerbate the demand-supply challenge and energy security issues. In 2019, aggregate technical and commercial losses for Tripura was 35.48 %. Though Tripura aggregate technical and commercial losses fluctuated substantially in recent years, it tended to decrease through 2010 - 2019 period ending at 35.48 % in 2019.

[32] General Overview Report 2020, CEA

Electricity Demand - Supply Scenario- The state power sector is crippled by the persistent demand-supply gap coupled with insufficient financial health and institutional capacity of the state utility. The demand-supply gap both in terms of peak and total energy demand and its trajectory is presented in the table and figure below:

Table 46: Total Electricity demand and supply scenario

Year	Electricity Requirement (MU)	Electricity Supplied (MU)	Unmet Demand (MU)
2016-17	1642	1621	22
2017-18	2600	2552	48
2018-19	1863	1841	22
2019-20	1538	1515	23
Year	**Peak Demand (MW)**	**Peak Met (MW)**	**Unmet Peak Demand (MW)**
2016-17	284	284	0
2017-18	342	342	0
2018-19	298	293	5
2019-20	320	311	9

Source- LGBR Report

Table 47: Electricity demand - supply scenario between April 20 to Dec 20

State	Energy Requirement (MU)	Energy Supplied (MU)	Unmet demand (MU)	Unmet demand (%)	Peak Demand (MW)	Peak Met (MW)	Unmet Peak Demand (MW)	Unmet Peak Demand (%)
Tripura	1161	1159	3	0.2	317	315	2	0.5

Source: Central Electricity Authority January 2021 Report

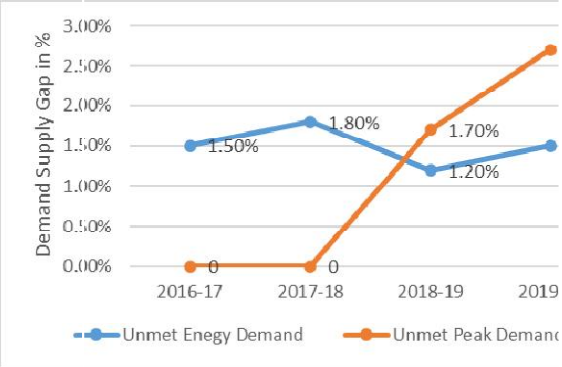


Figure 39: Trajectory of Unmet Total Electricity and Peak Demand

Household electrification: 100% of 7,88,871 households (including rural) in the state are electrified through grid outreach with all districts achieving full electrification.[33]

[33] Saubhagya Dashboard

5B.2 Impacts of Climate Change

- Variation in temperature and precipitation (in the catchment area) could alter future hydro power condition including availability of water resources and impact hydro power generation. Climate extreme events like flood resulting in higher discharge might impact the infrastructure
- Increase in temperature has a dichotomous relation with increase in energy demand to meet up the cooling load
- Climate extreme events might impose serious threat to energy access to far off remote villages
- Increase in operation and maintenance cost due to higher rate of failures in extreme weather events such as windstorms and, floods

5B.3 Key Issues and Challenges

Table 48: Key Issues and Challenges of Energy Efficiency Sector

Area	Issues/Challenges
Financial	• Paucity of funds with state utility restricts power sector infrastructure improvement, IT enablement and improving of billing and revenue recovery efficiency • Substantial AT&C losses attributes to widening of revenue gap
Technical/Infrastructural	• Need of infrastructure and resource for undertaking utility-based audit • Old distribution network infrastructure adds up to the maintenance challenge.
Institutional	• Need of institutional capacity and human resources with the power department for infrastructure improvement and implementation of Energy Efficiency measures • Need to mainstream adaptation and mitigation to climate change in developmental policy and planning. • Need of inter-departmental convergence and inadequate outreach of the nodal dept

5B.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Energy Efficiency sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

Code	Activities	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Centre/External)		
					Central Scheme	State Scheme	External Aid
EE/1 Conversion of open cycle gas based thermal power plant to combined cycle system							
a.	Upgradation/ installation of Frame- 6 F.03 (Capacity120 MW combined Cycle Gas Turbine (CCGT) at Rokhia Gas Thermal Power Plant • Preliminary Project Cost= Rs. 699.80 Crore • Final DPR cost= Rs. 845.359 Crore	Yes	Necessary Clearance/ concurrence already obtained from MHA, MEA, NITI Aayog, MNRE and MOP Government of India	69980.00			ADB Funding
			DEA (Department of Economic Affairs) proposed the project to ADB for financial assistance subject to submission of detailed project report (DPR)				
			DPR has been prepared by the consultant M/S DCPL after incorporation of recommendation of TPGL and ADB	84539.00			
			Final DPR will be submitted to DEA for necessary approval & thereafter competitive BID document will be done as per ADB strategic procurement procedure & guidelines for selection of vendor for EPC contract				
b.	Proposal for combined cycle extension project (Capacity- 23 MW) at Baramura Gas Thermal Power Plant	Yes	EoI for selection of Project Developer is under preparation for engagement of consultant, for implementation of the Project under PPP Model and External funding	30278.00			ADB Funding
EE/2	**T & D Loss reduction**	Yes	• The activity is continuous process taken up by the Department. The Department is maintaining the T&D losses at 15.94%			Dept. Fund	
EE/3	**Development of policy for mandatory use of efficient light particularly for commercial organizations in the state**		• Development of policy for mandatory use of efficient light in commercial organizations in under process				
EE/4	**Retrofitting of street light fittings from CFL to LED**		32,000 numbers of streetlights by AMC and 41,615 numbers of streetlights by UDD; Total	5891.00			

	luminaries		75815 numbers of streetlights replaced through EESL				
EE/6	**Policy Development for mandatory Energy Audit in Govt. Buildings**	Yes	Target is 19 buildings and out of 19 buildings, 12 buildings are completed and remaining 7 buildings are left (124 lakh). After completion of the audit task, replacement of the LED light fittings, Fan etc completed in three numbers of office buildings- DM office, SDA Office & TSECL Corporate office	337.00			
EE/8 Awareness and implementation for use of CFL and replacing incandescent lamp under Bachat Lamp Yojana, and Umbrella program of BEE							
a.	Purchase of 20,000 nos. LED Bulbs in 8 villages under **"Model Energy Efficient Programme"**	Yes	• Received the quotation from EESL • Quoted rate by EESL is at the rate Rs 63.00 including GST • E-tendering was floated. First tender was cancelled because of the poor response • Second tender will be floated by 12th Feb 2021 • Distribution of 20,000 nos. LED bulb through TSECL billing counters with receipt of documents from consumers • Selection of village made from the non-defaulter consumers of consecutive 6 months of highest AT&C losses bearing ESDs (one from each Electrical circle)	14.72	Central Scheme-BEE		
EE/9	**Development of policy to mandate ECBC adoption in state**	Yes	• Bureau of Energy Efficiency has notified the "updated ECBC 2017" on 'ECBC rule 2018' on 13h Feb 2018 through Gazette of India				
EE/10 Formulation of DSM project for TSECL							
a.	Retrofitting of the drinking water pumping system by replacing 100 numbers of inefficient pumps with BEE star labelled pump under "**Municipal Demand Side Management/ MEEP**"	Yes	• DPR for 100 nos. DWS pump prepared on 26.03.2018 by EESL • 72 nos. of pumps identified by DWS department for retrofitting • EESL will carry out site inspection and will submit their report within February 2021 • Tri-party agreement between EESL, State Government and DWS Department for implementation of Municipal Energy	20.00			

			Efficiency Programme (MEEP) in the public water works & sewerage systems;				
EE/14	**Promotion of use of star rated domestic appliances may be encouraged. The shops selling TV, Refrigerators or Washing Machines, Fans etc. may be asked to keep only star rated products**		• Awareness Programme on the activity is in process				

5B.5 Gap/ Barrier Analysis

Type	Gaps
Financial	• Fund Requirement for implementation
Policy & Regulatory	• Sensitization and awareness of the key stakeholders for streamlining of key policy and regulatory measures towards low carbon economic growth
Institutional	• Lack of coordinated actions amongst the departments and agencies institutionalizing different developmental and climate resilient project in the state • Need of integration of the climate concern in departmental planning and budgeting • Need of more skilled resources across the state and amongst the implementing department in operationalization of renewable energy project or augmenting technology up-gradation.
Socio-Economic	• Lack of accessible information and sensitization about the quality, cost and benefit of adopting energy efficiency measures forbids widespread adoption of the technology options

5B.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 3: To reduce the emissions intensity of its GDP by 33 to 35 per cent by 2030 from 2005 level	• Reliable and affordable power supply to all villages for domestic, commercial, agricultural and industrial consumers within a fixed time frame by providing full support to all utilities • State is focusing on 24x7 quality powers through the schemes like SAUBHAGYA and Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUY) • The State Government will split the existing Tripura State Electricity Corporation Ltd (TSECL) into Tripura State Electricity Generation Corporation Ltd. and Tripura State Electricity Distribution Corporation to build capacity in power infrastructure • The State Government will adopt new and advance technologies to improve energy efficiency • A master plan on energy conservation and mandatory conservation in Government offices, buildings and all public places will be ensured by the State.

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 7: Affordable and Clean Energy	• The State will ensurequality, reliable and affordable power supply energy • The State would implement 24X7 'Power for All' (PFA) programme with the objective to connect the unconnected areas before 2030	• 24x7 quality powers through the schemes like SAUBHAGYA and Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUY) • The State is preparing an annual Energy Audit that would enable it to analyze the consumption and distribution of power

	• Proportion of population with access to electricity will be increased from 68.4 per cent (Census-2011) to 100 per cent in 2030 • Energy GSDP ratio will be increased from 2.60 per cent to 5.5 per cent by 2030 • Proportion of households with primary reliance on clean fuels technology and renewable energy share from 0.05% to 2.5% in total energy consumption will be increased.	• Take reduction in Aggregate Technical and Commercial (AT&C) losses • Chalk out power purchase planning from central grid • Following good governance and innovation measures effectively for highly capital-intensive power sector • The State Government will put in place best practices in the power sector involving up-gradation, retrofitting etc. within the budget limit for ensuring 100% power supply • Take effective steps for capacity addition in power infrastructure including transmission and distribution • Undertake customer centric initiatives

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "**EE/N**" are transformative activities and other set of activities are named as "**EE**", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Energy Efficiency Sector.

EE/6- Conducts Energy Audit tasks through EESL in the selected 19 numbers of different Government buildings

Description- Energy audits are not only undertaken in industries but are also imperative to understand the energy efficiencies of various buildings- residential, commercial and government. Energy audit reports of buildings helps to understand the energy use in the building, identify the sources of energy waste, and explore opportunities to implement the energy conservation measures. Attaining energy efficiency in buildings introduces several benefits like reduced energy use for space heating and cooling; reduced electricity use for lighting, office machinery and domestic type appliances; lower maintenance requirements as well as reductions in greenhouse gas (GHG) emissions. Total target of conducting Energy Audit tasks through EESL is 19 numbers of different Government buildings and out of 19 buildings, 12 buildings are completed and remaining 7 buildings are left.

Direct & Co-Benefits-

- Energy Efficiency
- Reduced energy wastage

NDC Alignment- 3

SDC Alignment- 7, 13

EE/8- Distribution of LED bulbs in 16 villages, that is 2 villages per district

Description- The Model Energy Efficient Village Campaign is initiated to convert villages into model energy efficient villages by replacing existing inefficient electrical equipment / appliances with BEE star rated appliances including household bulbs, streetlights, fans, water pumps, etc. To help in improve energy access in rural areas, LED bulbs will be distributed among villages. Initially it is one village per district, but it can made to 2 village per district. The spillover activities for distribution of LED bulbs in villages will be carried under Modern Energy Efficient Village Campaign.

Direct & Co-Benefits-

- Energy access in rural areas
- GHG emission reductions
- Domestic Efficient Lighting

NDC Alignment- 3

SDC Alignment- 7, 13

EE/10- Retrofitting of the drinking water pumping system by replacing inefficient pumps with BEE star labelled pump

Description- DPR for 100 numbers of DWS pump prepared on 26.03.2018 by EESL and 72 numbers of pumps are identified by DWS department for retrofitting. This activity is undertaken under Municipal Demand Side Management.

Direct & Co-Benefits-

- Energy Efficiency
- reduced energy consumption
- GHG emission reductions

NDC Alignment- 3

SDC Alignment- 7, 13

EE/N/1- Retrofitting of electrical appliances- LED Bulbs, Tube lights and Fans

Description-Under State Partnership for Energy Efficiency Demonstration (SPEED), retrofitting of electrical appliances- LED Bulbs, Tube lights and Fans is planned to be done in 100 schools; 28 number of schools are completed and the retrofitting of remaining 72 schools work will be completed in coming years.

Direct & Co-Benefits-

- GHG emission reductions
- Efficient Lightning

NDC Alignment- 3

SDC Alignment- 7, 13

EE/N/2- Door to door campaign, rally on energy conservation; seminar, painting and quiz competition by Energy/Eco Clubs in various school/colleges in Tripura

Description- Considering the need to make the next generation more aware regarding efficient use of energy resources, it is necessary to introduce children during their school education. In this regard, promotion of energy efficiency in schools is being promoted through the establishment of Energy/Eco Clubs by conducting door to door campaign, rally on energy conservation, seminar, painting and quiz competition. Bureau of Energy Efficiency is implementing the Students Capacity Building Programme under Energy Conservation awareness scheme. Total 1100 numbers of Eco-Club have performed their activities related to Energy Efficiency matters in Tripura.

Direct & Co-Benefits-

- GHG emission reductions

- Domestic Efficient Lighting

NDC Alignment- 3
SDC Alignment- 7, 13

EE/N/3- Replacement of agriculture pump sets by star labeled pump in 8 villages (one from each district)

Description- The Agriculture Demand Side Management (Ag-DSM) scheme of BEE was initiated during XI plan. The objective of the program is to reduce the energy intensity of agriculture pumping sector by carrying out efficiency up gradation of agricultural pump sets. In order to make the State more energy efficient, there is a plan to replace all agriculture pump set of 8 village (one from each district) as pilot project after engagement of Energy Auditor. The programme will help farmers in replacing old agricultural pumps across the state with the new-age energy efficient agricultural pumps, with a 5-Star Rating.

Direct & Co-Benefits-

- Energy Efficiency
- reduced energy consumption
- GHG emission reductions

NDC Alignment- 3
SDC Alignment- 7, 13

EE/N/4- IEC activities; various activities under the programme on General Awareness

Description- The objective of State Energy Efficiency Research & Outreach Programme is to strengthen partnership between policy makers and educational institutions to forward the energy efficiency drive and to enhance the outreach activities. Conducting IEC Activities and other various activities under the programme on General Awareness related to Energy Efficiency

Direct & Co-Benefits-

- GHG emission reductions
- Domestic Efficient Lighting

NDC Alignment- 3
SDC Alignment- 7, 13

EE/N/5- VC/ Workshop/ Training Programme for School/ College/ University & Stakeholder Departments

Description- The organization of VCs/ workshops/ capacity building programmes at regular interval to disseminate information regarding energy efficiency to energy professionals like Accredited / Certified Energy Auditors, Energy Managers and also to School/ College/ University & Stakeholder Departments.

Direct & Co-Benefits-

- GHG emission reductions
- Domestic Efficient Lighting

NDC Alignment- 3
SDC Alignment- 7, 13

5B.7 Key Priorities Synopsis: Implementation Arrangement and Budget

Table 49: Synopsis of Planned Activities for Energy Efficiency Sector

Code	Activities/ interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed Budget during (2021-30) in INR Lakh	Amount likely from existing (Amount in INR Lakh			Implementing Department	Remarks (if any)
					Central scheme	State scheme	External Aid		
EE/6	Conducts Energy Audit tasks through EESL in the selected 19 numbers of different Government buildings	Energy Auditing Work	2	124.00	124.00			TSECL	Total budget for 19 building is 337 lakhs; Out of 19 buildings, 12 buildings are completed and remaining 7 buildings are left (124 lakh). After completion of the audit task, replacement of the LED light fittings, Fan etc completed in three numbers of office buildings- DM office, SDA Office & TSECL Corporate office
EE/8	Distribution of LED bulbs in 16 villages, that is 2 villages per district	Model Energy Efficient village campaign	2	30.00	30.00			TSECL	Initially it is one village per district (Rs 15 lakh budget), but it can made to 2 village per district; SDA Tripura preparing for further process
EE/10	Retrofitting of the drinking water pumping system by replacing inefficient pumps with BEE star labelled pump	Municipal Demand Side Management (MEEP)	2	20.00	20.00			TSECL	DPR prepared and submitted to the SD Tripura by the vendor EESL through UDD & DWS; 72 nos. of pumps identified by DWS department for retrofitting
EE/N/1	Retrofitting of electrical appliances- LED Bulbs,	State Partnership for Energy	2	72.00	72.00			TSECL	Total budget is 100 lakh and Target is 100

	Tube lights and Fans	Efficiency Demonstration (SPEED)							schools; 28 number of schools are completed (Rs 28 Lakh), and 72 schools work will be taken in coming years (Rs 72 Lakh)
EE/N/2	Door to door campaign, rally on energy conservation; seminar, painting and quiz competition by Energy/Eco Clubs in various school/colleges in Tripura	School Children Capacity Building Programme	4	66.00	66.00			TSECL	Total 1100 numbers of Eco-Club have performed their activities related to Energy Efficiency matters and the budget was Rs 16.5 lakh per year, so the same activity can be taken up for coming 4 years with same budget of Rs 16.5 lakh per year
EE/N/3	Replacement of agriculture pump sets by star labeled pump in 8 villages (one from each district)	Agriculture Demand Side Management	1	10.00	10.00			TSECL	To replace all agriculture pump set of 8 village (one from each district) as pilot project after engagement of Energy Auditor
EE/N/4	IEC activities; various activities under the programme on General Awareness	State Energy Efficiency Research & Outreach Programme	5	12.8	12.8			TSECL	Total budget per year is Rs 2.56 Lakh, so it can be taken up for coming 5 years
EE/N/5	VC/ Workshop/ Training Programme for School/ College/ University & Stakeholder Departments	Workshop & Capacity Building of Energy professionals	3	101.1	101.1			TSECL	Total budget per year is Rs 33.70 Lakh, so it can be taken up for coming 3 years
Total (in Crores)				**4.359**	**4.359**	**0**	**0**		

CHAPTER 5C: SUSTAINABLE HABITAT

5C.1 Sectoral Overview

National Mission for Climate Change identifies Sustainable Habitat as a major strategy to make urban regions more resilient to the climate change effects by combining adaptation and mitigation factors into the planning process. Mitigation measures would include more development of energy efficiency system, water management, wastewater management, solid waste management, urban transport and focusing on sustainable urban planning. Adaptation measures would include promotion of water efficient methods, rainwater harvesting, wastewater recycling, urban storm water management system and other urban planning measures.

The term Sustainable Habitat refers to maintenance of our natural home. True elucidation of urbanization is linked with rapid growth of economic activities and expansion of urban population. Unsustainable urbanization results in rising issues like pollution, food insecurity, uneven distribution of water, solid waste generation, vehicular emissions. Migration of people from rural to urban areas is an important factor of urbanization. Rising migration rate sets huge pressure on urban infrastructure and services, increase in consumption of energy and associated greenhouse gas emissions. Hence, it becomes necessary to make urban regions more resilient to the impacts of climate change by combining adaptation and mitigation aspects into the planning process.

About 26.17% of Tripura's population resides in urban areas as per 2011 Census which was significantly lower than that of all India's urban population 31.2%. The state has registered remarkable urban growth of about 76.17 percent during 2001–11, and the urban population has grown from 5.46 lakh to 9.6 lakh during this period. The sex ratio in urban areas of Tripura at 973 was greater than all India's sex ratio of 929. The overall literacy rate for urban areas of Tripura in 2011 Census was 93.47% while for all India it was 85%. As per 2011 Census, the urban male literacy rate in Tripura is 95.51% whereas female literacy rate is 88.70%. The share of Schedule Caste population in urban areas was 5.9% in Tripura against 12.6% of India, whereas the share of Schedule Tribe population stood at 1.34% against 2.8% at the national level. By 2021, the urban population growth in Tripura has been estimated to be 35.8% and due to this, there will be many major policy and managerial challenges in coping with the increased demand for urban infrastructure and access to basic civic amenities and services by the rapidly growing population.

Table 50: Classification of Urban Local Bodies (ULBs) in Tripura

Category of Urban Body	Number
Municipal Corporations	1
Municipal Council	13
Nagar Panchayats	6
Total	20

The categorization of urban local bodies under Census consist of all statutory towns- Corporations, Municipal Council and Town Panchayats. The State has 20 Urban Local Bodies (ULBs)- 1 Municipal Corporation (Agartala), 13 Municipal Council and 6 Nagar Panchayats.

5C.2 Impacts of Climate Change

Sector	Impact
Housing and Urbanization	• Increasing trends of people migrating from rural areas to towns (particularly Agartala, Udaipur and Dharmanagar) in search of employment and livelihood create acute shortage of housing stock in urban regions creating a stock demand-supply mismatch, Rur-ban influx is one of the major impacts of the climate change on the sector. • Increasing influx of poor immigrants to an area adds pressure on the existing infrastructure. Being poor, these immigrants settle in slums or areas vulnerable to disasters lacking in basic infrastructure like safe drinking water, sanitation and drainage facilities.
Drinking Water/ Water Management	• Reduction of water availability and quality from surface and groundwater sources in urban regions due to change in rainfall pattern • Increase in urban population means increase in demand of household water, this results in more and more extraction that can lead to scarcity • Demand-supply gap and inequitable distribution of water
Urban Development	• Increased frequency of floods, earthquakes and other extreme natural events which has an adverse effect on the state's urban infrastructures. • Climate extreme events like storms, floods etc interrupts the transport and communication, energy and water supply system in urban areas due to breakdown of power transmission lines, water pipelines and road infrastructures • Urban development planning is affected by climate extreme events • Lack of spatial urban planning and unregulated developments giving rise to environmental degradation and congestion
Health and Sanitation	• Increasing influx of migrants is leading to unplanned growth of towns; there is inadequate drainage, waste management and sanitation facilities. This makes the population highly vulnerable to various diseases. • Floods leading to contamination of water resources resulting in increased occurrence of water borne diseases • Inadequate health care system and health infrastructure of the State add to the vulnerability of people to the disasters
Waste Management	• Increase in urbanisation leads to more generation of solid waste affecting environment and human health, contamination of groundwater sources • Increased incidence of vector-borne and water-borne diseases

5C.3 Key Issues and Challenges

Table 51: Key Issues and Challenges of Sustainable Habitat Sector

Sector	Issues/ Challenges
Financial	1. Availability of fund- Project implementation depends on fund flow from Central, State and different funding agencies 2. Need for appropriate long term financial management and guidance to build governance capacity
Technical	1. Understanding of vulnerability assessment findings and what it means for the sector 2. Understanding of how to include climate change in regular programmes 3. Need of more technical expertise advising on departmental programs related to climate change 4. Need of sustainable city development plans 5. Inadequate drainage, waste management and sanitation facilities

Social-Political	1. Need of effective policies for proper monitoring and balanced development in the urban region 2. Increasing urbanisation sets huge stress on housing demand and space making living conditions unsustainable 3. Unplanned settlement and migration of rural people to urban areas 4. Lack of purchasing power 5. Need of effective policies for proper monitoring and balanced development in the urban region 6. Need of responsive approach towards the changing needs of people at policy level
Institutional and Regulatory	1. Need of awareness programmes to engage the people in mitigating climate change as well as adapting to its effects 2. Requirement of inter-departmental co-ordination 3. Need of proper integration in the departmental planning process 4. Requirement of proper human resource in departments
Sensitization	1. Need of public awareness about the overall scarcity and economic value of water resulting in its wastage 2. Need of awareness regarding energy efficiency (to save energy)

5C.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Sustainable Habitat sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

Code	Activities	Implementing Department	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Centre/External)		
						Central Scheme	State Scheme	External Aid
SH/2	Capacity building on solid waste management	UDD	No	Capacity building activities were taken up for solid waste management and related areas	429.00	386.00	43.00	-
SH/8	Composting and treatment of Municipal Solid waste in Agartala Town and other district towns is very important in regard to methane emission	UDD	Yes	Yes	2840.03	-	2840.03	-
		AMC	Yes	Sanitary Landfill and compost plant of 250 TPD has been established in Devendra Chandra Nagar 12km away from Agartala City Centre. Waste Collected from the city is transported to the site and processed to convert solid waste into compost manure	1650.00	-	1650.00	-
SH/11	Improvement of collection efficiency and segregation at source	UDD	Yes	Yes	1638.88	1638.88		
		AMC	Yes	Implementing	34.47	34.47		
SH/15	Disaster risk reduction in Urban Sector	AMC	Yes	Training at AMC premises in July 2019. Boats- 06 (six) numbers of rubberized rescue boats (inflatable), 4.7mtr (25HP/ 2 Stroke) OBM TUHATSU (of wt. 200kg) 72(seventy-two) life jackets, 12 (twelve) life buoys	0.74		0.74	
				5(five) numbers of vertex rain gauge (plastic), suitable place of installation not yet reported; matter referred to Disaster Management Cell of Revenue Department Govt. of Tripura necessary guideline				

				Organisation of Community Awareness Programme (CAP)	0.27		0.27	
SH/18	Promoting eco-friendly methods of road construction (Like Using Bitumen without burning)	NHIDCL & PMGSY Tripura	Yes	150.81 Km	10960.15	9864.14	1096.02	
SH/19	Recycling and Reuse of the Building and road Construction materials	AMC	Yes	At present C&D waste is being collected using machineries only. The C&D waste is collected on demand basis only. The waste is transported to Devendra Chandra Nagar waste processing site and department in place earmarkable as C&D waste. However, project for connection of C&D washing a unable from will shortly be undertaken.				
SH/21	Constructing Pilot waterproof Road (Heavy rain fall, water logging, average Ground water level is only 10 meter)	NHIDCL & PMGSY Tripura	Yes	10.662 Km	1104.84	994.36	110.48	
SH/24	Switching to liquid fuel-based vehicle to CNG based vehicle	Transport	Yes	2137 numbers	0.00	-	-	-
SH/25	Promotion of low emission vehicles, electric vehicles	Transport	Yes	4850 numbers	0.00	-	-	-
SH/26	Introduction of concept of mass rapid transit	Transport	Yes	05 numbers	0.00	-	-	-
SH/27	Introduction of more public transport	Transport	Yes	14012 numbers	0.00	-	-	-

5C.5 Gap/Barrier Analysis

Area	Gaps
Institutional	• Need of inter-departmental synergy • Awareness programmes to engage the communities in mitigating climate change as well as adapting to its effects • More technical experts advising on departmental programs related to climate change • Need of proper integration in the departmental planning process
Financial	• Delay of funds result in cost overrun • Need for appropriate long term financial management and guidance to build governance capacity
Regulatory/ Policy	• Co-ordination between regulating body and policy makers • Need for an integrated approach for urban development • Inter-departmental synchronization for better convergence and clarity of goals • Difficulty in benchmarking climate linked activities creating a challenge in analysis of state-level policy as well as planning and modelling future climate related spending

5C.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation	• Taking up measures for energy efficiency • Focusing on sustainable city development plans • Provision of safe drinking water supply to all households and ensure water security in urban local bodies • Focusing on affordable connectivity and transportation within the state • Providing universal housing for all sections of society through Rajiv Awas Yojana, Indira Awas Yojana, Pradhan Mantri Adarsh Gram Yojana • Solid Waste Management Rules
To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development.	• Eco-friendly methods of road construction • Renovation of roads using plastic waste • Following green building concept along with provision of rainwater harvesting, ground water recharge and implanting roof top solar panel • Encouraging environment friendly and energy efficient green buildings • Focusing on water resource management • Implementation of integrated solid waste management and visualizing garbage free environment (Swachh Bharat Mission) • Adopting for a cleaner path by expansion of sanitation facilities

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 6: Ensure the availability and sustainable management of water and sanitation for all	• 100% safe drinking water and safe sanitation will be provided to all by 2030, through facilities in institutional, major public places and household spheres, with special attention to the needs of women and girls including those in hilly and remote areas. • Enhancing the quality of life of the people by providing safe, sustainable drinking water supply and sanitation facilities and services along with promoting hygiene practices amongst the people by 2030	• Steps for creation of new infrastructure for replacement of obsolete pump houses, treatment plant, iron removal plant and distribution pipeline to ensure safe drinking water supply services • Provide adequate urban 135 liters per capita per day safe drinking water (piped) and water for sanitation for citizens • Steps for regulation of ground water resources to avoid Climate Change-related disasters and providing safe drinking water
SDG-9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	• 100% accessibility to all infrastructures by 2030 including that of transport, connectivity, irrigation, energy and banking • Improve communication and digital connectivity	• Invest in roads and bridges giving special emphasis on longevity, durability and quality • Focusing on building resilient infrastructure in the State
SDG-11: Make cities and human settlements inclusive, safe, resilient and sustainable	• All urban areas will be made inclusive, safe, resilient and sustainable by providing access of 100 per cent • All cities and urban settlements of the State will have efficient urban infrastructure as prerequisite for sustaining growth and development, pollution free transport system for commuters, all weather road, energy efficient illumination system, proper sewerage, storm water drainage, solid waste management, markets and streetlights, underground accommodation of electric lines, universal access to the internet before 2030, cooking gas pipeline, telecom cable, TV cable by 2030. • The percentage of slum population will be reduced from 16.49 per cent in 2014-15 to 8.50 per cent in 2030 • Special emphasis will be given for adequate discharge of urban solid waste to make the cities clean and hygiene	• Creation of urban infrastructure and quality services like safe drinking water, sewerage, solid waste management, roads and storm water drains, markets and streetlights in Agartala Municipal Corporation and thirteen municipal councils and other six towns through Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Pradhan Mantri Awas Yojana (PMAY-U) and Agartala Smart City project • Effective steps for investment and building the urban infrastructure in all districts • Improving urban transportation and pollution control through action plan investment in urban transportation and pollution • Afforestation is being encouraged around cities and towns • A master plan is being created to prevent monsoon flooding in Agartala and other urban areas of Tripura • Use of latest technologies like GIS (Geographic Information System) for information management about flood control and land erosion is being encouraged in urban cities • Investment in urban health care facilities

		• Development of slum areas covering housing, sewerage, sanitation, safe drinking areas, parks etc. • Focusing on integrated solid waste management and visualizing garbage free environment (Swachh Bharat Mission) • Taking steps to transform the cities into economically vibrant and environmentally sustainable habitats that provide equitable access to basic infrastructure, public services and opportunities to all citizens and platforms for democratic participation

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "**SH/N**" are transformative activities and other set of activities are named as "**SH**", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Sustainable Habitat sector.

SH/18- Promoting eco-friendly methods of road construction (Like Using Bitumen without burning)

Description-Constructing a new road has a number of effects on the environment, consuming large amounts of materials and energy**.** In this era of conservation and environmental management, the inbuilt sustainability of existing road construction practices is being developed. Promoting eco-friendly and sustainable methods of road construction can help to reduce environmental impacts; can be resilient to future environmental and economic pressures (e.g., climate change and resource scarcity), reduce the ecological footprint of roads and promote sustainability not only from an environmental point of view but also from a societal one.

Direct & Co-Benefits

- Reduced environmental impacts & pollution
- Reduced ecological footprint
- Resilience to environmental pressures

NDC Alignment- 2, 3

SDC Alignment-9, 11, 13

SH/21- Constructing Pilot waterproof Road (Heavy rainfall, water logging, average Ground water level is only 10 mt)

Description- The condition of most of the roads becomes bad, especially during the monsoons. Increased frequency of extreme events like heavy rainfall leads to urban flooding that has an adverse effect on the roads. Water entering the roads is the main cause for damage. Life of the roads can be increased by providing side drains and a water-resistant top layer. The waterproofing quality ensures that water does not seep down, thus reducing wear and tear of the roads.

Direct & Co-Benefits

- Road sustainability
- Resilience to environmental pressures

NDC Alignment- 2, 8

SDC Alignment-9, 11

SH/N/1- Construction of division offices for PWD(R&B) and PWD(DWS) at Bishlagarh, Sepahijala district Tripura following green building concept along with provision of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification etc.

Description- A green building concept is designed to reduce the overall impact of the built-up environment on the natural environment through the efficient use of energy by implanting roof top solar panel for internal electrification, water and other resources with provision of rainwater harvesting, reducing waste, pollution and harm to the environment.

Direct & Co-Benefits

- Energy and water saving
- Improvement in air and water quality
- Conservation of natural resources

NDC Alignment- 1, 2, 3, 4

SDC Alignment-7, 9, 15, 11, 13

SH/N/2- Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the Secretariat building, Govt. of Tripura

Description- This concept focuses on the promotion and protection of water, ground water recharge and highlights the need for augmenting the availability of water through rainwater harvesting, direct use of rainfall and other management measures. Compared to other commercial office buildings, government office buildings also completely depend on electricity for all its operations and an uninterrupted power supply becomes important for its smooth functioning. To deal with the power-cuts, meet the increasing energy needs; a solar panel can provide a cost-effective solution to deal with the power cuts.

Direct & Co-Benefits

- Restoration of hydrological cycle
- Groundwater recharge
- Reduction in carbon footprint
- Local temperature regulation
- Energy efficiency
- Improvement in energy mix

NDC Alignment- 2, 3, 4

SDC Alignment-6, 7, 11, 13

SH/N/3- Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the legislative Assembly building, Govt. of Tripura

Description- As discussed above, it has become important to focus on water management practices in government building for augmenting the availability of water through rainwater harvesting, direct use of rainfall and other management measures. As government buildings and other infrastructures are getting erected rapidly, they are putting an enormous burden on the existing power system. In order to meet the energy needs, more resources are being exploited which are drastically contributing to the increase in Carbon-Dioxide emissions. Implanting roof-top solar panel on the government building will not only save the electricity expenditure but will also motivate other office buildings to adopt solar energy.

Direct & Co-Benefits

- Restoration of hydrological cycle
- Groundwater recharge
- Reduction in carbon footprint
- Local temperature regulation
- Energy efficiency
- Improvement in energy mix

NDC Alignment- 2, 3, 4
SDC Alignment-6, 7, 11, 13

SH/N/4- Renovation of Bituminous concrete road (Battala to Dashamighat) using waste plastic material at Agartala, west Tripura district

Description- In a first-ever initiative in Tripura, the state has started using non-recyclable plastic waste in the construction of roads with an aim to reduce plastic waste and make the environment plastic-free. Plastic is a risk as waste and affects the environment as well as the ecosystem health. The Agartala Municipal Corporation generates almost 19 tonnes of plastic daily, and such initiatives will help the authority to manage waste.

Direct & Co-Benefits

- Waste to wealth
- Plastic waste management
- GHG emission reductions
- Climate resilient infrastructure

NDC Alignment- 2, 3
SDC Alignment-9, 11, 13

SH/N/5- Solid Waste Management (2nd Installment)

Description- The objective of solid waste management is to protect public health, the environment and natural resources (water, land, air). An effective Municipal Solid Waste Management service can be attained by reduction of waste generation, proper separation of Municipal Solid Waste and recyclable material, and recovery of compost and energy. The total budget for Solid Waste Management is 52.01 Cr, the second installment for solid waste management is for 2020-21 for which total budget is 7.75 Cr.

Direct & Co-Benefits

- GHG emission reductions
- Waste to energy
- Improvement in environmental quality

NDC Alignment- 2, 3
SDC Alignment-3, 12, 13

SH/N/6- Construction of Toilets to achieve Open Defecation Free (ODF, ODF+)

Description- For Individual Household Latrine (IHHL), there is 2nd installment of 19464 units and 1st installment of 5234 units as per State HPC for the year 2020-21. For Community Toilets (CT) and Public Toilets (PT), there is 2nd installment of constructing 458 seats of CT and 2nd installment of constructing 238 seats of PT for 2020-21.

Direct & Co-Benefits

- Sustainable sanitation
- Maintenance of environmental health

NDC Alignment- 2
SDC Alignment-3, 6

SH/N/7- Covered Storm Water Drainage

Description- A storm water drainage is defined as a drainage system that receives runoff from inlets and conveys the runoff at some point where it is then discharged into a channel or piped system. The objective of constructing storm water drainage is to collect storm water runoff from the roadway and convey it to an outfall. The placement and capacity of storm water drainage is designed in consistent with local storm water management plans.

Direct & Co-Benefits

- Urban flood protection and management
- Reduced wastage of freshwater due to mixing
- Green infrastructure

NDC Alignment- 2
SDC Alignment-9, 11

5C.7 Key Priorities Synopsis: implementation arrangement and budget

Table 52: Synopsis of Planned Activities for the Sustainable Habitat Sector

Code	Activities/ interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed Budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Department	Remarks (if any)
					Central scheme	State scheme	External Aid		
Continuation of activities from SAPCC-1									
SH/18	Promoting eco-friendly methods of road construction (Like Using Bitumen without burning)	PMGSY Tripura	5	14912.75	13421.48	1491.28		NHIDCL & PMGSY Tripura	
SH/21	Constructing Pilot waterproof Road (Heavy rain fall, water logging, average Ground water level is only 10 meter)	PMGSY Tripura	5	7717.65	6945.89	771.77		NHIDCL & PMGSY Tripura	
Proposal of New activities to be added in SAPCC-2									
SH/N/1	Construction of division offices for PWD(R&B) and PWD(DWS) at Bishlagarh, Sepahijala district Tripura following green building concept along with provision of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification etc.		2	865.00	865.00	0.00		PWD(R&B)	
SH/N/2	Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the Secretariat building, Govt. of Tripura.		1	650.00	650.00	0.00		PWD(R&B)	
SH/N/3	Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the legislative Assembly building, Govt. of Tripura.		1	330.00	330.00	0.00		PWD(R&B)	
SH/N/4	Renovation of Bituminous concrete road (Battala to Dashamighat) using waste plastic material at Agartala, west Tripura district.		0.25	175.00	175.00	0.00		PWD(R&B)	
SH/N/5	Solid Waste Management (2nd	Swachh Bharat	1	775.00	775.00	0.00		UDD	This is

	Instalment)	Mission-Urban							second instalment for solid waste management for 2020-21 for which total budget is 52.01 Cr
SH/N/6	Construction of Toilets to achieve Open Defecation Free (ODF, ODF+)								
	a. Community Toilet (CT) and Public Toilets (PT)- 2nd instalment of 458 seat of CT and 2nd instalment of 458 seat of PT	Swachh Bharat Mission-Urban	1	1060.056	1060.056	0.00			This is 2nd instalment of 458 seat of CT and 2nd instalment of 458 seat of PT for 2020-21
	b. Individual Household Latrine (IHHL)- 2nd instalment of 19464 and 1st instalment of 5234		1	565.00	565.00	0.00			This is 2nd instalment of 19464 and 1st instalment of 5234 as per State HPC for 2020-21
SH/N/7	Covered Storm Water Drainage	Smart City Mission Project	1	2500.00	2500.00	0.00			Remodelling of Storm water Drainage, work under progress
Total (in Crores)				**295.50476**	**272.8743**	**22.6305**	**0**		

CHAPTER 6: ADAPTATIONFOCUSED SECTORS

The Mitigation Strategies have been covered in four major chapters:

Chapter 6A: Agriculture and allied

Chapter 6B: Sustaining Himalayan Ecosystem

Chapter 6C: Water

Chapter 6D: Health

Chapter 6E: Strategic Knowledge Management

CHAPTER 6A: SUSTAINABLE AGRICULTURE

6A.1 Sectoral Overview

The state has favourable climatic conditions for cultivation of various fruit and horticultural crops. It is rich in natural resources such as natural gas, rubber, tea and medicinal plants. The State of Tripura is mainly hilly and extensively covered with forest during the erstwhile Maharaja's time and 'Jhum' popularly known as Shifting cultivation, was practiced in the hilly-areas as the only form of agriculture. The good agro-climatic conditions, deep fertile soils, subtropical humid climate with abundance of rainfall offer tremendous scope for development of Horticulture sector in the state. The cropping pattern in Tripura is characterized by two distinct farming systems, i.e. settled cultivation in the plains and shifting cultivation in the hills. Paddy, Pulses and Oilseeds are the major crops grown in the state. Paddy is grown in 55% of gross cropped area in three seasons viz. Aush (pre Kharif), Aman(Kharif) and Boro (Summer) whereas pulses and oilseeds and other crops altogether cover about 5% area. Fruits and vegetables are covered in 21% of gross cropped area, 10% area is under rubber and 9% under other miscellaneous crops like tea, medicinal plants etc. The major Kharif crops are rice, maize, pigeon pea, black gram, green gram, cowpea, ground nut, sesame, jute, mesta, cotton, and Kharif vegetables. Different crops taken during Rabi season are rice, wheat, pea, green gram, lentil, rapeseed-mustard, potato, and Rabi vegetables. The state has favourable climatic conditions for cultivating various fruit and horticultural crops including rice, jackfruit, pineapple, potato, sugarcane, chilli and natural rubber. Rice is the major crop of the state and is cultivated in 91 per cent of the cropped area.

The Nodal Departments for the Sector are Department of Agriculture and Farmers Welfare, Directorate of Horticulture and Soil Conservation, Directorate of Fisheries, Animal Resources Development Department along with Tripura Livestock Development Agency (TLDA) and Directorate of Biotechnology

6A.2 Impacts of Climate change

Hill Agriculture is more vulnerable to climate change due to complexity and lack of resources to farmers. North east regions falls under Complex, Diverse and Risk Prone (CDR) as 80% of more area is rain fed and Tripura holds a major population of small and marginal farmers. Projections shows reduction in water resources, with the current rate of ground water depletion. The drying up of surface water due to reduced rainfall has led to extraction of groundwater for irrigation.

6A.3 Key Issues and Challenges

Table 53: Key Issues and Challenges of Agriculture and Allied Sector

Area	Issues/Challenges
Technical/Infrastructural	• Absence of sectoral vulnerability assessment • R&D section for taking up sectoral climate change studies • Single paddy cropping is vulnerable to risk and leads to low productivity level • Large area of the State remains fallow in the dry season • Small farmers land holding
Financial	• Insufficient fund low for implementing farm mechanization • Improper implementation of KCC
Institutional	• Human resources crunch • Channelization of Department fund through CSS or State fund

6A.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Sustainable Agriculture sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

Code	Activities	Responsible/ Implementing Dept.	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Center/External)		
						Central Scheme	State Scheme	External Aid
Agricultural and Horticultural Department								
SAG/1	Rapid screening and strategy assessment of State agriculture policy	Dept. of Agriculture and Farmers Welfare	Yes	• Development of Tripura Comprehensive State Agriculture Plan (2015-20)			Dept. Fund	
SAG/3	Undertaking capacity-building	Dept. of Agriculture and Farmers Welfare	Yes	• Capacity building of farmers on bio fertilizers • Farmer's exposure visits • Establishment of farmers knowledge Centres • Dissemination of advanced technical know-how at farmers' doorstep, 19 no. "Krishak Bandhu Kendras" have been opened at Agri. Sub-Division level for technology dissemination to the farmers • Training and capacity building of growers' and extension agencies by Horticulture Research Complex				
SAG/4	Risk management in agriculture and allied sectors: Disaster Risk Reduction	IMD	Yes	• Installation of automatic weather station and rain gauge		RKVY, NMSA, AIBP		
	Crop Insurance	Dept. of Agriculture and Farmers		• 2,06,092 farmers for 31,235 ha. paddy area insured under the Pradhan Mantri Fasal Bima Yojana, during Kharif season, 2020	505	PMFBY		

		Welfare						
SAG/5	Breeding studies on major crops for tolerance/resistance (Adaptive Research-Breeding and Validation through multi location testing)	Dept. of Agriculture and Farmers Welfare	Yes	• Under Crop Diversification Programme, crops like hybrid maize (28,000 ha.) and Black gram (22,000 ha.) is being taken up during 2020-21 with post-harvest processing and value addition support • State research station conducts studies	3660	RKVY, NFSM		
SAG/7	Utilization of Bio-resources (Organic wastes, plant wastes, leaf fall droppings etc) towards preparation of organic manure	Dept. of Agriculture and Farmers Welfare	Yes	• 6,788 farmers under 12 FPCs are taking up Organic farming in 6,000 ha. • 15,000 ha. new area is being taken up under organic farming during 2020-21	114.82	MOVCD-NER		
SAG/8	Developing livelihood – focused, people- centric integrated watershed development in rain-fed areas	Dept. of Agriculture and Farmers Welfare	Yes	• 1,58,335 Soil Health Cards (SHC) distributed during 2017-18 & 2018-19. • 17,599 Soil Health Cards (SHCs) distributed during 2019-20		SLNA		
SAG/10	Developing sustainable soil, water and crop management practices	Dept. of Agriculture and Farmers Welfare	Yes	• 187 Farm Machinery Banks have been established and another 75 is being established during 2020-21		Sub Mission on Agricultural Mechanization (SMAM)		
SAG/11	Increasing crop intensity in Traditional Conventional Land (To achieve 300% Cropping Intensity)	Dept. of Agriculture and Farmers Welfare	Yes	• At present, the cropping intensity of the State stands at 191%, which is expected to increase and reach the target through irrigation facilities and climate resilient agriculture				
SAG/12	Improving monitoring and surveillance techniques including cropping cutting measures (Electronic communication System, GPS and CB 40 Training Personnel)	Dept. of Agriculture and Farmers Welfare	Yes	• Crop cutting measures are taken up as per the guidelines in the State. • Under the Establishment of an Agency for Reporting Agriculture Statistics (EARAS) scheme, production and productivity of major	77	EARAS		

				crops through crop cutting experiments for Aush Paddy, Aman paddy, Boro paddy, Wheat, Mustard and Potato is taken up, • Area, Production & Productivity of other major crops are done based on forecasting method				
ARRD								
SAG/ 14	Adaptability good milch breed of cattle such as Sahiwal, Gir and Red Sindhi, Jursey and Holstein cross, rearing and bio gas production with milk chilling plant	ARDD	Yes	• Cross breeding of local cattle through Artificial insemination using Frozen semen (FS)- 5,70,114 nos. (till December 2020) • Calf born are 2,66,941 nos.	2,22,867	NPBB, RGM & NMBP (100%)	State Plan	Infrastructure for building funded by MPLADS Fund, West Tripura
				• Activities by GCMPUL				
				2016-17: 2 KL BMC at Melaghar	6,87,244	IDDP-III		
				2017-18: 2 KL BMC at Melaghar				
				2018-19: 5 KL BMC at Melaghar	12,79,191	IDDP-IV		
				2019-20: 7 KL BMC at Melaghar				
				2020-21: 6KL BMC, 2KL each at Kalyanpur, Halhali and West Tripura District	9,61,369	NPDD		
SAG/ 19	Adaptability of low input technology like Kuroialer, Gramapriya and Kalinga Brown	ARDD	Yes	• Distribution of Day-Old Chicks (LIT birds) to beneficiaries & BLBH- 10,15,623 nos.	861	National Livestock Mission (NLM) RKVY 90%	10%	
SAG/ 20	Capacity Building and training of farmers	ARDD	Yes	• Capacity building through skill development and orientation training of farmers- 3509 nos.	133	NPBB, RGM (100%)	State Plan	
Department of Fisheries								
SAG/ 21	Capacity building and welfare activities of fishing communities	Directorate of Fisheries	Yes	340 no. of low-cost input technology (composite fish culture) covering an area of 54.4 ha is Tripura	6.52	PMSBY		
				1533 no. of Demonstration on Pisciculture in Seasonal/ non-perennial tanks, in 161.14 ha in Tripura;	17.50		Dept. Fund	

				Supply of fish culture inputs for the poor small tanks in 177.11 ha;	13.72		Dept. Fund	
				262 Demonstrations on feed based intensive fish culture in 42.016 ha area;	9.59		Dept. Fund	
				187 projects for Aquaculture of freshwater Giant Prawn in polyculture, covering an area of 29.92 ha;	23.28		Dept. Fund	
				Production of fingerlings (size of 7 cm and above) in 379 privately owned tanks of remote areas of 31.54 ha;	11.91		Dept. Fund	
				187 Integrated fish farming among the farmers having pig under 29.12 ha of ADC areas;	4.60		Dept. Fund	
				Feed and seed support to 5951 fish farmers in 555.47 ha of areas;	40.51		Dept. Fund	
				Entrepreneurship development of 249 SHGs for adoption of scientific pisciculture in 100.26 ha of area;	7.10		Dept. Fund	
				Entrepreneurship development of 63 co-operative societies for adoption of scientific pisciculture in 3.70 ha;	3.70		Dept. Fund	
SAG/ 22	Impact assessment of climate change on fishery	Directorate of Fisheries	Yes	Pisciculture in 1077 newly created/ reclaimed water bodies covering 165.16 ha area;	10.80	MGNREGA		
				Fish seed support for stocking of 10 cm size quality fingerlings under Development of Big water bodies in 112 ha area;	2.97		Dept. Fund	
				Ranching of (7-10 cm) quality fish seeds in Dumbur Reservoir/ River/ Rivulets, in 8.07 ha;	8.07		Dept. Fund	
SAG/ 23	Study of impact of Climate Change on the indigenous fauna of aquatic ecosystem and open water	Directorate of Fisheries	Yes	Conservation aquaculture projects for indigenous species pabda (State fish of Tripura) in 253 polyculture on 38.48 ha;	19.39		Dept. Fund	
				Production of stunted growth fingerlings in perennial nature of 348 water bodies in 55.04 ha of area;	14.15		Dept. Fund	
				Training on Technology Dissemination for Pisciculture development, imparted to 1370 trainees	1.56		Dept. Fund	

				Technology dissemination to 800 trainees in North and Dhalai district (3-day training to cover more than 50 farmers/ SHGs/ JFMC members;	0.31		Dept. Fund	
				Training to the 1750 Trainees, including members/ farmers of Co-operatives/ SHGs/ JFMC/ NGOs;	2.34		Dept. Fund	
				Technology dissemination for Pisciculture development to 1000 number of trainees (1 day training cum workshop with farmers/ SHGs/ JFMC members	6		Dept. Fund	

6A.5 Gap/Barrier analysis

Type	Gaps
Technical/Infrastructural	• Presence of technical expertise in climate change sectors • Research and Development activities on impacts of climate change • Sectoral vulnerability assessment profiles
Financial	• Departmental financial crunch • Channelization of funds under each activity head
Institutional	• Coordination between Departments for implementation of similar activities
Planning	• Implementation of activities from SAPCC 1 • Awareness of SAPCC 1

6A.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 6: To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management	• National Mission on Sustainable Agriculture • Mission for Integrated Development of Horticulture • RKVY • National Livestock Mission

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	• By 2030, double the agricultural productivity and incomes of small-scale food producers • By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production • By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species	• National Food Security Mission • Mission for Integrated Development of Horticulture • National Mission on Sustainable Agriculture • National Oil seed and Oil Palm Mission • National Mission on Agriculture Extension and Technology • RKVY • National Livestock Mission • Livestock Health and Disease Control • National Programme for bovine Breeding and Dairy Development
SDG 12: Ensure sustainable consumption and production patterns	• By 2030, achieve the sustainable management	• Soil Health Card Scheme

	and efficient use of natural resources and eco-system • By 2030, halve per capita food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	
SDG 13: Take urgent action to combat climate change and its impacts	• Strengthen resilience and adaptive capacity to climate related hazards and natural disasters • Integrate Climate Change measures into policies, strategies and planning • Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	• National Mission for Sustainable Agriculture • National Action Plan on Climate Change

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "SAG/N" are transformative activities and other set of activities are named as "SAG", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC (2014-17) and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Sustainable Agriculture sector.

SAG/4- Crop Insurance

Description- The Department plans to increase the area coverage under crop insurance in order to save the farmers from natural vagaries. It also includes provision of MSPs for the possible crops to save them from distress sale. The State target for the 2021-22 is 61,000 ha and for the year 2022-23 is 62,400 ha.

Direct & Co-Benefits

- Improvement in Climate Risk transfer
- Climate Resilient agriculture practices

NDC Alignment- 6

SDC Alignment- 2, 12, 13

SAG/5- Breeding studies on major crops for tolerance/resistance

Description- The activity includes activities on breeding studies in the Agriculture sector. Major activities include study and cultivation on Hybrid paddy (SRI), High Yield Variety (HYV) (SRI) and local scented rice. Area target for Hybrid paddy is 12,000 ha for 2021-22 and 2022-23, HYV (SRI) is 74,000 ha and local scented rice is 4000 ha during the year span 2021-22 and 2022-23.

Direct & Co-Benefits

- Climate resilient agriculture

- Reduced water use
- GHG emission reductions
- Food security
- Reduce vulnerability of crop storage facilities to CC&CV

NDC Alignment- 3, 6
SDC Alignment- 2, 13

SAG/7- Organic Farming

Description- Initiative taken for bringing additional 8,000 ha. area under organic cultivation in the state with certification and assured marketing support, during the Financial year 2021-22 and 2022-23 under the Agriculture Development Scheme of the State.

Direct & Co-Benefits

- Crop resilience
- GHG emission reductions
- Integrated organic and inorganic nutrient management
- Increase carbon sequestration

NDC Alignment- 6
SDC Alignment- 2, 12, 13

SAG/8- Developing livelihood – focused, people- centric integrated watershed development in rain-fed areas

Description- Special drive shall be given for 100% soil health coverage in 5 identified village of each block with establishment of 29 new Soil Testing Labs, 1(one) in every two block by engaging private agencies and strengthening of existing 3 District Soil Testing Labs (DSTLs) with further establishment of 5 new DSTLs. Further, for judicious use of fertilizer, soil test recommendation-based fertilizer demonstration shall be taken up in 50 ha. area in each identified block. The Soil testing and SHC preparation target of the department stands at 1,74,000 numbers during the year 2021-22 and 2022-23.

Direct & Co-Benefits

- Sustainable soil health management
- Integrated organic and inorganic nutrient management

NDC Alignment- 6
SDC Alignment- 2, 13

SAG/9- Development of water use efficient micro irrigation methods and individual/community farm ponds

Description- The Activity involves farm mechanization of 11100 numbers and creation of irrigation sources in 6500 ha in the State during the year 2021-22 and 2022-23.

Direct & Co-Benefits

- Restoration of natural drainage regime for carbon sequestration
- Increased water use efficiency

NDC Alignment- 6
SDC Alignment- 2, 6, 12

SAG/10- Developing sustainable soil, water and crop management practices

Description- Plan has been taken for correction of different untreated areas, with addition of soil ameliorants/ nutrients, as per status of deficiency, as recorded in the analysis of Soil health report in

different parts of the state. The Departmental target for both reclamation of soil and deficiency correction is 29,000 ha for the year 2021-22 and 2022-23.

Direct & Co-Benefits

- Sustainable agriculture
- Climate resilient agriculture
- Nutrient management
- Degraded land management
- Integrated ecosystem management

NDC Alignment- 6
SDC Alignment- 2, 13, 15

SAG/11- Increasing Cropping Intensity in Traditional Conventional Land

Description- Additional 10,500 ha. by Pulses like Black gram& Pea and Oilseeds like Mustard & Groundnut in clusters of minimum 5 ha. in Rabi Rice Fallow areas with lifesaving irrigation support has been planned for upcoming 2 years. 6,000 ha Sesamum and Black gram in clusters in RoFR areas during Kharif with post-harvest value addition and assured marketing support is planned by the Depart for the year 2021-22 and 2022-23. Alongside Proposal initiated for increasing Seed Replacement Rate of paddy to 50% from existing 33% to increase production, productivity and farmers' income, for which, 10,465 MT of seeds and 11,5000 MT of Fertilizers are targeted during 2021-22 and 2022-23.

Direct & Co-Benefits

- Food security
- Conservation of indigenous species
- Improvement of water regime in soil profile

NDC Alignment- 1, 6
SDC Alignment- 2, 12

SAG/14-Cross breeding of local cattle through Artificial Insemination using Frozen Semen (FS)

Description- Crossbred cattle are more economical and are expected to give higher milk yield than the indigenous cows, thereby, increasing the income of farmers, dairy entrepreneurs. Cross breeding provides economic beneficials and round the year employment to the cattle bearers. Therefore, population of crossbred cows should be increased simultaneously with Artificial Insemination programme to increase profitability to the farmers and dairy industry.

Direct & Co-Benefits

- Conservation of indigenous species
- Disease resistance

NDC Alignment- 1, 6
SDC Alignment- 2, 13

SAG/19- Distribution of Day Old Chicks (LIT bird) to beneficiaries & BLBH

Description- Block Level Brooder House (BLBH) are established under a PRI body. Day old Kuroiler chicks are reared in the BLBH up to the age of 49 days and distributed to the farmers under different Departmental and Extra-departmental scheme @ Rs. 80/-per chick. Generally 5-6 batches are reared in a financial year and the profits are distributed among the caretakers in each batch. Besides distribution among different government scheme, the interested farmers also purchased chicks from this BLBH as per approved rate and in turn rearing of these chicks in backyard system helps to achieve the target for egg production in the district as well as for the state.

Direct & Co-Benefits

- Livelihood security

- Food security
- Climate adaptability of indigenous birds to climate conditions

NDC Alignment- 6
SDC Alignment- 2, 13

SAG/20- Capacity Building and trainings of farmers

Description- Capacity building and training of farmers involved in livestock rearing is a continuous process taken up the Department.

Direct & Co-Benefits

- Climate Resilient Livestock rearing
- Indigenous Species conservation
- Pasture management
- Manure management and methane capture in animal husbandry

NDC Alignment- 2, 6
SDC Alignment- 2, 13, 17

SAG/N/1- Market Development (e-NAM)

Description- The State plans to adopt e-NAM by linking different wholesale agriculture marketing bodies. Regulated markets are proposed by the Department in a phase wise manner. 8 markets are proposed to be bought in under e-NAM in first phase (2020-21), another 13 regulated markets are proposed under the platform during 2021-22 and 2022-23.

Direct & Co-Benefits

- Agricultural advancement
- Food security

NDC Alignment- 2, 6
SDC Alignment- 2, 12, 13

SAG/N/2- Skill Development

Description- Skill Development in the Agriculture sector includes promotion of manpower and undertaking of up skilling of farmers through training courses, knowledge dissemination and capacity building programmes. The State has a target of 600 skill development programmes in the year 2021-22 and 2022-23.

Direct & Co-Benefits

- Climate Resilient Agriculture
- Crop-water management
- Crop resilience
- GHG emission reductions
- Integrated organic and inorganic nutrient management

NDC Alignment- 6, 8
SDC Alignment- 2, 7, 12, 13, 17

SAG/N/3- Assistance to the FPO/FPC

Description- The State has envisaged further promotion of organic farming through the formation and assistance to the Farmer Producer Organizations (FPOs) and Farmer Producer Company (FPCs) in areas where usage of chemical fertilizers is minimum.

Direct & Co-Benefits

- Livelihood security

- Food security
- Sustainable Agriculture through organic farming

NDC Alignment- 6, 8
SDC Alignment- 2, 13

SAG/N/4- Fruits & commercial plantation crop

Description- The favourable agro-climatic conditions, deep fertile soil and sub-tropical humid climate with abundance of rainfall offer immense scope for development of Horticulture in the state of Tripura. Making Pineapple available round the year through chemical staggering and commercial plantation will assist the State in increasing area, production & productivity of different Horticultural crops through supplying quality seeds/seedlings, planting materials, other inputs & technologies.

Direct & Co-Benefits

- Climate resilient crop production
- Technological advancement
- Increased productivity

NDC Alignment- 6
SDC Alignment- 2, 13, 17

SAG/N/5- Vegetable Cultivation

Description- The activity will involve cultivation of high value vegetables like Capsicum, Tomato, Cucumber, Certified vegetable seedlings production and Introduction of hybrid vegetables in non-traditional area. An adaptive trial of vegetables will be conducted for its suitability, as well as training and awareness amongst farmers for management and post- harvest care.

Direct & Co-Benefits

- Climate resilient crop production
- Food security

NDC Alignment- 6
SDC Alignment- 2, 12, 13

SAG/N/6- Cultivation of spices

Description- The activity involves production of black pepper rooted cuttings, production of ginger and turmeric seed rhizomes of improved varieties and maintenance of betel vines as well as standardization of agro technique in seed spices crop production technology.

Direct & Co-Benefits

- Climate resilient crop production
- Post-harvest value addition
- Enhanced productivity
- Pest and disease management
- Preservation of ethnomedicinal purpose

NDC Alignment- 6
SDC Alignment- 2, 12, 13

SAG/N/7- Cultivation of open field flowers

Description- The activity aims towards Commercial cultivation of economically important flowers in protected structure by the Department. The funds can be channelized from MIDH and HMNEH.

Direct & Co-Benefits

- Micro-irrigation for horticulture crops

- Protected cultivation
- Conservation of indigenous flower species

NDC Alignment- 6
SDC Alignment- 2, 12, 13

SAG/N/8- Mushroom cultivation

Description- Mushroom cultivation is one of the broad activities taken up by the Directorate of Horticulture & Soil Conservation in the State. The production of quality mushroom spawn and distribution among interested mushroom growers, popularization of mushroom production by the selected SHGs, standardization of production of Button mushroom as well as investments in lab instruments.

Direct & Co-Benefits

- Agroclimatic resilient horticulture crop
- Alternate income source during harsh climate

NDC Alignment- 6
SDC Alignment- 2, 12, 13

SAG/N/9- Support for composite fish farming (100 ha./ year)

Description- Composite fish farming with carps is the base of production technology in this state. Carp culture is a highly economic and profitable enterprise in India especially in Tripura state. Among many fish farming practices, the composite fish culture is one, which common fish farmers can easily adopt with comparatively less investment to have more production and income than the traditional farming practice. The common practice of composite culture includes 6 species of carps (3 indigenous and 3 exotic fishes) viz. Catla, Rohu, Mrigal, Silver carp, Grass carp and Common carp.

Direct & Co-Benefits

- Enhanced fish yield
- Food security

NDC Alignment- 6
SDC Alignment- 2, 6, 13

SAG/N/10- Support for Integrated Pig cum fish farming (100 ha./ year)

Description- Fish is the main source of animal protein for the people of Tripura and with almost 95% population being fish eaters there is high demand for fish with corresponding rise in population. With the available resources of fisheries, animals and crops here, the scope for integrated fish farming in the form of integration of fish with pigs, ducks, poultry, cattle and various agriculture and horticulture practices to obtain better livelihood security by judicious use of scarce resources of poor farmers particularly tribal farmers of the state is considerably wide.

Direct & Co-Benefits

- Manure management and methane capture in animal husbandry
- Waste utilization

NDC Alignment- 6
SDC Alignment- 2, 6, 12, 13

SAG/N/11- Ranching of Fish seed in natural and open water bodies (1000 ha. per year)

Description- River ranching or big water bodies fish ranching is an important scheme of the Department, where fish that are commercially important, native fishes which need replenishment are reared in a farmed environment and let into the river or water big bodies when they are of a certain size. The expectation is that they would develop so that local fishers can catch them. In this scheme, it is also

expected to maintain the ecological balance and conservation of fish species through natural recruitment in natural water bodies.

Direct & Co-Benefits

- Maintenance of ecological balance
- Conservation of native fish species

NDC Alignment- 6

SDC Alignment- 2, 6, 12, 13, 15

SAG/N/12- Training/ Awareness programme including fixing of hoardings (2000 no. beneficiary per year)

Description- Training and awareness programmes on the various aspects of fish farming like pond management, applying manure and lime, stocking, production, disease control, harvesting and sale are provided by the Directorate of Fisheries to the fishing communities.

Direct & Co-Benefits

- Climate Change Knowledge enhancement

NDC Alignment- 6, 8

SDC Alignment- 2, 7, 12, 13, 17

SAG/N/13- Reclamation of old ponds (500 ha./ year)

Description- Old ponds are subjected to siltation and weak embankment in due course of time. The Department aims to renovate the farm ponds as well as other ponds at Gram Panchayat level for enhancing fish production and productivity in the State. The major objective of the activity at a larger scale is Water Conservation and Water harvesting.

Direct & Co-Benefits

- Water harvesting and conservation
- Fish production
- Soil water conservation
- Enhanced carbon sequestration

NDC Alignment- 6

SDC Alignment-6, 13, 15

SAG/N/14- Development of Bio villages

Description- Bio- village is one of the flagship activities taken up by the Directorate of Biotechnology, Tripura. It is aimed towards sustainable socio-economic development of the beneficiaries with the climate relevant components. The Project includes distribution of chicks to community people, distribution of Biotech kit, including bio fertilizers, bio pesticides, bio fungicides, and yellow sticky Trap, intended to improve the soil health, ecology and food security. Distribution of mushroom cultivation in rural areas are aimed towards economic growth of women and rural youths. Installations of Solar Pump kit for drawing water from nearby water bodies, with low maintenance cost and sustainability. Fish feed materials are distributed to beneficiaries to accelerate their income.

Direct & Co-Benefits

- Improvement of environmental quality
- Energy efficiency
- GHG emission reduction
- Sustainable agriculture
- Integrated waste management

NDC Alignment- 1, 2,3, 4, 5, 6

SDC Alignment- 2, 6, 7, 12, 13, 15

SAG/N/15- Establishment and strengthening of College biotech club and DNA clubs

Description- A scheme namely setting up of College Biotech Club in order to foster the research activity, scientific mindset and creativity among students in different colleges of Tripura. Workshops on various technology like mushroom cultivation engaging local villagers are also initiated under the scheme.

Direct & Co-Benefits

- Climate Change Knowledge enhancement

NDC Alignment- 6, 8

SDC Alignment- 2, 7, 12, 13, 17

SAG/N/16- Setting of DNA clubs

Description- DNA clubs to be set up at school level, to nurture scientific knowledge and ideas in school students.Training are imparted to students and workshops were conducted on best practices from rural areas. The students are encouraged to bring new ideas related to their curriculum subjects. Financial support for the same shall be awarded to the selected schools.

Direct & Co-Benefits

- Conservation of species and germplasm
- Climate Change Knowledge enhancement

NDC Alignment- 6, 8

SDC Alignment- 2, 7, 12, 13, 17

6A.7 Key Priorities Synopsis: implementation arrangement and budget

Table 54: Synopsis of Planned Activities for the Agriculture and Allied Sector

Code	Activities/Interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Dept.	Remarks (if any)
					Central Scheme	State Scheme	External Aid		
Continuation of activities from SAPCC-1									
SAG/4	Crop Insurance (123400 ha)	PMFBY	2	2319	2087.1	231.9		DoAFW	
SAG/5	Hybrid Paddy (SRI) in 12,0000 ha area	NFSM- Rice	2	9000	8100	900		DoAFW	
	HYV (SRI) in 74,000 ha area	SAME (NMAET)	2	2788	2509.2	278.8		DoAFW	
	Cultivation of local scented rice in 4000 ha of area	NFSM- Rice	2	360	324	36		DoAFW	
SAG/7	Organic Farming (additional 12,000 ha area under organic cultivation)	Agriculture Development Scheme	2	5769		5769		DoAFW	
SAG/8	Soil Testing and SHC preparation of 174,000 numbers	NMSA	2	522	522			DoAFW	
SAG/9	Farm Mechanisation (11100 nos.)	SMAM	2	9550	8595	955		DoAFW	
	Creation of irrigation sources (6500 ha)	SMAM	2	6500	5850	650		DoAFW	
SAG/10	Reclamation of soil (29,000 ha)	SMAM	2	290	261	29		DoAFW	
	Deficiency Correction (29,000 ha)	SMAM	2	146	131.4	14.6		DoAFW	
SAG/11	Utilization of Rabi rice fallow (10, 000 ha area to be bought under cultivation)	NFSM- Rice	2	900	810	90		DoAFW	
	Special drive for Pulses & Oilseeds in RoFR areas (6,000 ha area to be bought under cultivation)	NFSM	2	540	486	54		DoAFW	
	Distribution of seed of 10,465 MT	State Plan Scheme	2	4826		4826		DoAFW	
	Distribution of Fertilizer of 11,5000 MT	State Plan Scheme	2	423		423		DoAFW	
SAG/14	Cross breeding of local cattle through Artificial Insemination using Frozen Semen (FS)	NPBB, RGM & NMBP	Till the scheme continues	10000	7600	240		TLDA under ARDD	
SAG/19	Distribution of Day Old Chicks (LIT bird) to beneficiaries & BLBH	National Livestock Mission (NLM), CSS Schemes for ST Development	Till the scheme continues	1750	1575	175		ARDD	

SAG/20	Capacity Building and trainings of farmers	Skill Development, NPBB	Till the scheme continues	1250	1125	125	NIL	ARDD	Rs. 5000 per head for 2500 trainees per year
Proposal of New activities to be added in SAPCC-2									
SAG/N/1	Market Development (e-NAM)	NeGP-A (NMAET)	2	1300	1170	130		DoAFW	
SAG/N/2	Skill Development	RKVY	2	450	405	45		DoAFW	
SAG/N/3	Assistance to the FPO/FPC	NABARD	2	40	40			DoAFW	
SAG/N/4	Fruits & commercial plantation crop	NHM	3	8842	7957.8	884.2		Horticulture Directorate	Yet to be finalised
SAG/N/5	Vegetable Cultivation	NHM	3	13890	12501.00	1389.00		Horticulture Directorate	Yet to be finalised
SAG/N/6	Cultivation of spices	NHM	3	1355	1219.50	135.50		Horticulture Directorate	Yet to be finalised
SAG/N/7	Cultivation of open field flowers	NHM	3	487	438.30	48.70		Horticulture Directorate	Yet to be finalised
SAG/N/8	Mushroom cultivation	NHM	3	120		120		Horticulture Directorate	Yet to be finalised
SAG/N/9	Support for composite fish farming (100 ha./ year)	PMMSY, RKVY, SCA to SCSP, SCA to TSS, PDF	10	4000	3600.00	400.00		Directorate of Fisheries	Under Central Schemes 40% subsidy is offered for UR beneficiaries and 60% subsidy is offered for ST/ SC beneficiaries
SAG/N/10	Support for Integrated Pig cum fish farming (100 ha./ year)	PMMSY, RKVY, SCA to SCSP, SCA to TSS, PDF	10	1000	900.00	100.00		Directorate of Fisheries	
SAG/N/11	Ranching of Fish seed in natural and open water bodies (1000 ha. per year)	PMMSY, RKVY, PDF	10	300	270.00	30.00		Directorate of Fisheries	
SAG/N/12	Training/ Awareness programme including fixing of hoardings (2000 no. beneficiary per year)	NFDB, RKVY, SCA to SCSP, SCA to TSS, PDF	10	114	102.60	11.40		Directorate of Fisheries	
SAG/N/13	Reclamation of old ponds (500 ha./ year)	RKVY, SCA to SCSP, SCA to TSS, PDF	10	20000	18000.00	2000.00		Directorate of Fisheries	
SAG/N/14	Development of Bio villages	State Plan	5	750		750		DBT	

SAG/N/15	Establishment and strengthening of College biotech clubs	State Plan	5	40		40		DBT and TBB	
SAG/N/16	Setting of DNA clubs	State Plan	5	101		101		DBT	
Total (in Crores)				**1097.22**	**865.799**	**231.421**			

CHAPTER 6B: SUSTAINING HIMALAYAN ECOSYSTEM

6B.1 Sectoral Overview

Tripura is extremely rich in biodiversity, playing a vital role in soil and moisture conservation providing sustainable livelihoods to local communities. Covering a total area of 10,491.69 sq. km, forested area is constituted of 6294.29 sq. km. Bamboo is a key resource, a total of 19 species occurring over an area of 3617 sq. km in the government forests of the State with an manifold increase in related economic activities. The Bamboo resource has faced an exploitation due to increasing demand, which has caused into resource depletion. In the light of climate change, it is estimated global levels of atmospheric greenhouse gases (GHGs) need to be stabilized at approximately 445-490 parts per million CO_2 e (CO_2 equivalent) or less, where Bamboo can be a tool for large-scale carbon storage (Bamboo grows 80% faster (or more) than comparable hard woods). 2 cane species, namely *Calamus Tenuis* and *Daemonorops jenkinsiana*are found in the State, with a major contribution to the State Domestic Product (SDP).

The State has 6 Protected Areas, including 4 Wildlife Sanctuary and 2 National Parks encompassing deciduous to semi evergreen forests and species of Bamboo, medicinal herbs and shrubs as well as wide faunal diversity.

6B.2 Impacts of Climate change in the sector

The continuous process of Jhum cultivation by the indigenous population has a degrading impact on forest in the hilly parts of the State, which has resulted in less average rainfall and uncertainty in the monsoon rainfall. A net decrease of 164 sq. km in the forest cover can be attributed to shift cultivation, harvesting of mature rubber plantations and other development activities.

6B.3 Key Issues and Challenges

Table 55: Key Issues and Challenges of Forest and Biodiversity Sector

Area	Issues/Challenges
Technical/Infrastructural	• Lack of data on availability, use, value addition and effective monitoring, leading to unsustainable harvesting and erosion of resource base • Integration of NTFPs in micro plan/ working plan and its implementation
Institutional	• Limited research studies available on Tripura ecosystem
Socio economic/Cultural	• Depletion of NTFPs due to Jhum Cultivation, over exploitation and fragmentation of lands restricting the economies of scale • High cultivation cost with less economical value addition • Dependency on local traders
Environmental	• Anthropogenic reasons attributing to forest fires

6B.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Sustaining Himalayan Ecosystem (SHE) sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

Code	Activities	Responsible/ Implementing Department	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Center/External)		
						Central Scheme	State Scheme	External Aid
SHE/1	Protection of existing forest lands from encroachment and illegal land use			• Chain-link mesh fencing was created over 106.91 km to protect Forests. Round the clock patrolling was ensured covering the entire forests.	966.20	CSS (90%)	CSS (10%)	
SHE/2	Protection of forests and forest land from soil erosion	Forest Dept.		• A total of 67 earthen checkdams and brushwood checkdams were constructed and Staggered contour trenching done over 91 ha, besides afforestation over 2754 ha under CAMPA.	851.55	CAMPA (100%)		
SHE/4	Conservation and Management of two major Wetlands Rudrasagar and Gumiti Reserve	Forest Dept.		• Construction of 5 nos. earthen check dams, ANR plantation over 10 ha, AR bamboo plantation over 15 ha, Riverbank plantation over 10 km, Riparian plantation over 10 km, Agro-Forestry 10.11 ha, Water harvesting structure 5 nos. Gully control structure 10 nos. Gully plugging 6 nos. etc.	347.58	NPCA (100%)		
SHE/5	Grazing Policy on domestic bovine population	Forest Dept., ARRD		• No such targets were given. However, 80 ha of fodder plantation was raised during 2020-21				
SHE/8	Studies to assess the impact of climate change on the endangered and vulnerable wildlife species in the state	TBB	Yes	• Studies were conducted from Tripura Biodiversity Board. Ecological status of four primate				

				species (Spectacled Langur, aped Langur, Pig-tailed Macaque & Rhesus Macaque) in Sepahijala Wildlife Sanctuary, Tripura and implemented by Sepahijala Wildlife Sanctuary.				
SHE/9	Monitoring of carbon stock and biodiversity at regular intervals		Yes	• Monitoring of carbon stock is done by the forest Survey of India				
SHE/10	Awareness creation on biodiversity conservation and its relation with the climate change to the Policy makers	TBB	Yes	• Every year 22nd May observed as International Day for Biological Diversity (IDB) on different themes which includes creation of awareness on the subject. Besides, Vanamahotsava and Wildlife Week are also celebrated every year for creating awareness about biodiversity conservation.	17	National Biodiversity Authority (100%)		
SHE/13	Documentation of the People's Biodiversity Registers and Biodiversity Conservation	TBB	No	• Peoples Biodiversity Registers (PBRs) have been prepared for 58 Blocks covering all the GPs/VCs in the State.		NBA (100%)		
SHE/14	Undertaking studies and investment promotion of NTFP and indigenous forest resources for adaptation of climate change	NCE		• NTFP Resource Assessment has been planned under Tripura JICA Project Phase-II.				
SHE/15	Ecotourism promotion for biodiversity protection and sustainable livelihood	TBB	Yes	• For the Ecotourism promotion 5 nos. of Biodiversity Heritage Sites has been identified and study has been conducted for Baramura Waterfall, Unakoti, Chabimura, Silachari Bat Cave, Betling Sib.	2.25		TBB (100%)	
				• Nature trail/ Bird watching/ Butterfly watching/ Nature walk programme has been conducted at different areas in the State for the Ecotourism promotion	0.40		TBB (100%)	

SHE/17	Documentation of Medicinal Plant resources in Tripura	MPBT	No	• Annual Action Plan for implementation of 36.064 National AYUSH Mission (NAM) under Component of Medicinal Plants for the year 2015-16. • Activity done for Arjun Plantation is 45 Ha and Construction of Drying Shed 3 nos.	36.064		MPBT (100%)	
SHE/18	Adopt appropriate land-use planning and watershed management practices for sustainable development of mountain ecosystem.	JICA-2		• ICA Phase-II Project (Project for Sustainable Catchment Forest Management in Tripura) has been formulated and launched based on watershed Management Principles. Appropriate land use planning is a part of Beat Forest Basic Plans (BFBP) prepared using Remote Sensing & GIS tools.				JICA (100%)
SHE/21	Creation and management of community and conservation reserves for economic welfare of local communities and conservation of Creation and management of community and conservation reserves for economic welfare of local communities and conservation of biodiversity.	IGDC		• Community Biodiversity Conservation Areas have been planned under IGDC Project Phase-II to be implemented under Dhalai and North Tripura.				
SHE/22	Capacity building of JFM committees and Panchayati Raj Institutions to adapt to climate change	Forest Dept.		• No such specific targets were given. However, similar activities have been planned under JICA and IGDC Project (Phase-II).				
SHE/26	Sequestering carbon through avenue plantations	Forest Dept.		• Roadside Beautification and Plantation in Tripura (RBPT) during the year 2016-17 to 2019-20 is 106.2 km.				
SHE/28	Awareness about climate change and its impact through 27 Eco-parks	Forest Dept.		• Creation of awareness about forest flora, fauna				

				&environmental conservation through showcasing in 32 eco parks is a continuing activity. Besides, Vanamahotsava is also celebrated every year for creating awareness about forestry and environment includes Climate Change.				
SHE/29	Promoting community-based management through developing mechanisms for incentives for protection and enhancement of forested lands.	JFM		• Joint Forest Management, a continuing programme of the State and is a part and parcel of almost all the Departmental activities.				
SHE/30	Building human and institutional capacities in the different existing / new Institutions in the Himalayan region.	Forest Dept.		• In this regard from 2016 to 2020 total 13 batch of forest staffs were trained and total number of trainees are 299 (all are Forest Guard and Foresters) by Tripura State Forest Academy. Besides other capacity Building Programmes are also undertaken under JICA & IGDC from time to time based on the requirement.				
Green Tripura Mission								
GTM/1	Provisioning services from forests, particularly fuel wood, fodder/grass/grazing; timber, cane/bamboo, NTFPs through creating community reserves	Forest Dept.	Yes	• Although no community reserve has yet been established in the State, development of fuelwood, fodder, grass, bamboo etc. from a part of regular working of Forests as per working plan prescriptions.				
GTM/2	Enabling adaptation of forest dependent local communities In the face of climatic variability	IGDC/ JICA Phase-2	Yes	• Undertaken as per the Project requirement and availability of budget provisions from time to time				
GTM/3	Promoting Urban Forestry (1000 Hectors Area will be taken under planting and after-care)	Forest Dept.	Yes	• Forest Department has created an Urban Forest Division and the Tripura Parks and Garden Society and the issue is being				

				addressed appropriately as per availability of resources from time to time.				
GTM/4	Agro Forestry and Social Forestry Promotion (1500 Ha will be taken under Agro/Social forestry to enhance Carbon Sinks)	IGDC/ JICA	Yes	• Taking up multi-tier plantation/Agroforestry is an important component of JICA & IGDC Projects, in RoFR land. Works taken up as per the APO.				
GTM/5	Rehabilitation of shifting cultivations (1 Lakh Ha will be restored to representative ecosystems through plantation of bio-diverse species mix to supplement natural	IGDC/ JICA	Yes	• Rehabilitation of abandoned jhum area and alternative income generation for jhumias are undertaken through JFMCs under the Department for the purpose.				
GTM/7	Valuation of existing forest wealth of Tripura	Forest Dept.	Yes	• No community accepted methodology exists. However, contribution to GDP was estimated to be Rs. 1195.66 lakhs in 2018-19. (Economic Review of Tripura)				
GTM/8	Tree Canopy covering improving by enrichment plantations with aim of optimum utility in degraded forest areas over 2 lakhs	Forest Dept.	Yes	• Plantation raised during the year 2016- 17 to 2019-20 is 12,994 ha. As per FSI Report 2019, at least 70% of Tripura's geographical forest area is covered with tree canopy density >40%, which shows that the State has been able to maintain canopy cover despite various challenges.				
GTM/9	Promoting rural households to adopt fuel wood efficiency and alternative RE device like improved Chulas, Biogas etc (Intervention in 20000 HH)	Forest Dept.	Yes	• As all rural households are being covered under Pradhan Mantri Ujjwala Yojna (PMUY), there is no separate programme for fuelwood efficiency rather the effort is on for fuel wood replacement by LPG in a planned manner.				
GTM/10	Strengthening of Forest Department (Infrastructure & Capacity Building)	Forest Dept.	Yes	Construction of 27 km chain link fencing	288.01	CAMP A		

				Construction of 3 nos. Range Offices.	148.90	(100%)		
				Construction of 5 nos. Hut /Barracks in vulnerable forest areas	54.54			
				Construction of 1 no. Inspection Hut in vulnerable forest areas	10			
				Construction of 5 nos. check dam/ Water harvesting structure	38.78			
				A large number of infrastructure development activities is also planned under JICA & IGDC Projects.				
GTM/11	GIS based Monitoring and Evaluation of the program	Forest Dept.	Yes	• Monitoring and Evaluation using RS/GIS technology is a continuing activity of the Department.	26.025	CAMPA (100%)		
GTM/12	Assessing Fire management Strategies	Forest Dept.	Yes	• Forest Fire Prevention & Management (FPM) (90:10) Scheme for the year 2020-21. Regular monitoring of fire and rapid action is carried out during fire seasons.	45.62	CSS (90%)	CSS (10%)	
GTM/13	Strengthening local level institutions about Forest Management Climate Change	Forest Dept.	Yes	• JFM is a continuing programme of the Department which amply addresses the issue.				
GTM/14	Livelihood improvement Activities	Forest Dept.	Yes	• Fishery, Fodder initiative, Bamboo, IGA/entry point activity are taken up from time to time towards livelihood development including those under JICA & IGDC.		CAMPA/ NAP		SCATFORM/ IGDC
GTM/15	Increasing plantation activities on outside forest land (Plantation Activities and Supporting natural Regeneration in 5000 Ha)	Forest Dept.	Yes	• Roadside plantation, Riverbank plan, railway embarkment and urban afforestation is carried out depending upon availability of resources from time to time.				
GTM/18	Certification of Rubber wood coming from Sustainably Managed Forests	TFDPC	Yes	• New plantation done during the period 2016-2020 is 761.55 ha.	1142.32		TFDPC (100%	
GTM/19	Energy Conservation within Rubber							

	Processing federation of TFDPC						)	
GTM/20	Enhancing the Resilience and Ability of vulnerable Species /ecosystems to adapt to climate change	IGDC/ JICA	Yes	• Departmental continuous Activities				
GTM/21	Enabling adaptation of forest dependent local communities in the face of climatic variability							

6B.5 Gap/Barrier analysis

Type	Gaps
Technical/Infrastructural	• Minimum manpower in the Department, to carry out climate change related studies
Financial	• Channelization of Central and State funds • Financial allocation of several activities is not present, involving utilization of Departmental funds
Institutional	• Inter Departmental coordination for similar activities
Planning	• Short term planning for the Department

6B.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 5: To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030	• National Afforestation Programme (NAP) • National Bamboo Mission • CAMPA • SCATFORM (Sustainable Catchment Forest Management in Tripura) • CREFLAT (Climate Resilience of Forest Ecosystems, Biodiversity & Adaptive Capacities of Forest Dependent Communities in Tripura) project
NDC 6: To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management	• Conservation of Natural Resources and Ecosystems

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 13: Take Urgent Action to Combat Climate Change and its Impact	• By 2030, ensure afforestation in denuded forest land, arresting soil erosion as well as degradation in affected areas • Maintenance of forest coverage • By 2030, Per capita forest and tree cover to reach 0.35 ha from 0.22 ha in 2016-17	• Forest fire Management and Prevention Scheme (FPM) • R&D for Conservation and Development Scheme
SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	• By 2030, State importance to proper conservation and sustainable use of these rivers	• Rudrasagar Wetland conservation
SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems,	• By 2030, comprehensive sustainable management system in place for	• Central Sector Scheme on Conservation, Development and Sustainable Management of Medicinal

sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss	restoration, conservation, and proper usage of ecosystems such as forests, rivers, wetlands, and mountains • By 2030, Forest area as a proportion of total land area to be 62% from 60% in 2016-17	Plants • Forest Fire Prevention and Management • Integrated Development of Wildlife Habitats (IDWH) • Project Elephant

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "SHE/N" are transformative activities and other set of activities are named as "SHE", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC (2014-17) and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Sustaining Himalayan Ecosystem sector.

GTM/ 18- Facilitating greater investment for realising true potential of rubber wood

Description-Tripura is the second largest producer of Rubber with 87,000 hectares under plantation. An additional 30,000 ha is planned by the Government of Tripura. Rubber Plantations are sources of Ancillary income like Wood, Honey, Seeds, Seed oil, Cover Crop.

Direct & Co-Benefits

- Mitigation of climate change
- Forest-based circular bioeconomy
- GHG emission reduction by replacing synthetic material and fossil fuels
- Increased carbon sink
- Temperature regulation

NDC Alignment- 5, 6

SDC Alignment- 15

SHE/N/1- Bamboo Resource Development

Description- Department will focus on production of high-quality bamboo seedlings of commercially important species and on plantation of industrially important bamboo species. The species identified for this purpose are: Mirtinga (*Bambusa tulda*), Bom (*Bambusa cacharensis*), Kanak kaich (*Thyrsostachyus oliverii*), Paora (*Bambusa polymorpha*), Rupai (*Dendracalamus longispathus*) and Dolu (*Neohouzea dullooa*). These species are commercially important and form the basis of a large number of secondary value addition activities. During the next 2 years, a total of 1.2 Crore quality bamboo seedlings will be produced and a total of 6000 ha be planted with the bamboo species.The above-ground biomass in the stands of two bamboo species,*Bambusa tulda* and *Dendrocalamus longispathus* have high potential for storing atmospheric carbon[34]. Bamboo carbon can be further sequestered and converted into durable products.

Direct & Co-Benefits

- Carbon sequestration
- Sustainable source of bioenergy
- Replacing fossil fuels and reducing deforestation
- Carbon- negative products

NDC Alignment- 5, 6

[34] https://www.nature.com/articles/nindia.2021.46#:~:text=On%20an%20average%2C%20one%20hectare,Indian%20bamboos%20are%20largely%20unexplored.

SDC Alignment- 7, 13, 15

SHE/N/2- Facilitation of inoculation of agar trees on private lands

Description- Department will focus on streamlining the supply of bamboo for industrial use from JFMCs at remunerative prices. Focus will also be on registration of private agar plantation and will facilitate inoculation of agar trees on private land. Under the Tripura Agar Wood Policy 2021, the government has proposed to double agar wood plantation by 2025.

Direct & Co-Benefits

- Carbon sequestration
- Biodiversity conservation
- Green economic opportunities

NDC Alignment- 5, 6

SDC Alignment- 11, 13, 15

SHE/N/3- Green Corridor Development

Description- Govt of Tripura has launched a scheme to develop green corridor along Roads/ Highways for beautification along with an additional objective of income generation by the private citizens residing beside the roads. It is proposed to cover most of the roads with emphasis on National highways and road leading to tourist destination. The scheme will cover 300 km of roadside plantation in 2 years under MGNREGA. Smriti Van initiative aims at plantation of trees for enhancing tree and forest cover in the State and also commemoration of the Purbajans. The Guidelines are innovative with the option of planting from a distance and geo tagging of each planted tree.

Direct & Co-Benefits

- Carbon sequestration
- Increased urban Biodiversity
- Maintenance of ecosystem services
- Flood mitigation
- Enhanced urban ventilation and reduced urban heat island effect

NDC Alignment- 5, 6

SDC Alignment- 11, 13, 15

SHE/N/4- Agroforestry plantation on RoFR land

Description-Department under JICA Project will assist RoFRPatta holders in raising agroforestry plantation on their patta land. A total of 5,000 ha agroforestry plantation at 0.5 ha per beneficiary will be raised after joint demarcation and mapping of patta land. Beneficiaries will be organized into 750 Joint Liability Groups (JLGs), each comprising 10-15 beneficiaries and will be provided technical support in collaboration with Agriculture/ Horticulture Department. Financial support available under JICA Project and MGNREGS will be utilized for agroforestry plantation in the ratio of 50:50.

Direct & Co-Benefits

- Carbon sequestration
- Restoration of degraded land
- Stabilisation of GHG emissions
- enhancing agricultural landscape resiliency
- Soil water conservation
- Increased carbon storage

NDC Alignment- 5, 6

SDC Alignment- 13, 15

SHE/N/5- Silvipasture/ fodder trees development, along with plantation of NTFP and RET species

Description- Department will carry out an assessment of the potential NTFPs through the budget available under JICA for conservation, augmenting, harvesting and value addition. Department will focus on plantation of NTFPs like Sugandh Mantri, Menda, Moringa, Black Pepper, Agar, etc over 1000 ha in 2 years. Plantation of RET species over 2000 ha as well as Silvipasture / Fodder trees over 700 ha will be taken up. In Silvipasture along with grass species emphasis will be given to Moringa species.

Direct & Co-Benefits

- Reduction in nutrient loss
- Reduction in fuel load
- Increased carbon capture and storage in plant biomass and soil

NDC Alignment- 5, 6

SDC Alignment- 13, 15

SHE/N/6- Soil and moisture conservation along with optimum utilization of check dams

Description- Department will create a total of 700 check dams of various models under EAPs, CAMPA and other Schemes. Efforts have been initiated for improved pisciculture in water areas created in the forests. A total of 3610 water bodies are presently available on Forest land spreading over2449ha area. Out of these water bodies, as per joint survey with Fishery Department, 556 nos. spreading over 426.67 ha area have been identified for Pisciculture. The JFMCs will be provided assistance by the Fishery Dept. in the matter, supported with appropriate models of aggregation for maximizing economic returns. Over 420 ha has already been identified for the initiative.

Direct & Co-Benefits

- Soil water conservation
- Aquifer recharge
- Increased vegetation cover
- Improved water-energy balance

NDC Alignment- 6

SDC Alignment- 13, 15

SHE/N/7- Forest protection with community involvement

Description- Joint Forest Management Committees are the primary institutional arrangement at village level to ensure the protection of forests through community involvement. Under JICA & IGDC Projects, the network of JFMCs will be expanded and strengthened. 150 new JFMCs will be taken up under JICA Project in next two years and 300 existing JFMCs will be strengthened. Awareness programmes will be conducted in the JFMCs. More than 1000 SHGs were created and supported under JICA-1. These will be brought under NRLM in a phased manner.

Direct & Co-Benefits

- Ecosystem regulation
- Biodiversity protection
- GHG emission reduction
- Carbon sequestration
- Implementation of carbon finance market transactions

NDC Alignment- 5, 6, 7

SDC Alignment- 8, 13, 15

SHE/N/8- Intensive management of eco-parks and protected areas

Description- Eco-parks draw huge visitors especially during winter. Efforts will be taken to strengthen and develop the tourism potential of eco-parks in the State in a phased manner. A total of 32 eco-parks,

spread over the state, are good source of providing environmental education to the visitors. Sepahijala, Trishna and Gomati Wildlife Sanctuaries have approved Management Plans and theses Plans will be implemented with the assistance from JICA, CSS, etc. Schemes to bring about qualitative improvements. New eco-tourism destinations will also be created at 3 places after feasibility study. Also, Bison Safari in the areas of Trishna Wildlife Sanctuary will be taken up under Eco-tourism.

Direct & Co-Benefits

- Biodiversity protection and conservation
- Air pollution reduction

NDC Alignment- 3, 6

SDC Alignment- 13, 15

6B.7 Key Priorities Synopsis: implementation arrangement and budget

Table 56: Synopsis of Planned Activities for the Forest and Biodiversity Sector

Code	Activities/Interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Dept.
					Central Scheme	State Scheme	External Aid	
Continuation of activities from SAPCC-1								
GTM/18	Facilitating greater investment for realising true potential of rubber wood	TFDPC	2	7581		7581		Forest Dept.
Proposal of New activities to be added in SAPCC-2								
SHE/N/1	Bamboo Resource Development: Production of high quality seedlings of industrially important bamboo species)	National Bamboo Mission	2	1200	1080	120		Forest Dept.
	Bamboo Resource Development: Plantation of industrially important bamboo species	National Bamboo Mission	2	5400	4860	540		
SHE/N/2	Facilitation of inoculation of agar trees on private lands	Forest Dept, NCE	2	30		30		Forest Dept.
SHE/N/3	Green corridor Development (Roadside beautification plantation) of 300 km	MGNREGA	2	2000	2000			Forest Dept.
	Green corridor Development Smritivan (7 nos.)	MGNREGA, State Fund	2	70		70		
SHE/N/4	Agroforestry plantation on RoFR land	JICA, MGNREGS	2	3000	1500	1500		Forest Dept.
SHE/N/5	Silvipasture/ fodder trees development, along with plantation of NTFP and RET species	JICA, CAMPA	2	2687				Forest Dept.
SHE/N/6	Soil and moisture conservation along with optimum utilisation of check dams	JICA, CAMPA, IGDC	2	3550	3550			Forest Dept.
SHE/N/7	Forest protection with community involvement							Forest Dept.
	Formation of new JFMCs	JICA	2	15			15	
	Strengthening of Existing JFMC	Forest Dept	2	50	50			
	Awareness programme	Forest Dept./ JICA	2	4	4			
SHE/N/8	Intensive management of eco-parks and protected areas							Forest Dept.

	Upgradation of Eco parks	CAMPA, JICA	2	186	186			
	Establishment of new Ecotourism destination	JICA	2	201			201	
	Scientific management of Wildlife Sanctuaries	Forest Dept.	2	900		900		
	Increasing visitors by improvement of infrastructure	Forest Dept.	2	600		600		
Total (in Crores)				**274.74**	**132.3**	**140.28**	**2.16**	

CHAPTER 6C: WATER MISSION

6C.1Sectoral Overview

The State has a total area of 24704.03 ha under culturable water area. The State geographically are intersected by river channels, Gomati, Howrah, Dhalai, Muhuri, Feni, Manu and Muhuri are the major rivers of the state. Tripura possess pristine water bodies, rivers, streams and wetlands which needs total conservation for sustainability and aquaculture. The State experience an average annual rainfall of 2100 mm, with both lentic and lotic water bodies, providing an array of ecosystem services. The lotic water bodies are rain dependent in nature, including the rivers, reservoirs, mini barrage, pond and tank. Average unit area of water bodies is 0.10 ha. The soil is mostly acidic red laterite sandy in nature having high load of iron and aluminium. Water holding capacity of the water bodies in the state are poor. The unique water bodies available in Tripura are mini barrages, which are situated mostly between hillocks by allowing rainwater to accommodate in the barrage from micro catchment and used for recharge of ground water and fish farming as well as irrigation.

The State is working efficiently towards increasing water use efficiency, regulation of groundwater extraction, maintenance of water quality, ensure safe drinking water supply services, water safety planning, storm water drainage, river water management and enhancement of culturable water area, amongst many other similar activities. Tripura accommodates the INDCs and Sustainable Development Goals (SDGs) in their departmental actions.

The responsible Departments working on the water sector are the wings of PWD, Water Resources (WR) and Drinking Water and Sanitation (DWS) along with TSPCB and AMC.

6C.2 Impacts of Climate change in the sector

The rivers in the State are majorly rain-fed and ephemeral, posing vulnerability to the changing rainfall patterns as a result of global climate change phenomenon. The rainfed rivers originating from the hills are susceptible to flooding in heavy rainfall. Sudden rain-bursts over a small time period makes the region prone to flood incidences. The total annual rainfall is likely to decrease, taking the present climatic conditions into account. The immediate impact of distortions in rainfall patterns will also be casted on crop production. he destruction of forest for the purpose of Jhum cultivation may also result the scanty rainfall and uncertainty in the monsoon rainfall. The temperature is also increasing day by day here and effects on human life.

6C.3 Key Issues and Challenges

Table 57: Key Issues and Challenges of Water Sector

Area	Issues/Challenges
Technical/Infrastructural	• Compliance and implementation of activities from SAPCC-1 • No distinction in departmental activities handled by PWD (DWS) and PWD (WR)
Policy & Regulatory	• Statutory Guidelines for protection & preservation of lakes, ponds and water bodies in Tripura
Institutional	• Programme for strengthening professional capacity in rural water sector
Socio economic/Cultural	• Water wastage from Public Hydrant points • Illegal water connections and theft • Increase in bottled water business, resulting in high plastic bottle load
Environmental	• Increasing stress on water resources due to population pressure • Quality of water- iron content in supplied water is high • Eutrophication in rural water bodies due to agricultural waste run off

6C.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Water sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

Code	Activities	Responsible/ Implementing Department	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Center/External)		
						Central Scheme	State Scheme	External Aid
WM/1	Creation of new minor storage/irrigation tanks-400	PWD (WR)		• Conservation and Development of River catchment for sustainable management of Water Resources, implemented by State Forest Department • Creation of 4,760 ha water area in 2380 check dams for improved moisture regime and better vegetation growth, water for irrigation and pisciculture, duckery, poultry, providing direct income support to 11,900 families • Check dam construction under MGNREGA				
WM/2	Protection and Conservation of large wetlands/ waterbodies (like Rudrasagar)	PWD (WR), Wetland Authority, TSPCB		• Establishment of Rudrasagar Development Authority (RDA) • Continuation of Desiltation; • Constitution of committee headed by DM for Rudrasagar/Dumboor to monitor related issues; • Afforestation in Catchments under JICA or other projects; • Preparation of and Integrated Master Plan to restore the ecological character of Rudrasagar wetland in future; • Strengthening of the Rudrasagar Unbastu Matasya Samabay Samiti (RUMSS) Limited by diversifying				

				activities from fisheries to agriculture and tourism; • Detailed survey of flora & fauna and other features of the Wetlands for the preparation of the management Action Plan (MAP) for each important wetland; • Cane plantations over an area of 700 ha. (100 ha. per year) covering wetland areas in all the divisions/sanctuaries, for protection of key wetland areas besides helping generation of income for the local people; • Eco-tourism based activities for Gumiti, Rudrasagar, Sepahijala and Trishna wetlands				
WM/3	Embankment raising in preventing high flood	PWD (WR)		• Construction of 154.41 km of embankment and 98 km of anti-erosion works by 2017 to protect 28,000 ha of land from flood submergence. • Construction of 150 km of bank revetment works among 831 rivers and streams in different parts of Tripura during 2017-2022 period • Riverbank plantation under afforestation programme by Forest Dept.				
WM/4	Development of GIS supported Database/status maps for all the existing water sources	PWD (WR)		• Mapping of groundwater contamination for groundwater protection and management • Identification of water body recognition of its problems (encroachment, diversion and pollution) through remote sensing/GIS maps • Mapping of Geographical details of water bodies in the state (size,				

				dimension, elevation) under the Indicative Action Plan for Restoration of water bodies				
WM/6	Extensive Awareness Generation Programme about water resource management	PWD (WR)		• To promote education and awareness among the different stakeholders on Wetland conservation by Tripura Forest Department				
WM/7	River conservation measures and river health monitoring sewerage Management	PWD (WR), TSPCB, DSTE (RRC)		• River Rejuvenation Committee for rejuvenation of 6 river stretches (Burigaon, Gomti, Haora, Juri, Khowai, Manu) • Preparation of Action Plan for individual river stretches • Monthly water quality monitoring under National Water Quality Monitoring Programme (NWMP) of CPCB				
WM/8	Establishment of Basin Authority for river conservation and Management	PWD (WR)		• State Level Committee constituted under the "Statutory Guidelines for Protection and Preservation of Lakes, Ponds and Water bodies in Tripura";				
WM/11	Installation of STW/DTW for irrigation	PWD (WR)		• Water Resource Department to bring 29,642 ha. under irrigation in 2017-18 to 2021-22 period by construction of 18 LI, 2 HPLI, 420 DTW, 7 Diversion, 128 Pick-up weir and 75 MI Storage schemes				
WM/14	Setting up Iron removal plants to remove excessive presence of iron in water	PWD (DWS)	Yes	• Setting up of 884 number of iron removal plants	23,456	JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog
WM/15	Setting up Surface Water Treatment Plant for supplying of Quality Water	PWD (DWS)	Yes	• Setting up of 7 number of Surface Water Treatment Plant for supplying of Quality Water		JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog

WM/17	Assessment of arsenic contaminated water areas/bodies/ground water sources	PWD (DWS)	Yes	• In the year 2005, analysis of 3800 water samples was carried outthrough the All India Institute of Hygiene & Public Health (AIIH&PH),Kolkata and presence of arsenic in 8 (eight) samples above permissiblelimit was found. • Further, samples from the said 8 (eight) locations werecollected by the Tripura State Pollution Control Board (TSPCB) andtested in the School of Environmental Studies, Jadavpur University,Kolkata.Arsenic beyond permissible limit was detected in 3 (three)samples.Accordingly, 8 (eight) spot sources (where arsenic was found above permissible limit) were sealed by the Department. • In addition,PWD(DWS) is conducting testing of water samples of piped watersupply schemes on regular basis - both Chemical & Bacteriological,but no arsenic has been detected beyond permissible limit in any of thewater samples tested so far.		JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog
WM/18	Installation of SBTW/DTW /Spot Sources (like OHP, Mark-II, Ring well) for drinking Water.	PWD (DWS)	Yes	• Number of installations: DTW: 1381 nos. SBTW: 4495 nos.		JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog
WM/19	Extensive Awareness Generation Programme about Safe use of drinking water & sanitation.	PWD (DWS)	Yes	• IEC and IPC programmes in Gram Panchayats were conducted; 755 IEC programmes conducted in school • Awareness meetings across rural areas with Gram Pradhans, PRIs and ASHA workers through Gram Sabha and door to door visits- 5306 • No. of TV Spot and radio jingle conducted- 4758		JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog

				• Organizing 555 street dramas • Awareness generation through flex/ hoarding/wall paintings- 1543				
WM/20	Setting up of Block level water testing laboratory for drinking water parameters	PWD (DWS)	Yes	• Monthly Water Analysis Report for all the stations and water streams. 45540 samples tested at laboratory • Water Quality Monitoring during festivals;		JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog
WM/21	Setting up of Scientific Research Laboratory for drinking water & wastewater parameters	PWD (DWS)	Yes	• Establishment of a State level Water testing laboratory in Tripura • The State Level Water Testing Laboratory is NABL accredited from 16.06.2016 to 22.09.2022 and 3454 samples were tested at State Laboratory		JJM Central (90%)	JJM State (10%)	RIDF, MSDP, NITI Aayog

6C.5 Gap/Barrier analysis

Type	Gaps
Technical/Infrastructural	• Absence of a sectoral vulnerability assessment
Financial	• Acute shortage of fund due to non-release of balanced fund under AIBP • Fund distribution amongst different wings of PWD, resulting in shortage in relevant climate relevant actions
Institutional	• Institutional wings of waters sector are not well-aligned and over-lapping of activities
Planning	• No targets given under per capita availability of water in base year 2016-17 under SDG-13 • Inter-departmental coordination between Water department and Fisheries Department for sustainable Aquaculture practices • Inter-departmental coordination between Water department and Health Department for abatement of pollution and water related health issues

6C.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 6: To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management	• AIBP Medium and Minor Irrigation • Jal Jeevan Mission • PMKSY (Har Khet ko Pani) • NABARD Load (RIDF) • Special Development Scheme (State resource) • Special Central Assistance (through the fund of NITI Aayog) in TTAADC areas • National Hydrology Project (CASP/ Central sector) • River Management activities & works related to Border areas • Flood Management Programme

Specific Targets under SDG for the Sector

SDG Goals	Key State level Initiative to comply with SDG Goals
SDG 6: Ensure availability and sustainable management of water and sanitation for all	• Tripura Solid Waste Management Policy, 2018 • Safe sanitation under Swachh Bharat Mission Grameen • National Rural Drinking Water Programme (NRDWP) • Saansad Adarsh Gram Yojna (SAGY) • Intensive coverage under Swachh Bharat Mission (SBM)
SDG 13: Take urgent action to combat climate change and its impacts	• Environmental Impact assessment for changes in rainfall, more flooding and drought • Legislation on protected areas in culturable water areas, lakes and ponds • Increase in water use efficiency
SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	• River Water Management • Protection and conservation of wetlands • Conservation and sustainable use of rivers

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "WM/N" are transformative activities and other set of activities are named as "WM", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC (2014-17) and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Water Mission sector.

WM/1- Creation of new minor storage/ irrigation tanks

Description- The activity is planned to be continued by the Department of Water Resources, Tripura. stage of expansion of irrigation infrastructure based on available surface flow has reached almost to its optimum level. rain water harvesting MI Storage reservoir is more suitable option for irrigation.The activity encompasses creation of MI storage tanks (21 nos.in 7,948.5 ha area), Diversion channels (7 nos. in 1050 ha. area), Lift irrigation system (13 nos. in 390 ha. area), with assistance from State. The financial support will be provided through Rainwater harvesting scheme, Diversion scheme and Lift irrigation scheme, respectively.

Direct & Co-Benefits

- Groundwater replenishment
- Top-soil conservation
- Soil-water conservation

NDC Alignment- 6

SDC Alignment- 6, 13, 14

WM/2- Protection and Conservation of large wetlands/ waterbodies

Description-The water bodies are conserved and protected through the varied inter- departmental activities of the State. The activity includes conservation and protection of Rudra Sagar Wetland, command area development of Kalashi Barrage and Hoara Dam under financial assistance from central scheme CADP.

Direct & Co-Benefits

- Maintenance and regulation of ecological balance
- Groundwater recharge
- Carbon sequestration

NDC Alignment- 5, 6

SDC Alignment- 6, 13, 14

WM/11- Installation of SBTW and DTW for irrigation

Description- As per the CGWB assessment, the rate of ground water extraction of Tripura is very less (7.88%) in comparison to national level (58%). The Department plans for a viable option for irrigation through SBTW and DTW. Installation of SBTW (6621 nos. in 9931.5 ha.) and DTW (87 nos. in 1740 ha) has been planned for 3 years through utilization of State Fund.

Direct & Co-Benefits

- Enhanced Agriculture productivity
- Flood management

NDC Alignment- 6

SDC Alignment- 6, 14

WM/14- Setting up Iron removal plants to remove excessive presence of iron in water

Description- Iron contamination is an issue faced in pockets of the State and the Department plans to continue its treatment through setting up of iron removal plants for provision of quality water.The activity is planned under the financial assistance of Jal Jeevan Mission by PWD (DWS).

Direct & Co-Benefits

- Water quality improvement and management
- Drinking water accessibility

NDC Alignment- 6
SDC Alignment- 6, 14

WM/15- Setting up Surface Water Treatment Plant for supplying of Quality Water

Description- Treatment of Surface Water is an essential and regular activity under the Department of Drinking Water and Sanitation (DWS), Tripura. The activity is planned for the coming 3 years in the State with fund allocation from Jal Jeevan Mission.

Direct & Co-Benefits

- Water quality improvement
- Drinking water accessibility

NDC Alignment- 6
SDC Alignment- 6, 14

WM/17-Assessment of arsenic contaminated water areas/bodies/ground water sources

Description- Ground water sources face contamination due contamination at source or channels. Assessment of arsenic and other harmful elements can further deteriorate the quality of water for consumption. The Department plans installation of Ground water treatment Plants in the State in order to monitor and improve the groundwater quality. The activity will be taken up by PWD (DWS) under assistance from Jal Jeevan Mission.

Direct & Co-Benefits

- Water quality improvement
- Drinking water accessibility

NDC Alignment- 6
SDC Alignment- 6, 14

WM/18- Installation of SBTW/DTW /Spot Sources (like OHP,Mark-II, Ring well etc) for drinking Water

Description- The activity will involve installation of Deep Tube well, Small bore deep tube well, Deep Tue well with IRP and innovative water supply scheme under Jal Jeevan Mission for improvement in quality of drinking water and its sources. The activity will be carried out by PWD (DWS).

Direct & Co-Benefits

- Water quality improvement
- Drinking water accessibility

NDC Alignment- 6
SDC Alignment- 6, 14

WM/N/1- Flood Protection/Anti erosion work at vulnerable location along the bank of different Rivers and streams

Description- Flood Protection/Anti erosion work at vulnerable location along the bank of different Rivers and streams of Tripura State for an amount of Rs. 1405.70 crore has been uploaded in the EAP portal of GOI for assistance from ADB.

Direct & Co-Benefits

- Natural flood and erosion control
- Surface water quality maintenance
- Groundwater recharge

NDC Alignment- 6

SDC Alignment- 6, 13, 14

WM/N/2- Flood protection/anti erosion work

Description- Flood protection and anti-erosion works are planned to be carried out for a length of 152.2 km in the State. The activity will be supported by the Department of Water Resources (WR) under the Flood protection scheme for the next 3 years.

Direct & Co-Benefits

- Natural flood and erosion control
- Surface water quality maintenance
- Groundwater recharge

NDC Alignment- 6

SDC Alignment- 6, 13, 14

WM/N/3- Raising & strengthening of Existing Embankment

Description- Strengthening of existing embankments in one flood protection and anti-erosion measure to be taken up by the State under RIDF-XXV, covering an area of 154.5 km. The Activity is planned under 3-year planning of Department of Water Resources (WR).

Direct & Co-Benefits

- Natural flood and erosion control
- Surface water quality maintenance
- Groundwater recharge

NDC Alignment- 6

SDC Alignment- 6, 13, 14

WM/N/4- Creation of New Embankment

Description- In Flood Management sector, creation of new embankments along with strengthening of the existing ones are essential for protection against floods. A total of 47.03 km is planned for creation of new embankment. The embankment will be established under the assistance from RIDF-XXV by the Department of Water Resources (WR).

Direct & Co-Benefits

- Natural flood and erosion control
- Surface water quality maintenance
- Groundwater recharge

NDC Alignment- 6

SDC Alignment- 6, 13, 14

WM/N/5- Cane/Bamboo plantation along the toe of New and existing embankment

Description- Plantation alongside the embankment provides support against floods and surface erosion. For the due purpose the Department has planned cane and bamboo plantation in 201.4 km in both new and existing embankments under the RIDF-XXV.

Direct & Co-Benefits

- Flood protection
- Carbon sequestration
- Maintenance of Ecological balance

NDC Alignment- 5,6

SDC Alignment- 6, 13, 14, 15

6C.7 Key Priorities Synopsis: implementation arrangement and budget

Table 58: Synopsis of Planned Activities for the Water Sector

Code	Activities/Interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Dept.	Remarks (if any)
					Central Scheme	State Scheme	External Aid		
Continuation of activities from SAPCC-1									
WM/1	Creation of new minor storage/ irrigation tanks : MI Storage scheme	Rainwater Harvesting Scheme	3	21,000		21,000		PWD (WR)	
	Diversion Scheme	Diversion Scheme	3	7,000		7,000			
	Lift Irrigation Scheme	Lift Irrigation Scheme	3	520		520			
WM/2	Protection and Conservation of large wetlands/ waterbodies (Command Area Development of Rudrasagar and others	CADP	3	1,000	1,000			PWD (WR)	
	Command Area Development of Kalashi Barrage (500 ha)	CADP	3	1,288	1,288				
	Command Area Development of Hoara Dam (700 ha)	CADP	3	5,108	5,108				
WM/11	Installation of SBTW and DTW for irrigation	State Fund	3	41,882		41,882			
WM/14	Iron Removal Plant (IRP)	Jal Jeevan Mission	3	7,461	6715	746		PWD (DWS)	Functional Household Tap connection to be provided from the proposed scheme
WM/15	Surface Water Treatment Plant (SWTP)	Jal Jeevan Mission	3	3,200	2880	320		PWD (DWS)	
WM/17	Groundwater Treatment Plant (GWTP)	Jal Jeevan Mission	3	1,850	1665	185		PWD (DWS)	
WM/18	Installation of • Deep Tube Well (DTW) • Small Bore Deep Tube Well (SBDTW) • Deep Tube Well with IRP • Innovative Water Supply	Jal Jeevan Mission	3	2,18,735	196862	21874		PWD (DWS)	

	Scheme								
Proposal of New activities to be added in SAPCC-2									
WM/N/1	Flood Protection/Anti erosion work at vulnerable location along the bank of different Rivers and streams	ADB Assistance		140,570			140,570	ADB, PWD (WR)	
WM/N/2	Flood protection/anti erosion work	RIDF-XXV	3	103,512	103,512			PWD (WR)	
WM/N/3	Raising & strengthening of Existing Embankment	RIDF-XXV	3	18,838	18,838			PWD (WR)	
WM/N/4	Creation of New embankment	RIDF-XXV	2	24,840	24,840			PWD (WR)	
WM/N/5	Cane/Bamboo plantation along the toe of New and existing embankment in 201.4 km	RIDF-XXV	2	125	125			PWD (WR)	
Total (in Crores)				**5894.09**	**3628.324**	**860.066**	**1405.7**		

CHAPTER 6D: HEALTH MISSION

56.1 Sectoral Overview

Human health plays an important role in well-being and is inextricably linked with both the environment and development. Climate change inevitably affects the basic requirements for maintaining health, clean air and water, sufficient food and adequate shelter. Climate Change poses new challenges to the control of infectious diseases. As climate change affects air and water quality, it becomes necessary to focus on adapting to the health effects. Many of the major killers are highly climate sensitive with respect to temperature and rainfall, including Cholera and the diarrheal diseases, as well as diseases including malaria, dengue and other infections carried by vectors. Also, the tissues of reductions and seasonal changes in the availability of fresh water, regional drops in food production etc has the potential to force population displacement with negative health impacts. The State Health department in order to extend the benefit of the programme to the entire population has introduced the state Climate change cell in the department[35]. In Tripura, there are 2 Medical Colleges, 6 State Hospitals, 6 District Hospitals, 12 Sub-Divisional Hospitals, 22 CHCs, 107 PHCs, 6 UPHCs, 35 Ayurvedic Government Dispensary, 73 Homeopathic Government Dispensary and 1020 Health Sub-Centres.

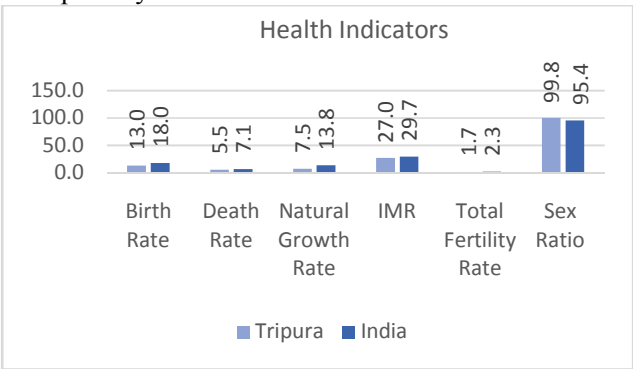


Figure 40: Comparative Health Indices India and Tripura

During 2011, Infant Mortality Rate (IMR) was 29 that reduced to 27 per 1,000 live births during 2018 against the National IMR of 29.7. During 2011, the birth rate in the state was 14.3 that reduced to 13.0 during 2018 against the National value of 18.0. In 2018, Total Fertility Rate (TFR) in the state was 1.7 against National TFR of 2.3. The natural growth rate in the state is 7.5 against the National value of 13.8. Existing Maternal Mortality Ratio (per one lakh population) in the State is 87 in 2016.

6D.2 Impact of Climate Change

Climate change impacts human health directly and indirectly:

- Direct Impact- Floods, droughts, storms, increased number of warm days and nights; heat waves; cold spells – injury & death
- Indirect Impact- Water-borne & vector-borne diseases, increase incidence of non-communicable diseases, low food production leading to malnutrition

Social and environmental factors like adequate food, proper shelter, clean air and safe drinking water gets affected by climate change. It is estimated that climate change will trigger more deaths rising from heat stress, malnutrition, malaria and diarrhoea. Increase in temperature will cause more cardiovascular and respiratory diseases among elderly people. Increased incidence of natural disasters will affect people and their livelihood resulting in death directly and indirectly through infections and disturbed food security.

[35] 2ND DRAFT TRIPURA PUBLIC HEALTH POLICY 2019

Malaria is considered as a major public health issue in Tripura. In all the districts, Dhalai District is more prone to malaria. According to API (Annual Parasite Incidence), the endemic areas in Dhalai district are Manikpur, Ganganagar, Chawmanu, Chailengta, Jagabandu Para, Ambassa and Manu.[36]

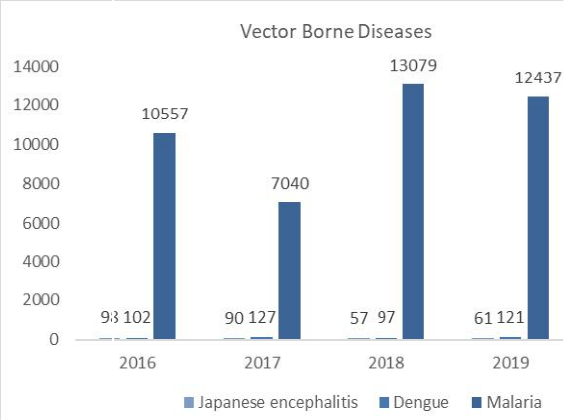


Figure 41: Number of Vector Borne Diseases in Tripura from 2016 to 2020

The number of malaria cases significantly reduced from 51240 in 2014 to 3395 in 2020. The State observed 19 number of JE cases in 2020 that was lowest during the last five years. Several initiatives like awareness generation, fever screening programme, special health camps, formation of District level Malaria elimination Committee have been taken for elimination of malaria.

6D.3 Key Issues and Challenges

Table 59: Key Issues and Challenges of Health Sector

Area	Issues/Challenges
Financial	• Dependency on flow of grants from Central and State Government • Availability of finance
Technical/Infrastructural	• Infrastructure issues because of its location in south-west corner of the North-Eastern Region • Understanding of vulnerability assessment findings and what it means for the sector • Dietary habit of people in remote areas
Institutional	• In-house experts advising on departmental programs • Need of Early Warning System
Socio economic/Cultural	• Providing better healthcare facility at an affordable price for economically weaker section

[36] Malaria Situation in Dhalai District, HFW, Tripura

6D.4 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Health sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

<table>
<tr><th rowspan="2">Code</th><th rowspan="2">Activities</th><th rowspan="2">Continuation of Activity (Yes/No)</th><th rowspan="2">Physical Progress (2016-2020)</th><th rowspan="2">Financial allocation for the Activity (in Lakhs)</th><th colspan="3">Source Funding (State/Centre/External)</th></tr>
<tr><th>Central Scheme</th><th>State Scheme</th><th>External Aid</th></tr>
<tr><td colspan="8">HEL/1. Formulating Adaptation strategies to reduce the impact of climate change issues affecting human health</td></tr>
<tr><td>1.1</td><td>Upgradation of state health policy through incorporation of Health Impacts due to climate change</td><td>Yes</td><td>Draft Health policy is prepared and it is under the process of finalization</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1.2</td><td>Research initiatives for changed patterns of diseases by region and by climate parameters</td><td>Yes</td><td>5 research activities and project taken up from Agartala Medical Government College (AGMC)</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="8">HEL/2. Health impacts due to drinking water contamination and temperature variation</td></tr>
<tr><td>2.1</td><td>Identification of vector borne diseases like malaria, kala-azar, dengue, filarial, encephalitis etc.</td><td>Yes</td><td>No of positive cases identified during last 5 years
<table>
<tr><th>Year</th><th>JE</th><th>Dengue</th><th>Malaria</th></tr>
<tr><td>2016</td><td>98</td><td>102</td><td>10557</td></tr>
<tr><td>2017</td><td>90</td><td>127</td><td>7040</td></tr>
<tr><td>2018</td><td>57</td><td>97</td><td>13079</td></tr>
<tr><td>2019</td><td>61</td><td>121</td><td>12437</td></tr>
<tr><td>2020</td><td>19</td><td>25</td><td>3395</td></tr>
</table></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.2</td><td>Establishment/Upgradation of pathological laboratories for disease identification caused due to climate variations</td><td>Yes</td><td>3 laboratories (1 at state level and 2 at district level) upgraded</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.2</td><td>Public health infrastructure development</td><td>Yes</td><td>12 (PHC)</td><td></td><td></td><td></td><td></td></tr>
</table>

6D.5 Gap/Barrier analysis

Type	Gaps
Financial	• Delay in funding • Need of financial resources to provide multi-specialty health care • Insufficient allocation of finance for construction of health facilities due to large area of the state and scattered population
Policy & Regulatory	• Revision of health policy from time to time
Institutional	• Need of convergence among line department and common action point leads to poor indicator of health • Poor healthcare infrastructure • Need of sufficient healthcare staffs in remote areas
Socio-Economic/Cultural	• Behavioral change of people • Need to sensitize the people living in remote areas about health care services

6D.6 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 1: To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation	• The state aims to extend public health care services with affordable prices, under **"health care for all"** with particular to poor and backward, providing adequate and qualitative preventive and curative health care • Effective steps for ensuring greater access to primary health care by providing medical institutions as close to the people as possible • Taking effective preventive health measures through 100% vaccination under various disease prevention programmes like **Mission- Indra Dhanush** • Ensure nutritional and food supplement to all segments and ages especially in TTAADC • The state will give highest priority for improving maternal and child health care to reduce the maternal and infant mortality rates • The State will ensure effective coverage of affordable quality health care through allopathic as well as homeopathic, ayurvedic system of medicine etc. of **AYUSH programme**. • Training programmes for Medical officers and health workers related to Climate Change and Health

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 3: Ensure healthy lives and promote wellbeing for all at all ages	• By 2030, health sector will be capable of providing adequate, qualitative, preventive and curative health care without financial hardship ensuring affordable quality health care to all through Allopathic as well as Homeopathic and Ayurvedic system of medicines etc. • By 2030, ensuring greater access to primary health care by providing medical institutions as well as increasing the health workers close to the people as possible • Special emphasis will be given to reduce, and cure cases of vector borne, water borne and communicable diseases to bring down to half of present level. • State aims at Infant Mortality Rate (IMR) of 10 and under-five mortality rate (U5MR) at 20 per 1000 live birth by 2030. Existing Maternal Mortality Ratio (per one lakh population) will be brought down from 87 in 2016 to 25 by 2030. • There will be preventive and curative healthcare in hilly and remote areas especially for ST population by augmenting greater access of medical institutions and increasing the health workers. • The coverage of full vaccination will be increased for ST children aged 12-23 months, from 32.2% to 90% and institutional delivery for ST pregnant women aged 15-49 years will be increased from 51.1% to 90% by 2030.	• National Health Mission • Ayushman Bharat Pradhan Mantri Jan Arogya Yojana (PM-JAY) • Pradhan Mantri Bharatiya Janaushudhi Pariyojana • Pradhan Mantri Suraksha Bima Yojana • Chiranjeevi Yojana • Janani Shishu Suraksha Karyakaram (JSSK) • Kasturba Poshan Sahay Yojana (KPSY) • Rashtriya Kishor Swasthya Karyakaram (RKSK)
SDG 6: Ensure the availability and sustainable management of water and sanitation for all	• 100% safe drinking water and safe sanitation will be provided to all by 2030, through facilities in institutional, major public places and household spheres, with special attention to the needs of women and girls including those in hilly and remote areas.	• Swachh Bharat Abhiyan • Jal Jeevan Mission

	• Enhancing the quality of life of the people by providing safe, sustainable drinking water supply and sanitation facilities and services along with promoting hygiene practices amongst the people by 2030.	

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "**HEL/N**" are transformative activities and other set of activities are named as "**HEL**", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Health sector.

HEL/1- Task force Meeting to draft health sector plan for heat and air pollution

Description- Drafting ofhealth sector plan for heat will strengthen the approach to deal with heat conditions in the State in future. This activity will focus on continuously sensitizing the staff of control rooms on treatment protocols from March to June to deal with heat stress. Key Strategies in coming year are strengthening the surveillance, standardizing the investigation of deaths due to suspected heat stroke cases, developing District/ City specific heat and health action plan, increasing public awareness and community outreach, developing measures for early warning system/ alerts and response at district level. The draft health sector plan will also consider in controlling of diseases arising from air pollution. Strategies proposed will help to expand Acute Respiratory Illnesses (ARI) surveillance in the polluted cities of States, developing District/Cities level health sector adaptation plan for air pollution and health.

Direct & Co-Benefits

- Human health improvement and security

NDC Alignment- 1, 8

SDC Alignment- 3, 6, 13

HEL/3.1a- Sensitization workshop/ meeting of the state programme officers and district level health officers

Description- Sensitization workshop/ meeting of the state programme officers and district level health officers with respect to climate change is an essential element of the global response to climate change. It helps them to understand and address the impact of global warming that will enhance their "climate literacy" and helps them adapt to climate change related trends. This will play an essential role in increasing adaptation and mitigation capacities of health sector empower people to adopt sustainable healthy lifestyles**.**

Direct & Co-Benefits

- Human health improvement and security

NDC Alignment- 1, 8

SDC Alignment- 3, 6, 13

HEL/3.1b- Trainings of Medical Officers, Health Workers and Programme Officers under NPCCHH (National Program on Climate Change and Human Health)

Description- Increasing awareness of the linkages between climate and health is fundamental to taking protective actions against climate related health risks. Trainings of Medical Officers, Health Workers and Programme Officers under NPCCHH will strengthen the capacity of healthcare system to reduce

illnesses/ diseases due to variability in climate. This will lead to strengthening of Healthcare system in context of climate change and also build capacity in context of vulnerability against climate sensitive illnesses at district level in the state.

Direct & Co-Benefits

- Human health improvement and security

NDC Alignment- 1, 8
SDC Alignment- 3, 6, 13

HEL/N/1- Greening of Health Sector; DH/CHC as per IPHC guidelines

Description- Greening of health sector will help in our physical and mental health, as well as offsetting some of the carbon emissions creating in the local area that would otherwise contribute to climate change. Green spaces and other nature-based solutions offer innovative approaches to increase the quality of environment, enhance local resilience and promote sustainable lifestyles, improving both the health and the well-being.

Direct & Co-Benefits

- Human health improvement and security

NDC Alignment- 1, 8
SDC Alignment- 3, 6, 13

HEL/2- Life extension of existing roof top off grid solar power plant (power back up and hot water supply) with replacement of batteries and AMC contract for 5 years in different hospitals (DH-2/ CHC-11/ PHC-66) in Tripura by TREDA

Description- Strategies like training of staffs in the use of renewable energy, life extension of existing roof top off grid solar power plant and use of energy efficiency measures will help to reduce the carbon footprint of hospitals.

Direct & Co-Benefits

- Energy efficiency
- Increased energy mix

NDC Alignment- 1, 8
SDC Alignment- 3, 6, 13

HEL/N/3- Disease Vulnerability Assessment relevant to Climate Change

Description- The importance of conducting a disease vulnerability assessment is that it allows the health department to understand the people and the regions in their jurisdiction that are more prone to adverse health impacts associated with the climate-related exposures modified by climate change. This assessment of disease vulnerability can then be used to implement targeted public health interventions to reduce the burden of public health impacts. The changing climate results in increase of non-communicable and infectious diseases. Disease Vulnerability Assessment relevant to climate change can help health departments to assess and prevent associated adverse health impacts.

Direct & Co-Benefits

- Human health improvement and security
- Climate Change Knowledge enhancement

NDC Alignment- 1, 8
SDC Alignment- 3, 6, 13

HEL/N/4- IEC activities

Description- Integrating IEC activities will help in awareness generation, development of IEC in local languagewill help to explain local people the impact of climate change on human health, and to make a

communication plan for dissemination of health-related alerts/ education materials for target or general population

Direct & Co-Benefits

- Climate Change Knowledge enhancement
- Skill development on climate change

NDC Alignment- 1, 8

SDC Alignment- 3, 6, 13

6D.7 Key Priorities Synopsis: implementation arrangement and budget

Table 60: Synopsis of Planned Activities for the Health Sector

Code	Activities/ interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed Budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Department
					Central scheme	State scheme	External Aid	
Continuation of activities from SAPCC-1								
HEL/1.1	Task force Meeting to draft health sector plan for heat and air pollution	State Fund	1	0.50		0.50		DoHFW
HEL/3.1	Sensitization workshop/ meeting of the state programme officers and district level health officers	State Fund	5	5.00		5.00		DoHFW
HEL/3.2	Trainings of Medical Officers, Health Workers and Programme Officers under NPCCHH (National Program on Climate Change and Human Health)	NPCCHH	5	2.50	2.50			DoHFW
Proposal of New activities to be added in SAPCC-2								
HEL/N/1	Greening of Health Sector; DH/CHC as per IPHC guidelines	Central Fund	5	14.00	14.00			DoHFW
HEL/N/2	Life extension of existing roof top off grid solar power plant (power back up and hot water supply) with replacement of batteries and AMC contract for 5 years in different hospitals (DH-2/ CHC-11/ PHC-66) in Tripura by TREDA	State Fund	5	10.00		10.00		DoHFW
HEL/N/3	Disease Vulnerability Assessment relevant to Climate Change	State Fund	5	10.00		10.00		DoHFW
HEL/N/4	IEC activities	State Fund	5	25.00		25.00		DoHFW
Total (in Crores)				**0.67**	**0.165**	**0.505**	**0**	

CHAPTER 6E: STRATEGIC KNOWLEDGE MANAGEMENT

6E.1 Sectoral Overview

Tripura government and the respective departments have contributed to the sectoral knowledge development addressing the increasing impacts of climate change. The knowledge centre have carried out studies on impacts of the unprecedented climate change events, district level vulnerability assessment. The state is a repository of an array of natural resources harnessed by different sectors for their economic development and livelihood generation. Also, the state owing to its geographic location and existing vulnerability in both hilly and plain regions, there is an urgent need to study the future expected changes and develop adaptation and mitigation strategies for the sustenance of the system. In order to tackle the issue of lack of awareness on climate change and alignment of sectoral activities in line with the ongoing climate trends, a strong research base is required along with dissemination of the same on a wide platform.

The state has identified the major departments which will face the negative impacts and the vulnerable sectors. The sectors are: Sustaining Himalayan Ecosystem, Green Tripura, Agriculture and allied, Water mission, Solar Mission, Energy Efficiency, Sustainable Habitat, Health and Strategic Knowledge Management.

All the Departments involving the vulnerable sectors are part of the Strategic Knowledge Management in the State. The departments have taken up capacity building and awareness generation programmes on climate change in their respective sectors. The Nodal department responsible for the Strategic Knowledge Management is the Department of Science, Technology and Environment (DSTE) and the Tripura Climate change Cell (TCCC).

6E.2 Key Issues and Challenges

Table 61: Key Issues and Challenges of Strategic Knowledge Sector

Area	Issues/Challenges
Technical/Infrastructural	• Minimum coverage of activities from the SAPCC-1 • Absence of critical sectors under Action Plan, including industries, rural development, disaster management
Policy & Regulatory	• Implementation of National Mission on Strategic Knowledge of Climate Change and strengthening of Tripura Climate Change Cell • Financial allocation at sectoral level is meagre
Institutional	• Absence of a departmental Climate change cell, dealing solely with activities of the department concerning climate change • Crunch of climate change professionals in the field
Socio economic/Cultural	• Knowledge dissemination at Departmental and official level • Lack of awareness of officials on Climate Change Action Plan
Environmental	• Increasing climate change impacts in the North eastern regions necessitates the need of sectoral vulnerability assessment • Land use changes in the North east States

6E.3 Progress Mapping (in last 5 years)

Physical Progress

The achievements under the strategies of the Strategic Knowledge Management sector are highlighted below for Tripura State Action Plan on Climate Change (TrSAPCC)

Code	Activities	Responsible/ Implementing Department	Continuation of Activity (Yes/No)	Physical Progress (2016-2020)	Financial allocation for the Activity (in Lakhs)	Source Funding (State/Center/External)		
						Central Scheme	State Scheme	External Aid
SKM/2	Capacity Building on Climate Change	TCCC and DSTE	Yes	• Phase-I Completed, Submitted DPR for Phase-II	1,21,31,900	NMSHE	-	-
SKM/3	To build GHG inventory and identify the dominant GHG/CO_2 emitting sectors, industries, districts, municipalities in order to enable selection of mitigation opportunities.	DSTE		• Block level vulnerability assessment is carried out in the State	NIL		DSTE	
SKM/4	Identifying and inventorizing all kinds of water sources existing in the state (include generation of database for ponds, tanks, dighis, lakes and big water-bodies) with focus on water quality.	DSTE and TSPCB	Yes	• TSPCB handles the water quality monitoring • 180 nos. water bodies have been identified in the urban areas of the State	NIL		TSPCB	
SKM/6	Conservation of Rivers and Aquatic Resources and generation of basin level data	Industries & Commerce Dept. UDD, TSPCB, DSTE		• Action Plan for restoration of 6 identified river stretches (Burigaon, Gomti, Haora, Juri, Khowai and Manu) of Tripura as part of River Rejuvenation Committee (RRC), Tripura	NIL		RRC	
SKM/14	Targeted Monitoring of Air Pollution and Climate Change Impacts on Biodiversity	DSTE and TSPCB	Yes	• TSPCB ambient air quality of Agartala city is being monitored through CAAQMS since available data suggests	11,000,00	CPCB	-	-

				occurrence of high PM 2.5 and PM 10 and Carbon monoxide • Similar system has been proposed to CPCB for Udaipur and Dharmanagar • CAAQM to be installed in 2020				

6E.4 Gap/Barrier analysis

Type	Gaps
Technical/Infrastructural	• Building bridge amongst Government Department, media, scientists and civil society • Sectoral vulnerability assessment
Financial	• Channelization of funds for climate relevant projects
Policy & Regulatory	• Inclusion of Climate adaptation and mitigation strategies into regulatory system
Institutional	• Inter-departmental coordination
Socio-Economic/Cultural	• Awareness in common people on climate change impacts
Planning	• Long term planning and a departmental vision report with targets for identification of strategies and Monitoring of the activities

6E.5 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
NDC 7: To mobilize domestic and new & additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap	• Preparation of State Action Plan on Climate Change (SAPCC-1) • Revision of State Action Plan on Climate Change (SAPCC-2)
NDC 8: To build capacities, create the domestic framework and international architecture for quick diffusion of cutting-edge climate technology in India and for joint collaborative R&D for such future technologies	• Strengthening of TCCC • Strengthening of Climate wing at Departmental level • Training and Capacity building at departmental level

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG 13: Take urgent action to combat climate change and its impact	• By 2030, combat climate change and its impact by involving all stake holders in the state • By 2030, maintain eco-system by comprehensive risk assessment, risk management, risk insurance facilities, other insurance solutions with emphasis on water availability and minimizing disaster related loss for human life and properties	• NMSKCC • State Action Plan on Climate Change • NMSHE
SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development	• By 2030, enhancing the foreign trade of the state from current Rs. 383 Cr. to Rs. 1500 Cr. • By 2030, build meaningful and workable collaboration, networking and partnerships among neighboring states as well as neighboring country	• NMSKCC

Description of Strategies/Activities

The description of activities below is based of mitigation and adaptation options. The activities that are named "SKM/N" are transformative activities and other set of activities are named as "SKM", which are incremental activities. Incremental activities are those which are old activities proposed under earlier SAPCC (2014-17) and will be continued for upcoming years as per agreement of the nodal departments and transformative activities are those which are newly proposed by the nodal departments for the upcoming years under Strategic Knowledge Management sector.

***SKM/N/1*- Strengthening of the State Climate Change Cell under the NMSKCC in terms of capacity building**

Description- State Climate Change Cell under National Mission on Strategic Knowledge for Climate Change (NMSKCC)is responsible for carrying out Climate change relevant actions at the State Level. The strengthening of the Cell is an important aspect in terms of technical and professional support, financial support, which will support the cell to develop projects and strategies to fulfil the aligned NDCs and SDGs.

Direct & Co-Benefits

- Climate Change Knowledge enhancement
- Skill development on climate change

NDC Alignment- 7, 8

SDC Alignment- 13, 17

***SKM/N/2*- Mass awareness programs for Govt. officials, public and students for spreading climate awareness and adoption of an environment friendly lifestyle**

Description- Policy and decisionmaker from all relevant sectors and departments, in particular, will be sensitized for the issue of climate-proofed planning through the implementation of a to-be-designed capacity building strategy. Accompanying awareness campaigns for students and the general public will actively involve these in adaptation and mitigation measures. integrating climate change adaptation in development planning will be good resource for trainers to conducted training programme for different level of governance (policy makers, government officials, NGOs, local level institutions, gender etc.)

Direct & Co-Benefits

- Climate Change Knowledge enhancement
- Awareness on climate change
- Implementation of long-term climate actions

NDC Alignment- 7, 8

SDC Alignment- 13, 17

***SKM/N/3*- Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling for the State of Tripura**

Description- With increasing trends in climate phenomenon, the State in its geographic region is likely to face changes in the coming years. A vulnerability assessment of the related vulnerable sectors like forestry, water, agriculture and allied must be taken up to assess the future impacts of climate change. It is also important to access the resource availability and its mapping for its sustainable use, considering the natural resource base of the State.

Direct & Co-Benefits

- Climate Change Knowledge enhancement
- Implementation of long-term climate actions
- Sectoral climate change impacts and vulnerability
- GHG accounting
- Net-zero plan of the State

NDC Alignment- 7, 8

SDC Alignment- 13, 17

***SKM/N/4*- Spatial temporal surveys to monitor changing land use patterns, environmental changes, irrigation systems, forest resource and crop disease surveillance using space technology**
Description- Tripura is ecologically rich and is undergoing a rapid land use change, facilitated by rapidly increasing population. Land use changes were observed in the State, natural forests being converted to build up areas and agricultural lands. The Spatial and temporal surveys will assist the State to identify vulnerable areas and monitor the changes. The monitoring and assessment outcomes may help in development of strategies and policies for protection and conservation of the natural resources.
Direct & Co-Benefits

- Climate Change Knowledge enhancement
- Natural resource management
- Climate change vulnerability

NDC Alignment- 7, 8
SDC Alignment- 13, 17

***SKM/N/5*- Develop a Centre for Excellence to address all research issues and technology development and demonstration issues in terms of climate change**
Description- The Centre of Excellence on Climate Change will help in understanding climate change processes, impacts and vulnerabilities in State for understanding and implementation of new innovative technologies in the respective vulnerable sectors. Climate change cell will coordinate for demonstration of technology and collaborate with various stakeholders to build capacities for climate relevant actions. It can be enhanced by introduction of a sectoral Centre for Excellence on climate change and Nodal officer for better grasp of departmental activities, knowledge management and inter-departmental coordination.

6E.6 Key Priorities Synopsis: implementation arrangement and budget

Table 62: Synopsis of Planned Activities for the Strategic Knowledge Sector

Code	Activities/Interventions	Name of ongoing/ new scheme from which the fund can be accessed	Duration (in years)	Proposed budget during (2021-30) in INR Lakh	Amount likely from existing sources (Amount in INR Lakh)			Implementing Dept.
					Central Scheme	State Scheme	External Aid	
Proposal of New activities to be added in SAPCC-2								
SKM/N/1	Strengthening of the State Climate Change Cell under the NMSKCC in terms of capacity building	NMSHE, NMSKCC	5	165	165	-	-	DSTE
SKM/N/2	Mass awareness programs for Govt. officials, public and students for spreading climate awareness and adoption of an environment friendly lifestyle	NMSHE, NMSKCC	10	270	243	27	-	DSTE
SKM/N/3	Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling for the State of Tripura	NMSHE, NMSKCC	5	100	100	-	-	DSTE
SKM/N/4	Spatial temporal surveys to monitor changing land use patterns, environmental changes, irrigation systems, forest resource and crop disease surveillance using space technology	NMSHE, NMSKCC	5	1000	1000	-	-	DSTE
SKM/N/5	Develop a Centre for Excellence to address all research issues and technology development and demonstration issues in terms of climate change	NMSHE, NMSKCC	5	1500	1500	-	-	DSTE
Total (in crores)				**30.35**	**30.08**	**0.27**	**0**	

CHAPTER 7: CROSS CUTTING SECTOR

Chapter 7A: Gender
Chapter 7B: Disaster Management

CHAPTER 7A: GENDER AND CLIMATE CHANGE

7A.1 Sectoral Overview

For effective action on all aspects of climate change, the effective participation of women is necessary. Women can provide solutions required in enhancing their resilience and hence effective participation of women is imperative for adaptation planning to address climate change.Women suffer climate impacts relatively more than men because they have less opportunities, authority and resources which enable them to adapt to the unavoidable impacts of climate change. Gender is a crosscutting issue, and it is important to integrate and address gender concerns in the context of climate change.

Table 63: Labor Force Participation Rate for persons aged 15 years and above (2015-16)

	Rural			Urban			Total		
	Female	Male	Person	Female	Male	Person	Female	Male	Person
Tripura	59.1	82.9	71.0	36.2	84.7	59.4	54.4	83.3	68.7
India	31.7	78.0	55.8	16.6	69.1	43.7	27.4	75.5	52.4

Source: Participation in Economy, Ministry of Statistics 2017

The female labour force participation rate in Tripura is higher than the national average. However, it is also important to note that climate change disproportionately affects female employment as well as makes them more vulnerable.

Table 64: Share of Women in Tripura

State	% Share of Women			Sex Ratio		
	Rural	Urban	Total	Rural	Urban	Total
Tripura	48.86	49.33	48.98	955	973	960

Source: Census Tripura 2011

To tackle the climate change challenges, we need to have both men and women coming together. It is also unfair to say that mainstream climate adaptation/mitigation programmes are not women friendly. 65 of 162 INDCs including India (40%) mention “women” and /or “gender” in the context of their national priorities and ambitions for reducing emissions. But in many cases, they are not tightly focused on gender issues and sometimes insensitive to the changing role of women in the modern society. A contextual analysis of the priorities, needs, roles and experiences of women and men as well as the integration of specific actions proposed under SAPCC to address any gender related inequalities is required for gender mainstreaming.

Table 65: Comparison of Literacy Rates

State	2001 (in %)			2011 (in %)		
	Female	Male	Total	Female	Male	Total
Tripura	64.91	81.02	73.19	82.73	91.53	87.22

Source: Census Tripura 2011 and 2001

The State observed growth in female literacy rate from 64.91 (in 2001) to 82.73 (in 2011). When executing climate impacts solutions are concerned, women are considered to be as changing agents. Traditional and sometimes the long-established knowledge which they hold helps to adapt to climate change impacts. Women have important impact on consumption patterns and lifestyle choices also. Improper health diet as well as lack of access to good health services results in weakness, maternal mortality, reduced physical and mental capacity, etc. Women are more prone to the increased occurrence of vector-borne and water-borne diseases as a result of climate change. It is important to monitor health inequalities while gender mainstreaming through proper coverage of health services.

Gender Policy Framework

1. Create productive assets – land titles, livestock ownership, CPR/forest land lease, water harvested tanks, micro-enterprises traditional knowledge thought leaders
2. Reduce drudgery and workload - pro-women technology transfer across sectors. E.g. in farm tasks, shorter distances transport
3. Invest in new livelihoods e. g. transport, renewable electrification (ex- solar systems), waste, housing, health, climate science
4. Ensure women's fair representation in mainstream decision-making institutions and governance platforms to help them shape laws, policies and programmes that affect their lives
5. Dedicate fair proportion of financial resources for women, mandating gender budgeting and ensuring impact assessment
6. Promote integrated risk management - address DRR, CCA and ecosystem regeneration together in village upwards development plans to safeguard natural resources

Figure 42: Four Cornerstones of Gender Mainstreaming and Gender Empowerment
(Source: Mainstreaming Gender in the Implementation of State Action Plan on Climate Change)

Gender Mainstreaming Checklist

It is important to integrate gender concerns in adaptation and mitigation strategies and the following checklist can help in the integration process.

- Assess the different implications of policy and programme interventions suggested in the SAPCC for women and men from the outset.
- Assess women and men's technology choices, uses and needs.
- Assess women and men's knowledge concerning the climate change risks, changes in local environment, weather, strategies and coping mechanisms in response.
- Ensure that these assessments are informed by a gender expert to support in developing a gender analysis and by consultations with women and men on priorities, strategic needs and options for action.
- Based on this analysis, refine targeted objectives for incorporating gender equality and women's empowerment into policies' and programs' plans and budgets.
- Use female project implementers, extension agents and trainers to ensure that women participate equally in knowledge access and training.
- Set targets for female participation in activities.
- Make women's equality, access to information, economic resources and education a priority.
- Monitor and evaluate changes in gender relations using gender-sensitive indicators.
- Monitor beneficiaries and results of projects using sex-disaggregated data.

- Proactively seek out and engage with appropriate women's rights organizations and female community leaders when selecting partner

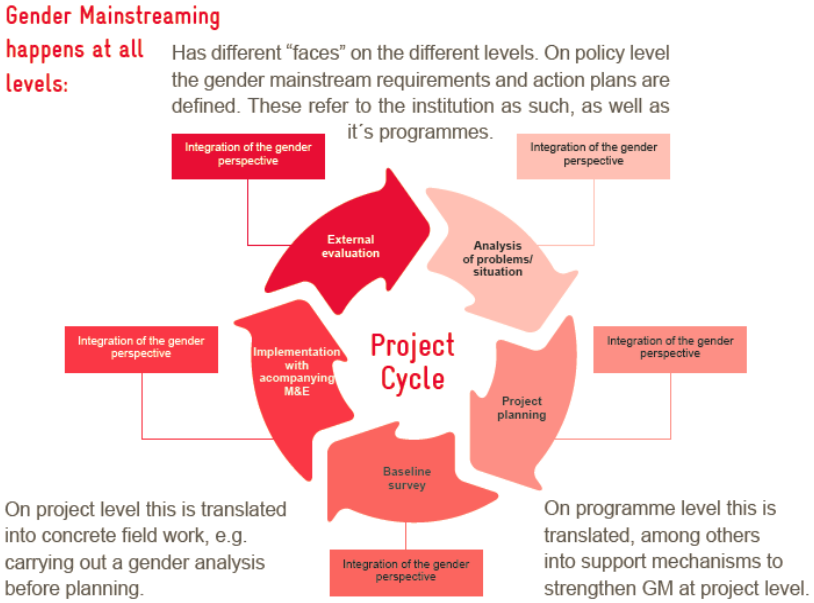


Figure 43: Gender Mainstreaming Process
(Source: GiZ gender checklist)

7A.2 Gendered Impact of Climate Change

Climate Change impacts	Women's Vulnerabilities
Lower food production	• Less availability of food, so least to eat and sleep on an empty stomach • Taking additional work as wage labor
More natural disasters – cyclones, floods, waterlogging and droughts; infrequent rains; intense rains	• Livelihood gets affected • Loss of fodder and livestock • Longer distances to walk to collect water and fuelwood • Because of drought and less amount of rain, agricultural land becomes hard to work on
Higher summer temperatures; longer summers	• Affect milk production among cattle thereby affecting livelihood • For agricultural female laborer's, more tiring work in fields
Social Impacts	• Chances of higher indebtedness because sometimes women go to take loans and have the responsibility to pay off loans • Increase in domestic violence because of greater poverty and frustration among men

Source: Engendering the Climate for Change, Policies and practices for gender-just adaptation by Aditi Kapoor

7A.3 Gap/ Barrier Analysis

- Huge knowledge gap regarding climate change
- Need of awareness and more capacity building
- Need of gender-based research and participatory planning to design the policies and programmes
- Proper collection and mapping of gender disaggregated data

- Lack of accepting the contributions of women as decision makers, stakeholders and experts across sectors and at all levels that can lead to long-term solutions to climate change
- Women hold the knowledge and understanding of what is required to adapt to changing climate conditions and to arise with practical solutions but still their knowledge are not made use of

7A.4 Sectoral Strategies and Planning

National/State-Level Targets and Linkages

Specific Targets under NDC for the Sector

NDC Commitments	Key State level Initiatives to comply with NDC Targets
To put forward and further propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation	• Sensitize women to carry out extensive information, education and communication (IEC) and behaviour change campaigns to change the attitude of people regarding healthy sanitation practices • Social sector schemes like Kishori Shakti Yojana (KSY), Integrated Child Development Schemes (ICDS), Supplementary Nutrition Programme (SNP) etc. schemes will be implemented within timeline in all districts • Involving women in water-efficient micro-irrigation methods like linkages with kitchen gardening • Awareness among Anganwadi workers about various mitigation measures prescribed by public health specialists to manage climate stress • Training of Women PRI members about various mitigation measures and mandatory mitigation provisions required to be met by urban and rural local bodies on waste management, water management

Specific Targets under SDG for the Sector

SDG Goals	Targets	Key State level Initiative to comply with SDG Goals
SDG-5: Achieve gender equality and empower all women and girls	• Gender equality will be ensured in education, health and other social sector by 2030 • Workforce participation rate for women will be raised from 23.6 per cent (Census-2011) to 40 per cent by 2030 • The proportion of crime against women will be reduced from 25.75 per cent to 5 per cent by 2030 • Participation of more women in governance and decision making will be encouraged to have at least doubled the current numbers • Active workforce participation rate of ST women will also be raised to 40% and also to ensure their participation in decision making • The sex ratio of ST population will also be raised to 995 from 983.	• Implementation of schemes on girls education like Kasturba Gandhi Balika Vidyalaya (KGBV) covering all districts will be ensured in the State • Effective steps for improvement in women's employment and skilling, re-skilling for their economic upliftment • Effective steps for equal remuneration for women and men both in rural and urban areas • Effective steps for more women in decision-making process • Steps for reduction in prevalence of anaemia especially among girls and women covering TTAADC areas • Look after the skilling, re-skilling of women and promotion of more Self-Help Groups (SHGs) particularly in JFM hilly areas • Encourage micro-financing among

		all women SHGs, including ST women for enhancing employment opportunities

7A.5 Sectors where gender concerns can be integrated

Agriculture

- Capacity building- at least x% of the personnel should be women
- Water-efficient micro-irrigation methods- linkages with kitchen gardening, vegetable cultivation
- Creating awareness regarding climate change adaptation- special focus on women farmers, involvement of women SHG groups, involvement of women farmers

Women play a major role in animal husbandry, fish processing and trading, especially dry fish. Therefore, proper awareness about climate change issues, alternate healthy fish drying mechanisms using solar dryers should be introduced in the fishery clusters. Risk management through self helps groups during extreme weather events should be integrated in the planning framework.

Forestry

The role of women in forestry sector is significant because huge tribal population that is directly dependent on forest. As women constitute the most important user group collecting forest produce for meeting the family's subsistence needs, sustainable forest management is not possible without their active involvement. Awareness about trees, shrubs and grasses is higher amongst women and they are more concerned with biodiversity conservation and multiple products-based management which ensures fuel wood, fodder, water and other NTFPs. Women participation needs to be improved and they should be made aware of the current scenario. Gender equity in benefit sharing and land holding should also be ensured. The policy provisions regarding women participation should be clear and mandatory.

Water Sector

Women representation in Pani Panchayat, water management and also off-farm livelihood initiatives should be given priority. Women PRI members should also be trained about various mitigation measures and mandatory mitigation provisions required to be met by urban and rural local bodies on waste management, water management and land use change under different regulatory framework.

Health

Women play a key role in health management in family. They must be fully aware about events like heat stress, vector borne diseases especially not to have stagnant water in house and proper management practices. Women health workers, Anganwadi workers should be made aware about various mitigation measures prescribed by public health specialists to manage climate stress. They need proper training and re-orientation for this. Targeted communication needs to be provided to women on these areas. They also need to be trained on proper drinking water management due to the falling water quality due to higher temperature.

Energy

Energy sector: Women are important positive change agents through their role as key energy managers and their participation in the renewable energy sector and value chain, including the design, production, servicing and marketing of these technologies. They can bring out changes from household level enterprises to larger units at scale with proper incentives.

- Linking women in the decentralized solar generation value chain
- Involvement of women in converting traditional cook stoves to biogas-based cook stoves
- Possible involvement of women in bio-mass generation (small scale) and incentive to women-entrepreneurs

Sustainable Habitat

Women should be aware about the threat of climate change as well as sustainable lifestyle. Sustainable lifestyle is a balanced lifestyle and over-consumption or conspicuous consumption affects the carrying capacity of the world and affects its balance making it unsustainable Young women should, be sensitized to sue clean fuel, bi-cycles, and electric bikes and should be sensitized to protect plantation and greenery.

Following approaches can be adopted to integrate gender concerns in the various sectors under the climate action plan:

- Address the different vulnerabilities associated with gender roles due to climate change
- Capacity Building of women and gender-focused community-based organizations (common interest groups, SHG groups, women PRI members)
- Integrate gender considerations into adaptation/mitigation planning and programmes
- Systematically documenting and widely sharing case studies that demonstrate the benefits of applying gender-sensitive approaches
- Empowering women as agents of change and innovation and not to depict them only as the victims of climate change

CHAPTER 7B: DISASTER MANAGEMENT AND CLIMATE CHANGE

The State experiences varied natural hazards due to its geographical location. Tripura is prone to various natural disasters, particular to Earthquake. The State is situated in the most vulnerable earthquake prone Zone-V of India. The State is also affected by Cyclone, Flood, Drought and Fire hazards. The Disaster Management Department is constituted of State Executive Committee (SEC), Tripura Disaster Management Authority (TDMA) and District Disaster Management Authority, with members of Agriculture Department, Fishery Department, Power Department, Urban Development Department and Central Training Institute.

- The Revenue Department has developed Disaster Management Plans for the State, which includes:
- Flood Management Plan of West Tripura District (2017-18)
- Disaster Management Plan for Industry and Commerce Department (2016-17)
- Disaster Management Plan for Fisheries Department (2016-17)
- Disaster Management Plan for Animal Resources Development Department (2016-17)
- Disaster Management Plan for Health & Family Welfare Department (2016-17)
- Disaster Management Plan for Science, Technology & environment (2016-17)
- Disaster Management Plan for Rural Development Department(2016-17)
- Agriculture Disaster Management Plan 2016-17
- Flood Management Plan for PWD (Water Resources), 2016-17
- District Disaster Management Plan (2016-17) for Dhalai, Gomati, Khowai, North Tripura, Sepahijala, South Tripura, Unakoti and West Tripura Districts.

The Department imparts Training and Capacity building programmes through various training Institutes. SIPARD conducts theoretical training on Disaster Management, Central Training Institute impacts practical training on First Aid & Search and Rescue, NIT- Agartala has been identified for Engineers Training, CWTIT for training and capacity building of Masons and artisans, NDRF team for carrying out on-campus and off-campus trainings as well as Master trainers for specialised Trainings at different levels.

Vulnerability to Earthquakes- Tripura comes under Zone V of Seismic Zoning Map of India which is the most severe seismic zone in the country. Many moderate to large magnitude earthquakes have occurred within the State boundary as well as within 100 km distance around it. In 1897, an earthquake of 8.7 Richter scale occurred which caused massive destruction. Another earthquake of measuring 7.5 Richter scale occurred in 1869 with its epicentre within 18 km of the district town of Dharmanagar, causing destruction in permanent infrastructures and lives. In 1950, an earthquake of measuring 6.3 Richter scale occurred within North Tripura district causing damage to the buildings and other infrastructures. About 41.2% of houses in the State are Kutcha type which are vulnerable to receive severe damage including collapse in moderate intensity of earthquakes.

Vulnerability to Cyclones- As far as wind hazard is concerned, the State faces cyclonic wind speed which reaches after crossing Bangladesh. As Bay of Bengal is located nearer to the state, cyclone occurs throughout the state during the period of South-West Monsoon. Cyclone affects the means of surface communications, damages agricultural crops including human lives/properties and livestock. In 2004 severe cyclone occurred in Jeolcherra and Hudlook under Dhalai District. This cyclone uprooted many trees, electric pools, etc. including huge loss to human lives/properties. A tropical cyclone originated from the Bay of Bengal named “Sidor” which devastated large areas in neighbouring Bangladesh. It also affected adjacent areas of Indo-Bangladesh Border areas located in Tripura.

Vulnerability to Flood- State experiences average annual rainfall that ranges from 1922 mm to 2855 mm. Normally rain arrives in the State in late April and continues up to October, but the intensity of rainfall increases during June to September. High intensity rainfall occurring during this period causes floods in low lying areas and land erosion throughout most parts of the State. In the past, the State has witnessed worst form of disasters caused by floods making normal life paralysed. This disrupted means of communications caused due to damage of roads and bridges and blockage of roads due to landslides.

Table 66: Ongoing Activities for Disaster Risk Reduction (DRR) by Revenue Department, Tripura

Sl. No.	Activities	Duration	Funding	Implementing Agency
1.	Create a master plan to prevent monsoon flooding in Agartala and other urban areas of Tripura	3 years	Not finalized	Urban Development Department
2.	Establishment of effective flood forecasting system in 7 locations of major rivers in Tripura	3 years	Central Water Commission & State Government	Central Water Commission, Government of India
3.	Introducing a special scheme for promoting erosion-preventing plantation along the river belts using agricultural biotechnology	3 years	State Disaster Response Fund (SDRF)	Agriculture Department
4.	Preparation of Disaster Mitigation Plans	Ongoing	State Disaster Mitigation Fund (SDMF)	Line Departments
5.	Capacity Building Activities on Disaster Risk Reduction as per Annual Action Plan	Ongoing/ Regular	State Disaster Response Fund (SDRF)	Revenue Department, District Administration & Line Department
6.	Implementation of Flood Level Early Warning System (FLEWS)	2 years	Government of India	North East Space Application Centre
7.	Implementation of Lightning Early Warning System (LEWS) by North East Application Centre	Ongoing	Government of India	North East Space Application Centre
8.	Identification of landslide prone areas	ongoing	Government of India	Geological Survey of India
9.	Identification of land for establishment of Automated Weather Station (AWS)	Ongoing	Government of India	Indian Meteorological Department

Table 67: Suggested activities on Disaster Management by Revenue Department

Natural Hazards	Suggested Activities for Disaster Risk Reduction by the Line Department in SAPCC- 2
Flood	1. Extensive flood early warning system by developing flood inundation map, community-based flood management system, community awareness and flood management training. 2. Using latest technologies like GIS (Global Information System) for information management about flood control and land erosion 3. Dredging of major rivers in the State to maintain standard for flood protection. 4. Strengthening of vulnerable embankments. 5. Extensive plantation drive in upper catchment area to reduce heavy siltation.

	6. Implementation of nature-based solution for prevention of riverbank erosion such as by Kalmilata & Bamboo plantations. 7. Construction of flood and cyclone shelters.
Cyclone	1. Development of cyclone vulnerability mapping in GIS platform. 2. Cyclone mitigation activities such as cyclone resistant & low-cost housing, development of cyclone resistant bush around cyclone path to reduce the speed of cyclone wind. 3. Effective Cyclone early warning by using last mile connectivity.
Landslide	1. Development of landslide vulnerability mapping in GIS platform. 2. Taking up landslide's mitigation projects in landslide prone areas with emphasis to highways, populated habitation & vegetations.
Lightning	1. Baseline survey of lightning vulnerability & development of lightning hazard maps. 2. Establishment of location specific lightning early warning system. 3. Lightning mitigation activities through installation of lightning arrester in lightning prone areas. 4. Lightning preparedness and capacity building programmes.

CHAPTER 8: FINANCING SAPCC

8.1 Financing Strategy

India is doing its best to meet the promised adaptation and mitigation actions as per Paris agreement, finance still remains a critical issue. It is estimated that India's climate adaptation gap by 2030 will be around 1 trillion USD[37]. Therefore, creative financing strategy by the states is the need of the hour. It has become apparent since the last SAPCC, that additional finance is hard to come by. Therefore, high impact areas have to be identified from the state's ongoing sectoral activities for mainstreaming and tagged. In addition, more and more private sector involvement should be pooled in for high priority activities in a systematic way including public-private partnership mechanism. In addition there will be additional climate finance from international climate funds (Green Climate Fund, Global Environment Facility, Adaptation Fund) Bilateral Cooperation (additional financial and technical support for climate change outcomes like SDC, GiZ, JICA, DFID), Multilateral facility (loan and grant projects through WB, ADB, UNDP, etc.), National Climate Fund (National Adaptation Fund for Climate Change, Small Grants programme, mission-specific allocation, regular schematic allocation having climate relevance).

8.2 Approach

The approach taken for financing mechanism is explained in the table below. Various types of financing windows are listed down and source of fund against each of them is figured. Many kinds of instruments can be used to access the funds. The key sectors in which the funds can be used are also mentioned in the table along with the modalities and challenges faced in the process.

Table 68: Available climate finance options

Financing Window	Source of Fund	Instrument	Key sectors	Access modalities and challenges
International climate fund (budget additional)	Green Climate Fund	Loan and grant, guarantee, equity	Food and water, health, Livelihood, infrastructure and built environment, ecosystem (for both adaptation and mitigation	Micro up to 10 million USD Small (10-50) Medium (50-250) Large (>250)
				National Designated Authority (MoEFCC) as focal point
				Through (Direct Access Entity and multilateral access entities) approved as NIE or MIE by NDA (MoEFCC)
				1-2 years, elaborate process
	Adaptation Fund	Grant, But Loan as co-finance (by NIE or MIE) maximum up to 50% of the project cost	Natural resource systems (addressing climate risks), eco-system, hazard	Regular project size >1 million USD Small <1 million USD Through NDA through NIE and MIE 8-12 months Maximum cap for country 10 mn USD (India exhausted)

[37] CEEW

National Fund	GEF	Grant	Based on the sectors under the star allocation both for adaptation and mitigation. 1) Food systems, Land Use and Restoration; 2) Sustainable Cities; and 3) Sustainable Forest Management (under GEF 7 series)	Full sized project > 2 million USD Medium size (up to 2million USD) Enabling activity (strategy development under a convention) Minimum 12 months
	NAFCC	Grant, Co-finance, convergence fund from state	Agriculture, horticulture, agro-forestry, environment, allied activities, water, forestry, urban, coastal and low-lying system, disaster management, human health, marine system, tourism, habitat sector and other rural livelihood sectors to address climate change related issues. Climate scenarios, capacity building, consultation, monitoring	Though no upper limit specified typical maximum for a state is about Rs 25 crore. Through NIE Typically, 6 months for preparation and sanction Maximum preparation cost is Rs 10 lakh, NIE fee capped at 3% of the project cost
Bilateral and Multilateral projects/programmes	Programs/Projects linked to clear climate outcomes	Loan, Grant	Sectoral (both for adaptation and mitigation)	On state partnership basis and through the concurrence of national government
INGOs	Programs/Projects linked to clear climate outcomes	Grant	Sectoral (both for adaptation and mitigation)	On state partnership basis and through the concurrence of national government
CSR	Programs/Projects linked to clear climate outcomes	Grant	Sectoral (both for adaptation and mitigation)	As per statutory requirement under Company Act for the eligible companies, private foundations with voluntary pledge with programmatic convergence
Budgetary (National and State)	Regular schematic (may not be additional)	Budget (grant in aid) state, central and centrally sponsored schemes	Sectoral (both for adaptation and mitigation)	Some of the schemes are listed in the report, not all required/proposed strategies/priorities are covered under the scheme guideline. This needs to be classified as climate relevant and possible have a climate

				tag for reporting. Currently, there is no standard approach available
Budgetary (Mission specific)	As per mission guideline	Both demands driven and also as per target	Sectoral (both for adaptation and mitigation	Some of these have been specified in the report

There are four broad steps to be taken for the financing in climate change domain. Typical process to be followed in the climate finance area is explained stepwise as follows:

Table 69: Generic processes for developing climate finance proposals

Step 1a: Identify high impact/high priority activity/strategy having linkage to SDG/NDC	**Identify relevant schemes in the state budget and put in the right demand (some examples have been given in the report). The expenditures can be treated a climate relevant expenditure based on how many components of the project activities have been covered.**
Step 1b: identify activities linked to national missions	Draw down resources form relevant mission based on the demand/target
Step 2: There is no correspondence or availability of funds from state budget/national missions	Map to CSP, external aided projects or sources under bi-lateral or multilateral cooperation. Prepare proposal under the formats/processes given by the agency. The lead department/agency can initiate the process.
	Look for grants from CSR and INGO sources
Step 3: There is correspondence or availability of funds from special climate funds available nationally	• For NAFCC, prepare project concept note, do a preliminary go-no go check with NIE • If agreed go ahead with the detailed project report and submit through NIE to National Designated Authority • Executing agency signs the grant agreement and project cycle operation starts. • Baseline and end line assessment conducted by external agencies track outcomes as per the project result framework
Step 4: There is correspondence or availability of funds from special climate funds available internationally	• Assess the concept based on the result/impact areas and investment criteria (for GCF) 1) Impact potential 2) Paradigm shift potential 3) Sustainable development potential 4) Needs of the recipient 5) Country/state ownership 6) Efficiency and effectiveness • Submit proposal to NDA through NIE or MIE as per the format. Once approved by relevant board sign subsidiary agreement with NIE/MIE • Executing agency starts the project cycle operation.

8.3 Synthesis

There has been thorough analysis of climate strategies in the context of NDC-SDG alignment through several deliberations. There are 83 actions proposed in the SAPCC V2 (2021-30), out of which 44 are strongly linked to adaptation, 34 linked to mitigation and 5 strategies have linkages to both adaptation and mitigation. The total proposed budget for these activities in 10 years (2021-30) amounts to Rs 7683.20 crore. The distribution of these climate strategies has been presented in the figure below:

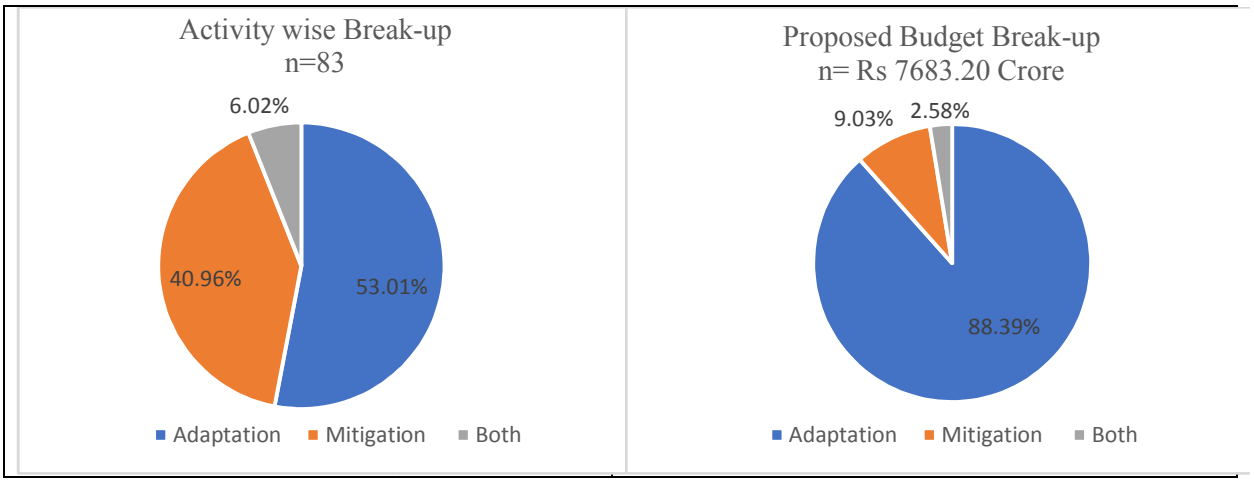


Figure 44: Overall distribution of climate strategy

53.01% of the activities are linked to adaptation, 40.96% are linked to mitigation and 6.02% are linked to both. In the energy sector, which has a strong linkage with NDC targets focusses entirely on mitigation. Sustainable Habitat (Urban) sector have strong mitigation focus with adaption co-benefit. Similarly, agriculture, forestry and health sectors have strong adaptation focus with mitigation co-benefit.

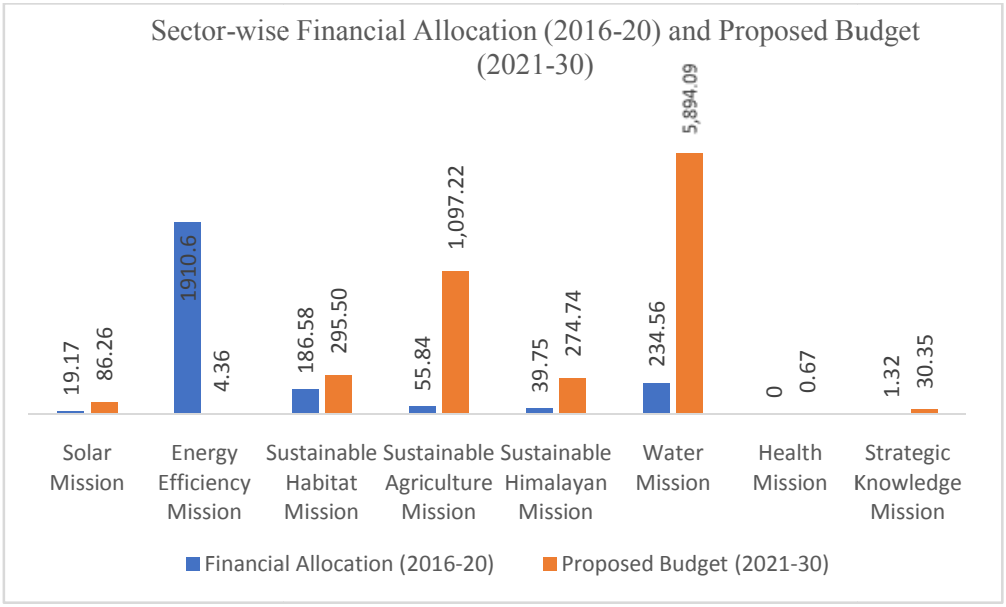


Figure 45:Sector-wise Financial Allocation (2016-20) and Proposed Budget (2021-30)

The sectoral distributions of climate investment in 10 years (2021-30) have been given in the table below:

Table 70: Summary of sectoral climate investment (2021-30)

Mission	Sector	Proposed Budget 2021-30	State Budget Source	National, EAP others
Solar Mission	Energy	86.26	42.13	44.13
Energy Efficiency	Energy	4.36	-	4.36
Sustainable Habitat	Urban	295.50	22.63	272.87
Water Mission	Water	5894.09	860.07	5034.02
Sustainable Himalayan	S&T	274.74	140.28	134.46

Sustainable Agriculture	Agri & Allied	1097.22	426.81	670.41
Strategic Knowledge	S&T	30.35	0.27	30.08
Health	Health	0.67	0.51	0.16
Total		**7683.20**	**1492.71**	**6190.49**

In terms of nature of investment, 88.39% are for adaptation, 9.03% for mitigation and 2.58% for both. It shows that 53.01% of the adaptation strategy requires 88.39% of the total public investment. Sustainable Habitat have strong mitigation focus with adaption co-benefit. Similarly, agriculture and forestry sectors have strong adaptation focus with mitigation co-benefit. Disaster linked investment are linked to climate proofing and the actual investments are reactive based on the nature, frequency and intensity of the disaster. The following figures give the distribution of proposed climate investment for next 10 years.

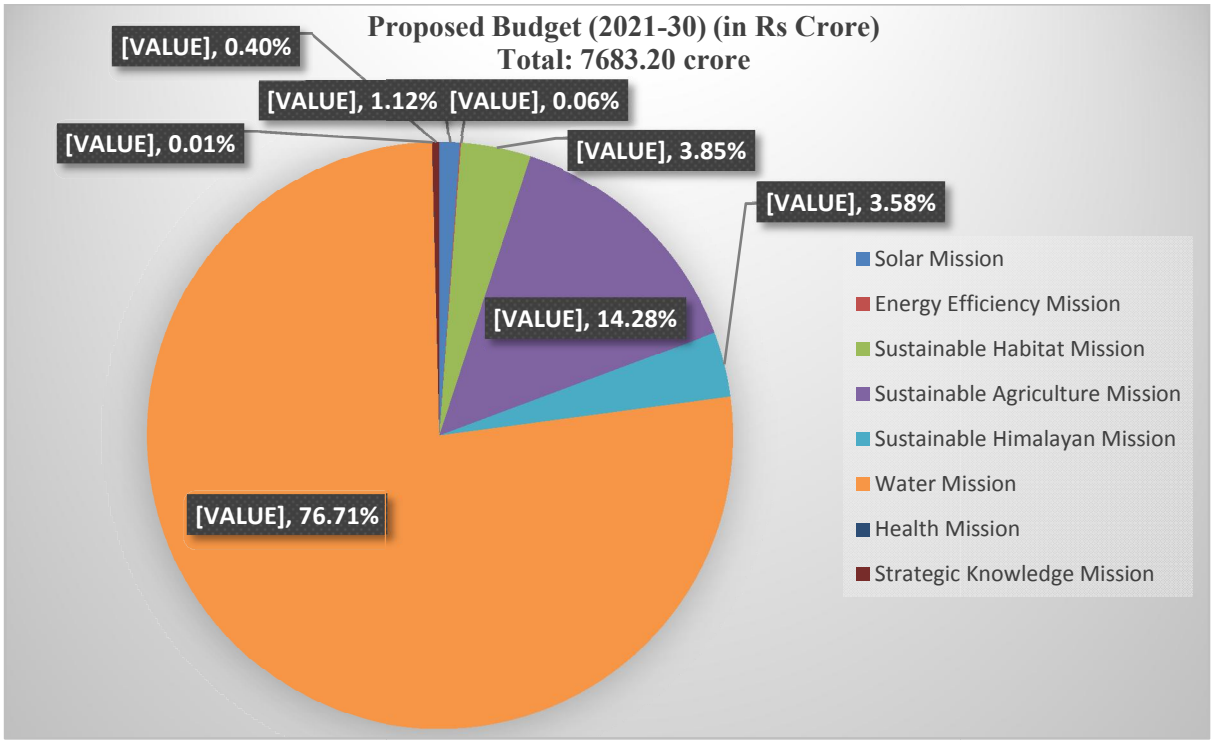


Figure 46: Share of sector wise proposed budget (2021-30)

The investment focus has been more on the Water sector which has strong relevance with the NDC and is highly affected by climate change. Investment in Sustainable Agriculture has received the second highest allocation which will contribute to the NDC goals. The third allocation has been to Sustainable Habitat. The fourth highest allocation has been to forestry sector which has strong bearing on addressing climate variability, soil conservation as well as it helps in creating the carbon sink.

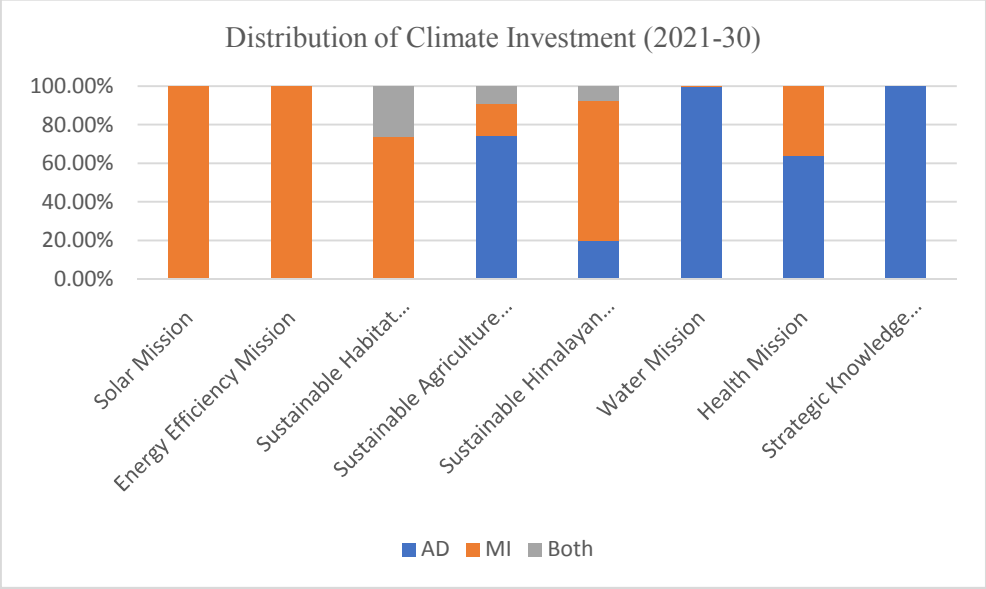


Figure 47: Distribution of Climate Investment (2021-30)

8.4 Summary of Prioritized Interventions

After the discussion with all relevant stakeholders and departments, 83 planned activities have been identified in 8 sectors. This has been examined based on its linkages to SDG-NDC, funding linkage and implementation potential.

Of the 83 planned activities that have been identified in 8 sectors for prioritization, the financial allocation has been proposed merging similar activities. The key method of prioritization is driven by the following:

- ✓ The adaptation activities that address high vulnerability and fits in to the impact chain (as relevant to sector)
- ✓ Low carbon development linked to mitigation activities
- ✓ There are some activities where adaptation and mitigation both possible, the co-benefit approach has been taken

Though for prioritization of activities, a multi criteria analysis-based score card was used, first the activities were screened based on vulnerability/impact as well as low carbon development processes. Thereafter, NDC-SDG linkage was assigned highest weight of 50%. Implementation potential based on low barriers was assigned 30% weight and funding linkage was assigned 20% weight (since our funding is mostly schematic and climate relevance for proposed activities is still not standardized). The activities based on this were scaled as (1) no linkage (2) meagre (3) reasonable (4) significant. The weighted averages were used for ranking and prioritization.

Table 71: SDG-NDC linkage of proposed activities

Sector wise SDG-NDC Linkages						
			SDG-NDC			Total
			Meagre	Reasonable	Significant	
Sector	Energy Efficiency	No.	0	1	7	8
		% of Total	0.0%	1.2%	8.4%	9.6%
	Health Mission	No.	0	2	5	7
		% of Total	0.0%	2.4%	6.0%	8.4%
	Solar Mission	No.	0	0	7	7
		% of Total	0.0%	0.0%	8.4%	8.4%
	Strategic Knowledge Mission	No.	0	0	5	5
		% of Total	0.0%	0.0%	6.0%	6.0%

	Sustainable Agriculture Mission	No.	0	20	6	26
		% of Total	0.0%	24.1%	7.2%	31.3%
	Sustainable Habitat Mission	No.	0	2	7	9
		% of Total	0.0%	2.4%	8.4%	10.8%
	Sustaining Himalayan Mission	No.	1	4	4	9
		% of Total	1.2%	4.8%	4.8%	10.8%
	Water Mission	No.	1	7	4	12
		% of Total	1.2%	8.4%	4.8%	14.5%
Total		No.	2	36	45	83
		% of Total	2.4%	43.4%	54.2%	100.0%

In 83 proposed activities in 8 sectors, 97.6% of the activities had reasonable or significant linkages with SDG-NDC goals while only 2.4% have feeble linkage.
Sectorally, sustainable agriculture mission has maximum number of activities having either reasonable or significant linkage, followed by Water Mission, Habitat Mission and Sustaining Himalayan Ecosystem. This pattern is because strong focus of climate action planning on adaptation.

SDG-NDC and Funding Linkages
Since majority of the activities are having significant linkages to SDG and NDC, a further analysis was done to see their sectoral distribution and identify funding linkage.

Table 72: SDG-NDC and Funding Linkages

			SDG-NDC			Total
			Meagre	Reasonable	Significant	
Funding	Meagre	No.	1	3	1	5
		% of Total	1.2%	3.6%	1.2%	6.0%
	Reasonable	No.	1	32	39	72
		% of Total	1.2%	38.6%	47.0%	86.7%
	Significant	No.	0	1	5	6
		% of Total	0.0%	1.2%	6.0%	7.2%
Total		No.	2	36	45	83
		% of Total	2.4%	43.4%	54.2%	100.0%

47% of the activities those have significant NDC-SDG linkages too have reasonable funding linkage. 97.6% of the activities having SDG-NDC linkages also had reasonable or significant funding linkages. Only 1.2% did have meagre linkages to SDG-NDC as well as funding.
Funding and their implementation goes side by side. Further analysis was done to explore the funding and implementation linkages (from the barrier analysis).

Table 73: Funding and Implementation Linkages

			Implementation		Total
			Meagre	Reasonable	
Funding	Meagre	No.	5	0	5
		% of Total	6.0%	0.0%	6.0%
	Reasonable	No.	32	40	72
		% of Total	38.6%	48.2%	86.7%
	Significant	No.	0	6	6
		% of Total	0.0%	7.2%	7.2%
Total		No.	37	46	83
		% of Total	44.6%	55.4%	100.0%

Most funds are tied to schemes and not necessarily have indicators under NDC-SDG; if at all, the linkage is too indirect. Only 6.0% of the total activities had meagre funding and implementation linkages. Overall 55.4% activities had reasonable implementation potential. Little more than a quarter of the activities had significant funding and implementation linkages.

CHAPTER 9: IMPLEMENTATION MECHANISM

9.1 Implementation Arrangement of the SAPCC

The SAPCC implementation must be supplemented by a mechanism for not only as a mode of ensuring that the detailed activities are implemented as planned, but also, as a method for systematic review and programme improvement. Interdepartmental coordination has an important role when it comes to effectively implementing the climate-relevant strategies for getting the desired results. A systematic and synchronized approach along with a sincere effort is required for the proposed strategies. For every strategy proposed in the SAPCC, the principle implementing department along with collaborative departments has been identified. Moreover, if required, further association with other departments as well as agencies is also possible depending on the planned intervention.

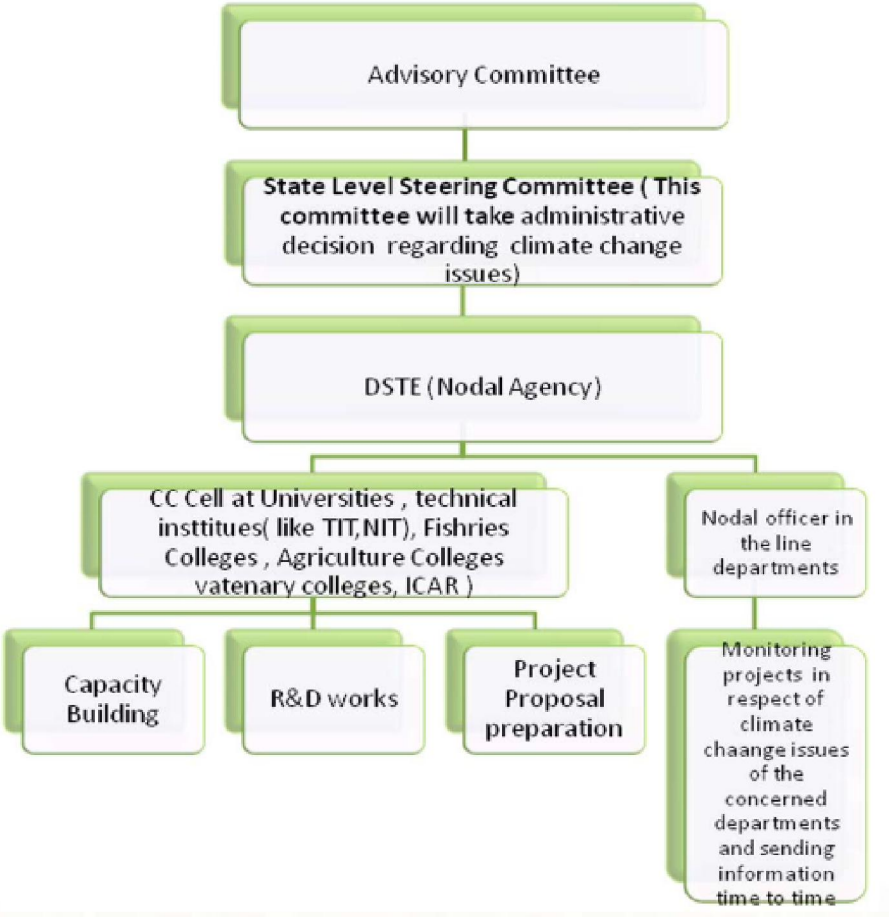


Figure 48: Common framework elements for Sectoral Implementation under Tripura SAPCC

9.2 Implementation Framework

The state is responsible to ensure complete implementation of the SAPCC through the incorporation of a robust framework and mechanism. The framework must capture the implementation of operational plans as well as act as a tool for systematic review and continuous improvement of the programs. For an effective implementation of the climate change strategies, interdepartmental coordination has a crucial role to play for desired outcomes. The proposed activities will demand sincere efforts along with a systematic and synchronized approach.

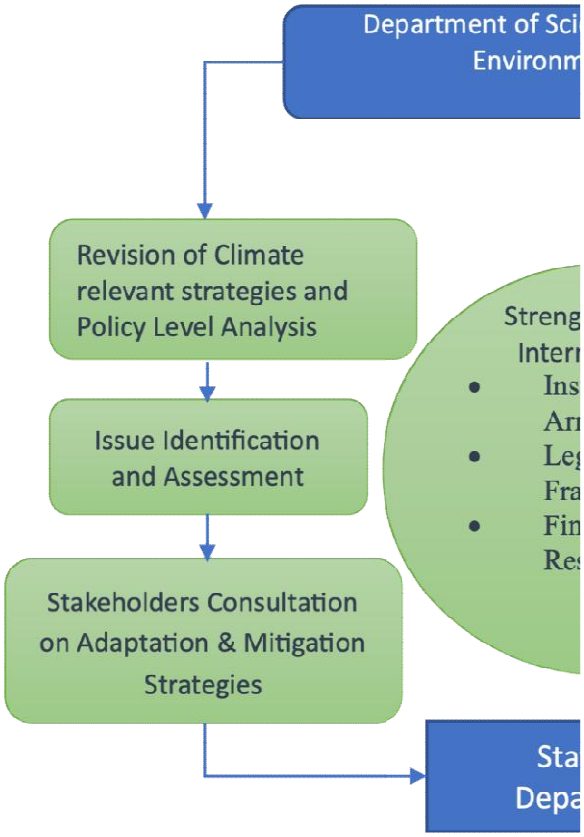


Figure 49: Implementation Mechanism of Tripura SAPCC

9.3 Proposed Activities And Implementing Agencies

Code	Strategy	Departments	
		Primary	Collaborative
	Solar Mission		
SM/2.2	Installation of 1000 numbers Biogas Plants	TSECL	-
SM/2.3	Installation of Solar Photovoltaic Street Lighting System at all marketplaces in Tripura on turn-key basis including 5 years warranty/ Guarantee and Operation & maintenance contract- 50000 numbers	TSECL	-
SM/N/1	Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants	TSECL	-
SM/N/2	Installation of agricultural waste-based Biogas Plants in the state of Tripura under Waste to Energy & Biomass based Co-generation.	TSECL	-
SM/N/3	Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura- 150 KWp	TSECL	-
SM/N/4	Installation of Solar Drier cum Smoke House for Rubber Processing Center in Tripura- 3950 numbers	TSECL	-
SM/N/5	Installation of Off-grid/ Hybrid Solar Power Plants (Maximum Capacity- 25KWp) at Government schools, hostels, police stations and other public service institutions in RESCO model- 700 KWp	TSECL	-
	Energy Efficiency		
EE/6	Conducts Energy Audit tasks through EESL in the selected 19 numbers of different Government buildings	TREDA	
EE/8	Distribution of LED bulbs in 16 villages, that is 2 villages per district	TREDA	
EE/10	Retrofitting of the drinking water pumping system by	TREDA	

	replacing inefficient pumps with BEE star labelled pump		
EE/N/1	Retrofitting of electrical appliances- LED Bulbs, Tube lights and Fans	TREDA	
EE/N/2	Door to door campaign, rally on energy conservation; seminar, painting and quiz competition by Energy/Eco Clubs in various school/colleges in Tripura	TREDA	
EE/N/3	Replacement of agriculture pump sets by star labelled pump in 8 villages (one from each district)	TREDA	
EE/N/4	IEC activities; various activities under the programme on General Awareness	TREDA	
EE/N/5	VC/ Workshop/ Training Programme for School/ College/ University & Stakeholder Departments	TREDA	
Sustainable Habitat			
SH/18	Promoting eco-friendly methods of road construction (Like Using Bitumen without burning)	NHIDCL	PMGSY Tripura
SH/21	Constructing Pilot waterproof Road (Heavy rain fall, water logging, average Ground water level is only 10 meter)	NHIDCL	PMGSY Tripura
SH/N/1	Construction of division offices for PWD(R&B) and PWD(DWS) at Bishlagarh, Sepahijala district Tripura following green building concept along with provision of rainwater harvesting, etc.	PWD (R&B)	
SH/N/2	Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the Secretariat building, Govt. of Tripura.	PWD (R&B)	
SH/N/3	Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the legislative Assembly building, Govt. of Tripura.	PWD (R&B)	
SH/N/4	Renovation of Bituminous concrete road (Battala to Dashamighat) using waste plastic material at Agartala, west Tripura district.	PWD (R&B)	
SH/N/5	Solid Waste Management (2nd Instalment)	UDD	
SH/N/6	Construction of Toilets to achieve Open Defecation Free (ODF, ODF+)	UDD	
SH/N/7	Covered Storm Water Drainage	UDD	
Agriculture & Allied			
SAG/4	Crop Insurance (123400 ha)	DoAFW	
SAG/5	Breeding studies on major crops for tolerance/resistance	DoAFW	
SAG/7	Organic Farming (additional 12,000 ha area under organic cultivation)	DoAFW	
SAG/8	Soil Testing and SHC preparation of 174,000 numbers	DoAFW	
SAG/9	Development of water use efficient micro irrigation methods and individual/community farm ponds	DoAFW	
SAG/10	Developing sustainable soil, water and crop management practices	DoAFW	
SAG/11	Increasing crop intensity in Traditional Conventional Land	DoAFW	
SAG/14	Cross breeding of local cattle through Artificial Insemination using Frozen Semen (FS)	TLDA	ARDD
SAG/19	Distribution of Day-old Chicks (LIT bird) to beneficiaries & BLBH	ARDD	
SAG/20	Capacity Building and trainings of farmers	ARDD	
SAG/N/1	Market Development (e-NAM)	DoAFW	
SAG/N/2	Skill Development	DoAFW	

SAG/N/3	Assistance to the FPO/FPC	DoAFW	
SAG/N/4	Fruits & commercial plantation crop	Horticulture Directorate	
SAG/N/5	Vegetable Cultivation	Horticulture Directorate	
SAG/N/6	Cultivation of spices	Horticulture Directorate	
SAG/N/7	Cultivation of open field flowers	Horticulture Directorate	
SAG/N/8	Mushroom cultivation	Horticulture Directorate	
SAG/N/9	Support for composite fish farming (100 ha./ year)	Directorate of Fisheries	
SAG/N/10	Support for Integrated Pig cum fish farming (100 ha./ year)	Directorate of Fisheries	
SAG/N/11	Ranching of Fish seed in natural and open water bodies (1000 ha. per year)	Directorate of Fisheries	
SAG/N/12	Training/ Awareness programme including fixing of hoardings (2000 no. beneficiary per year)	Directorate of Fisheries	
SAG/N/13	Reclamation of old ponds (500 ha./ year)	Directorate of Fisheries	
SAG/N/14	Development of Bio villages	DBT	
SAG/N/15	Establishment and strengthening of College biotech clubs	DBT and TBB	
SAG/N/16	Setting of DNA clubs	DBT	
Sustaining Himalayan Ecosystem and Green Tripura			
GTM/18	Facilitating greater investment for realising true potential of rubber wood	Forest Dept.	
SHE/N/1	Bamboo Resource Development	Forest Dept.	
SHE/N/2	Facilitation of inoculation of agar trees on private lands	Forest Dept.	
SHE/N/3	Green Corridor Development	Forest Dept.	
SHE/N/4	Agroforestry plantation on RoFR land	Forest Dept.	
SHE/N/5	Silvipasture/ fodder trees development, along with plantation of NTFP and RET species	Forest Dept.	
SHE/N/6	Soil and moisture conservation along with optimum utilisation of check dams	Forest Dept.	
SHE/N/7	Forest Protection with community development	Forest Dept.	
SHE/N/8	Intensive management of eco-parks and protected areas	Forest Dept.	
Water Mission			
WM/1	Creation of new minor storage/ irrigation tanks	PWD (WR)	
WM/2	Protection and Conservation of large wetlands/ waterbodies	PWD (WR)	
WM/11	Installation of SBTW and DTW for irrigation		
WM/14	Iron Removal Plant (IRP)	PWD (DWS)	
WM/15	Surface Water Treatment Plant (SWTP)	PWD (DWS)	
WM/17	Groundwater Treatment Plant (GWTP)	PWD (DWS)	
WM/18	Installation of SBTW/DTW /Spot Sources (like OHP, Mark-II, Ring well etc) for drinking Water	PWD (DWS)	
WM/N/1	Flood Protection/Anti erosion work at vulnerable location along the bank of different Rivers and streams	PWD (WR)	ADB
WM/N/2	Flood protection/anti erosion work	PWD (WR)	
WM/N/3	Raising & strengthening of Existing Embankment	PWD (WR)	
WM/N/4	Creation of New embankment	PWD (WR)	
WM/N/5	Cane/Bamboo plantation along the toe of New and existing embankment in 201.4 km	PWD (WR)	
Health Mission			

HEL/1.1	Task force Meeting to draft health sector plan for heat and air pollution	DoHFW	
HEL/3.1	Sensitization workshop/ meeting of the state programme officers and district level health officers	DoHFW	
HEL/3.2	Trainings of Medical Officers, Health Workers and Programme Officers under NPCCHH (National Program on Climate Change and Human Health)	DoHFW	
HEL/N/1	Greening of Health Sector; DH/CHC as per IPHC guidelines	DoHFW	
HEL/N/2	Life extension of existing roof top off grid solar power plant (power back up and hot water supply) with replacement of batteries and AMC contract for 5 years in different hospitals (DH-2/ CHC-11/ PHC-66) in Tripura by TREDA	DoHFW	
HEL/N/3	Disease Vulnerability Assessment relevant to Climate Change	DoHFW	
HEL/N/4	IEC activities	DoHFW	
Strategic Knowledge Mission			
SKM/N/1	Strengthening of the State Climate Change Cell under the NMSKCC in terms of capacity building	DSTE	
SKM/N/2	Mass awareness programs for Govt. officials, public and students for spreading climate awareness and adoption of an environment friendly lifestyle	DSTE	
SKM/N/3	Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling for the State of Tripura	DSTE	
SKM/N/4	Spatial temporal surveys to monitor changing land use patterns, environmental changes, irrigation systems, forest resource and crop disease surveillance using space technology	DSTE	
SKM/N/5	Develop a Centre for Excellence to address all research issues and technology development and demonstration issues in terms of climate change	DSTE	

Strategic Knowledge Mission			
SKM/N/1	Strengthening of the State Climate Change Cell under the NMSKCC in terms of capacity building	DSTE	
SKM/N/2	Mass awareness programs for Govt. officials, public and students for spreading climate awareness and adoption of an environment friendly lifestyle	DSTE	
SKM/N/3	Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling for the State of Tripura	DSTE	
SKM/N/4	Spatial temporal surveys to monitor changing land use patterns, environmental changes, irrigation systems, forest resource and crop disease surveillance using space technology	DSTE	
SKM/N/5	Develop a Centre for Excellence to address all research issues and technology development and demonstration issues in terms of climate change	DSTE	
Health			
HEL/1.1	Task force Meeting to draft health sector plan for heat and air pollution	Health and Family Welfare Dept.	
HEL/3.1	Sensitization workshop/ meeting of the state programme officers and district level health officers	Health and Family Welfare Dept	
HEL/3.1	Trainings of Medical Officers, Health Workers and Programme Officers under NPCCHH (National Program on Climate Change and Human Health)	Health and Family Welfare Dept	
HEL/N/1	Greening of Health Sector; DH/CHC as per IPHC guidelines	Health and Family Welfare Dept	
HEL/N/2	Life extension of existing roof top off grid solar power plant (power back up and hot water supply) with replacement of batteries and AMC contract for 5 years in different hospitals (DH-2/ CHC-11/ PHC-66) in Tripura by TREDA	Health and Family Welfare Dept	

CHAPTER 10: MONITORING AND EVALUATION

Monitoring and Evaluation (M&E) of climate change interventions is essential to monitor and evaluate the effectiveness of implemented adaptation and mitigation measures. The Paris Agreement has necessitated countries to have harmonized measurement and reporting systems for the countries as per their NDC mitigation commitments. Indian NDC also has several areas in adaptation that needs systematic monitoring and assessing the change in vulnerability due to the investments made. Some of these investments are through the budget and some others are off-budget supported through bi-lateral and multilateral agencies, philanthropic bodies, and national and international climate funds. All these information have to be consolidated nationally and a seamless harmonization of measurement and reporting is also required at state level.

M&E for Tripura SAPCC envisages to determine States' overall progress towards climate resilience and can also help to assess the SAPCCs' contribution for achieving the country's NDCs and SDGs. Individual strategies proposed under respective sectors in Tripura SAPCC will have their respective result framework highlighting the output and impacts. In order to aggregate the outputs/impact of each strategy under the missions proposed under Tripura SAPCC up to the national level, following approach (provided in figure below) is envisaged to monitor and evaluate the interventions. This uses a sectoral approach for measuring the achievement towards India's NDC and SDGs.

Figure 50: Approach for measuring impact of proposed intervention and its contribution towards NDC and SDG

In the SAPCC the attempt has been made to follow a structured process of monitoring which is given as follows.

- Analysis of state circumstances (various, policy targets/achievements)
- Change in vulnerability and risk (as compared to the last SAPCC baseline)
- Stock Taking (sectoral both for adaption and mitigation sectors as per the last SAPCC)
- Analysis of climate relevant investment (on and off budget)
- Category of support as per their climate relevance
- Linkages to SDGs and NDCs goals
- A score card for prioritization of planned actions based on the linkages to both the goals

There is an **institutional mechanism** to be followed for uniform reporting to MoEFCC. The following diagram shows such a process.

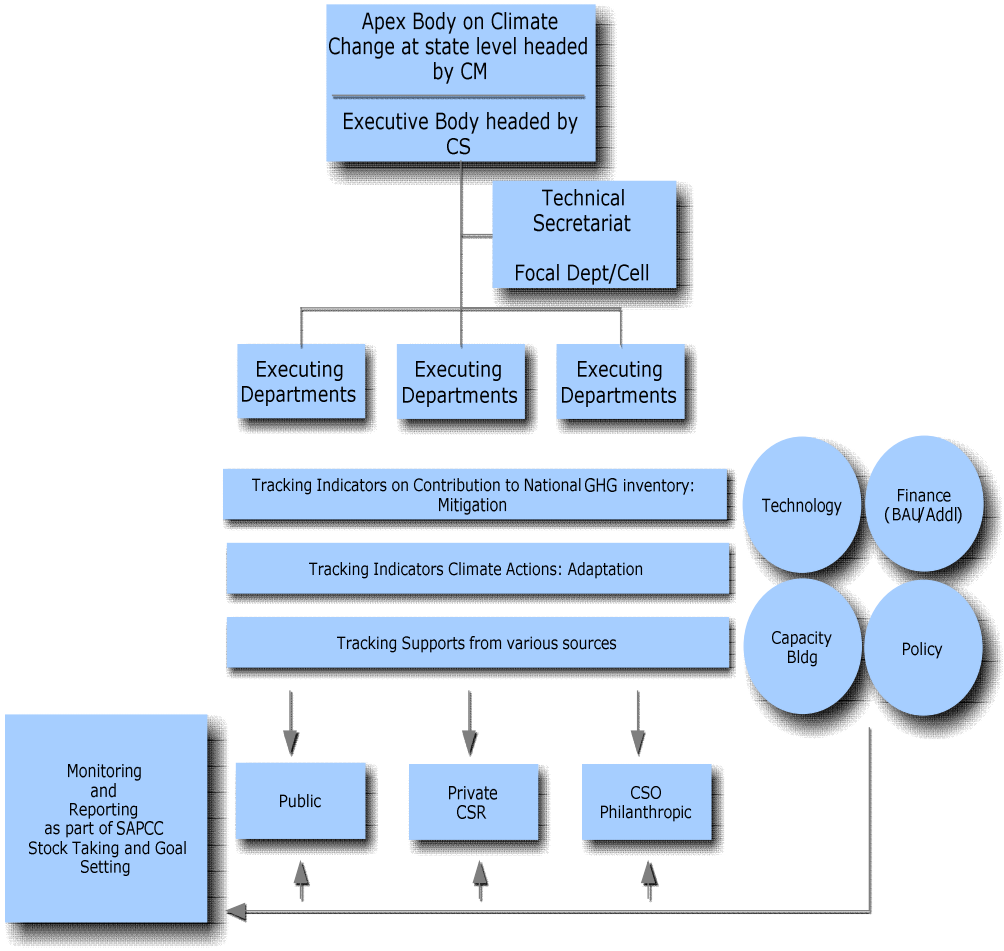
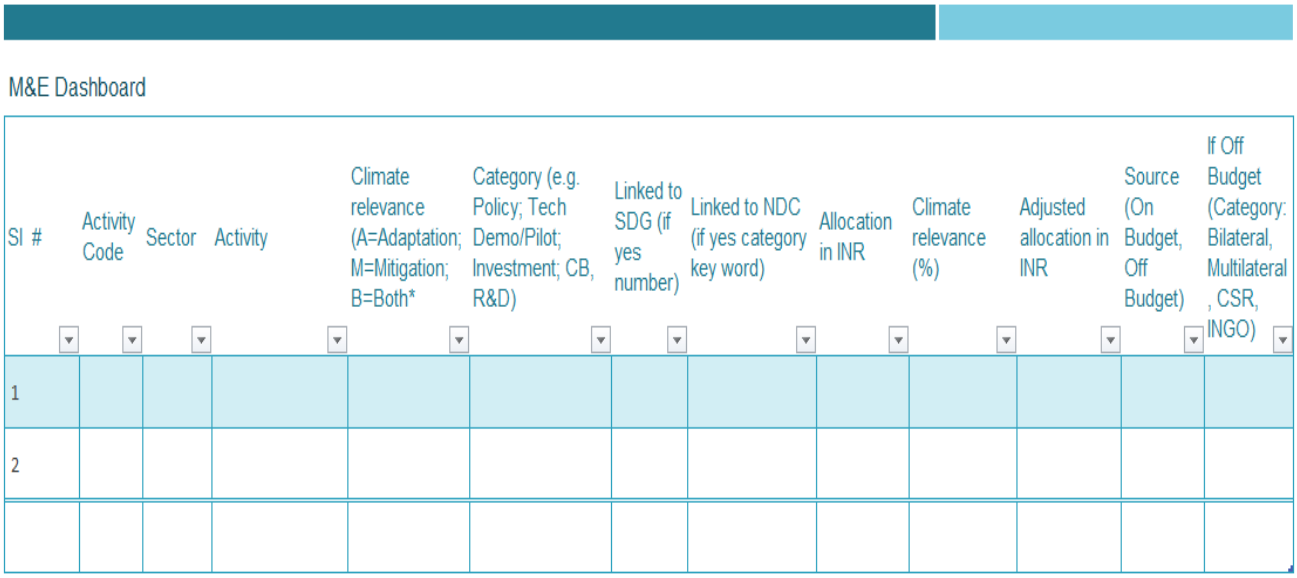


Figure 51: Institutional Mechanism for M&E

Key to M&E system is the proper institutional arrangement. The M&E system will be grounded in the existing institutional framework driven by the focal department/climate change cell within the focal department with higher level political and executive bodies providing policy guidance and governance. The cell/focal department will act as the technical secretariat and will interface with executing departments/line departments for data collection. Each department may constitute a small working group with at least one member in the working group dealing with departmental finance. The working group can be headed by a nodal officer who will interface with the cell/focal department for data/MIS updation.

The working group members and nodal officers must be trained by the focal department on kind of data requirement and their frequency. In addition to the line department officials, members drawn from the finance, statistics and planning should also be part of the training process.

The **M&E protocol** will be activity/strategy based and indicators (both categorical and outcome wise) that should fit this protocol have been given below:



M&E Dashboard

Sl #	Activity Code	Sector	Activity	Climate relevance (A=Adaptation; M=Mitigation; B=Both*	Category (e.g. Policy; Tech Demo/Pilot; Investment; CB, R&D)	Linked to SDG (if yes number)	Linked to NDC (if yes category key word)	Allocation in INR	Climate relevance (%)	Adjusted allocation in INR	Source (On Budget, Off Budget)	If Off Budget (Category: Bilateral, Multilateral, CSR, INGO)
1												
2												

Illustration

Based on the above approach, the state had

- 34 no. of mitigation actions
- 44 no. of adaptation actions
- 5 no. of both adaptation and mitigation actions
- Climate relevant budget for adaptation and allocation and their breakup. However in the absence of budget coding, the climate relevance % can be subjective

Indicator system

The indicators can be classified broadly into the following categories (a) output indicator – as outlined in the physical progress (b) process indicators (c) outcome indicators (aggregation of a and b). The other ways to classifying the indicators can be as follows:

Table 74: Indicator system for monitoring and reporting

Category	Explanation	Remark
Climate Impact[38]	Indicators that depict a particular climate change risk/impact	Only after ex-ante and ex-post assessment, periodicity as per the project, may be exceptionally long term in case of adaptation
Adaptation Measure	Indicators that depict the adaptive measures undertaken	This can be easily tracked in form of relevant activities leading to adaptation
Adaptation Outcome	Indicators that depict the outcomes of the adaptive measures	Aggregate indicator as defined in the project logical framework/result framework
Mitigation Measure	Indicators that depict the mitigation measures undertaken	This can be easily tracked in form of relevant activities leading to mitigation
Mitigation Outcome	Indicators that depict the outcomes of the mitigation measures	Aggregate indicator as defined in the project logical framework/result framework
Process Indicators	Indicators that depict the policies/processes in place that facilitate implementation of adaptation/mitigation measures	Can be reported in form of presence and absence of certain polices or activities that may lead to outcome but not necessarily always leads to a positive outcome, in case of adaptation sometimes may lead to mal-adaptation another sector

[38] Based on a GiZ report on monitoring adaptation projects

Some of the examples of indicators are given below:

Table 75: Indicators and their monitoring and reporting cycle

Sector	Indicators	Level	Remarks (periodicity and challenges)
Agriculture and allied	Reduced key risks and adverse impacts of climate change	Outcome	Aggregate indicator, impact indicator-medium to long-term periodicity
	Irrigation Intensity or % of area under irrigation	Output	May be annual, easy to report
	Cropping intensity	Outcome	Annual easy to report
	Agricultural insurance policy including new crops	Process	Presence of the policy will reduce the risk
	Crop diversification (areas under different crops)	Both output and process	Paddy to Non-paddy may reduce the risk due to climate
	% of individuals who have diversified sources of income	Outcome	Challenges in attribution of rise in income, sometimes direct cash transfer an adaptive policy may result in temporary rise in income
Water	Enhanced food and water security	Outcome	Aggregate indicator, impact indicator-medium to long-term periodicity
	Rise in ground water level	Output	May be short to medium term (pre-monsoon post monsoon reporting possible)
	State water policy addressing climate risks specific to the state	Process	Presence of the policy
Forest	Increased ecosystem resilience in response to climate variability and change	Outcome	Aggregate indicator, impact indicator-long-term periodicity can be combined from various provisioning services
	Increase in plantation area	Output	Short term (if area) to medium term (if based on survival percentage)
	Incentive or Policies on tree outside forest, urban forestry	Process	Presence of the policy
Health	Reduction in vector borne and water borne diseases	Outcome	Aggregate indicator, impact indicator medium to long-term periodicity
	Improvement in dealing with heat wave conditions	Outcome	Aggregate indicator, impact indicator medium to long-term periodicity
	Health policy addressing climate risks specific to the state	Process	Presence of the policy
Energy	Reduction in energy intensity of state GDP	Outcome	Short to medium term considering all factors and leakage
	Share of renewable energy in the energy mix of the state	Output	Easy to report
	Implementation of energy conservation building code in public building	Process	Easy to report from compliance
Urban habitat	% Reduction in Migration of local population directly and indirectly dependent on concerned sectors for their livelihoods	Outcome	Aggregate indicator (short to medium term reporting possible after survey)
	Open defecation free status	Output/Process	Short term
	Amount of solid waste converted to energy	Output	Short term
	Smart city policy on bi-cycle tracks or car pooling	Process	Short term, presence of policy

The above list is only indicative, and the process of indicator selections should be possible after wider consultation with departments. First priority is climate relevant scheme specific indicators (mostly

output indicators) that the department report as routine. The second is project level indicators as defined in the result framework. The third is sector/mission level indicators as defined under mission document or state/national priority (e.g. doubling farm income, reduction of energy intensity of GDP).

Tools and methods for harmonization

- Key aspects in this are to choose indicators/proxy that has relevance to SDG/INDC
- IPCC defined methods on emission inventory (since the state level inventory is not available, proxies on share of renewable, energy efficiency, etc. can be reported)
- For project level emission reduction, Co-benefit tracking tools, sustainable development potentials can be tracked and consolidated. If required, state share reflected in NAMAs can be reflected.
- For adaptation investments, change in vulnerability (mostly the change in adaptive capacity and sensitivity) to be tracked. Those should follow IPCC AR5 methods and tools (presented in the vulnerability section). This tracking can be spatial or temporal.
- The project level vulnerability reduction can be tracked against committed targets based on the project level assessment reports.
- Policy level assessment can be done by tracking policy goals and targets for various sectors.
- Finance data for effective harmonization requires budget coding, without that the nodal department can discuss with technical working groups to fix climate relevance % based on scheme components.

Data management System

- Collect a relevant economic and social data to develop the state circumstances (macro)
- Collect departmental level data based on the proposed strategies by the departments and their output and outcome
- Collect project level data from project MIS (may be externally aided and off budget projects)
- Delegate responsibility for the collection of particular data sets to authorized individuals and agencies of the government.
- Work with industry associations/ NGOs for collecting relevant data having impact on NDC/SDG

Capacity Building

Generally, awareness and capacity to plan and deliver on climate change strategies is low at cutting edge. Therefore, efforts should be made to demystify the climate strategies proposed by the departments at regular interval. The process will be facilitated by the focal department and technical working group members (both department and inter-department) will take part in it. This process should be a quarterly affair each year.

Data frequency

The data sets should be divided in to two categories (a) static e.g. GDP data (b) dynamic data. In essence nothing is static, but some statistics are annual or more. The dynamic datasets change more frequently. However, for such data sets monthly or quarterly cycle of updation will be adequate.

Data consolidation and validation

The data will be validated by the focal department/cell in assistance with experts and also the nodal officers who in turn will provide clarification if any after due consultation with sectoral working group members.

Reporting

The dashboards for key indicators will have regular updation. The climate strategy and action plans should be revised every five years as is the process now. The monitoring of results will be part of that stock taking.

10.1 Priority Adaptation Actions

The high priority activities under State Mission for Sustainable Agriculture are:

- SAG/7- Organic Farming
- SAG/9- Development of water use efficient micro irrigation methods and individual/community farm ponds
- SAG/N/3- Assistance to the FPO/FPC
- SAG/N/4- Fruits & commercial plantation crops
- SAG/N/13- Reclamation of old ponds
- SAG/N/14- Development of Bio villages

The high priority activities under Sustaining Himalayan Ecosystem are:

- SHE/N/5- Silvipasture/ fodder trees development, along with plantation of NTFP and RET species
- SHE/N/6- Soil and moisture conservation along with optimum utilisation of check dams
- SHE/N/3- Green Corridor Development
- SHE/N/1- Bamboo Resource Development

The high priority activities under Water Mission are:

- WM/1- Creation of new minor storage/ irrigation tanks
- WM/2- Protection and Conservation of large wetlands/ waterbodies
- WM/3- Installation of SBTW and DTW for irrigation

The high priority activities under Health Mission are:

- HEL/3- Trainings of Medical Officers, Health Workers and Programme Officers under NPCCHH
- HEL/N/1- Greening of Health Sector; DH/CHC as per IPHC guidelines
- HEL/N/3- Disease Vulnerability Assessment relevant to Climate Change

The high priority activities under Strategic Knowledge Mission are:

- SKM/N/1- Strengthening of the State Climate Change Cell under the NMSKCC in terms of capacity building
- SKM/N/2- Mass awareness programs for Govt. officials, public and students for spreading climate awareness and adoption of an environment friendly lifestyle
- SKM/N/3- Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling for the State of Tripura
- SKM/N/4- Spatial temporal surveys to monitor changing land use patterns, environmental changes, irrigation systems, forest resource and crop disease surveillance using space technology

10.2 Priority Mitigation Actions

The high priority activities under State Solar Mission are:

- SM/2- Installation of 1000 numbers Biogas Plants
- SM/N/1- Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants
- SM/N/3- Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura
- SM/N/5- Installation of Off-grid/ Hybrid Solar Power Plants at buildings in RESCO model

The high priority activities under Energy Efficiency are:

- EE/8- Distribution of LED bulbs in 16 villages, that is 2 villages per district
- EE/N/3- Replacement of agriculture pump sets by star labeled pump in 8 villages

The high priority activities under Sustainable Habitat are:

- SH/N/6- Construction of Toilets to achieve Open Defecation Free (ODF, ODF+)
- SH/N/5- Solid Waste Management (2nd Installment)
- SH/18- Promoting eco-friendly methods of road construction

10.3 Conclusion

According to IPCC, AR6, global warming rise at 1.5 degree Celsius in near-term would increase multiple climate hazards and risks to ecosystem and human beings. The magnitude and rate of climate change and its associated risks depends strongly on the near-term mitigation and adaptation strategies, or actions taken up by respective countries around the world. The near-term strategies have potential to limit global warming and substantially reduce projected losses and damages related to climate change in human systems and ecosystems. Progress is being made in adaptation planning and strategy implementationacross all sectors and regions. The State of Tripura has planned for initiatives to curb the climate change impacts and prioritised immediate and near-term climate risk reduction. It is necessary that an institutional framework to track climate change related activities emerges post this state action planning process. The success of the State's implementation would lie in regular capacity building in all sectors as identified by the MoEF&CC, Agriculture and allied activities, forests and biodiversity, Himalayan Ecosystem, health, tourism, urban habitat, disaster management and energy. It will be worthwhile to do concurrent monitoring and evaluation of the sectoral indicators by the respective departments and share data periodically on three main aspects – capacity building, adaptation and mitigation. This when linked along with the SDGs, NDCs and Net Zero Plan, it would be able to reflect the response to the climate change scenario in the coming years.

ANNEXURE 1

Score Card

Sl. No.	Code	Proposed Activities	Sector	Funding (20%)	Implementation (30%)	SDG-NDC (50%)	Marks	Overall Rank	Sub Rank
1	SM/2.2	Installation of 1000 numbers Biogas Plants	Solar Mission	2	2	3	2.5	6	1
2	SM/2.3	Installation of Solar Photovoltaic Street Lighting System at all marketplaces in Tripura on turn-key basis including 5 years warranty/ Guarantee and Operation & maintenance contract- 50000 numbers	Solar Mission	2	2	3	2.5	6	1
3	SM/N/1	Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants	Solar Mission	1	1	3	2	46	7
4	SM/N/2	Installation of agricultural waste-based Biogas Plants in the state of Tripura under Waste to Energy & Biomass based Co-generation.	Solar Mission	2	2	3	2.5	6	1
5	SM/N/3	Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura- 150 KWp	Solar Mission	2	2	3	2.5	6	1
6	SM/N/4	Installation of Solar Drier cum Smoke House for Rubber Processing Center in Tripura- 3950 numbers	Solar Mission	2	2	3	2.5	6	1
7	SM/N/5	Installation of Off-grid/ Hybrid Solar Power Plants (Maximum Capacity- 25KWp) at Government schools, hostels, police stations and other public service institutions in RESCO model- 700 KWp	Solar Mission	2	1	3	2.2	32	6
8	EE/6	Conducts Energy Audit tasks through EESL in the selected 19 numbers of different Government buildings	Energy Efficiency	2	2	3	2.5	6	3
9	EE/8	Distribution of LED bulbs in 16 villages, that is 2 villages per district	Energy Efficiency	3	2	3	2.7	1	1
10	EE/10	Retrofitting of the drinking water pumping system by replacing inefficient pumps with BEE star labelled pump	Energy Efficiency	2	2	3	2.5	6	3
11	EE/N/1	Retrofitting of electrical appliances- LED Bulbs, Tube lights and Fans	Energy Efficiency	2	2	3	2.5	6	3
12	EE/N/2	Door to door campaign, rally on energy conservation; seminar, painting and quiz competition by	Energy Efficiency	3	2	3	2.7	1	1

		Energy/Eco Clubs in various school/colleges in Tripura							
13	EE/N/3	Replacement of agriculture pump sets by star labelled pump in 8 villages (one from each district)	Energy Efficiency	2	2	3	2.5	6	3
14	EE/N/4	IEC activities; various activities under the programme on General Awareness	Energy Efficiency	2	1	3	2.2	32	7
15	EE/N/5	VC/ Workshop/ Training Programme for School/ College/ University & Stakeholder Departments	Energy Efficiency	2	1	2	1.7	61	8
16	SH/18	Promoting eco-friendly methods of road construction (Like Using Bitumen without burning)	Sustainable Habitat	2	2	3	2.5	6	2
17	SH/21	Constructing Pilot waterproof Road (Heavy rain fall, water logging, average Ground water level is only 10 meter)	Sustainable Habitat	2	2	3	2.5	6	2
18	SH/N/1	Construction of division offices for PWD(R&B) and PWD(DWS) at Bishlagarh, Sepahijala district Tripura following green building concept along with provision of rainwater harvesting, etc.	Sustainable Habitat	2	1	3	2.2	32	7
19	SH/N/2	Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the Secretariat building, Govt. of Tripura.	Sustainable Habitat	2	2	3	2.5	6	2
20	SH/N/3	Implementation of rainwater harvesting, ground water recharge and implanting roof top solar panel for internal electrification in the legislative Assembly building, Govt. of Tripura.	Sustainable Habitat	2	2	3	2.5	6	2
21	SH/N/4	Renovation of Bituminous concrete road (Battala to Dashamighat) using waste plastic material at Agartala, west Tripura district.	Sustainable Habitat	1	1	2	1.5	79	9
22	SH/N/5	Solid Waste Management (2nd Instalment)	Sustainable Habitat	2	2	3	2.5	6	2
23	SH/N/6	Construction of Toilets to achieve Open Defecation Free (ODF, ODF+)	Sustainable Habitat	3	2	3	2.7	1	1
24	SH/N/7	Covered Storm Water Drainage	Sustainable Habitat	2	1	2	1.7	61	8
25	SAG/4	Crop Insurance (123400 ha)	Sustainable Agriculture	2	1	3	2.2	32	4

26	SAG/5	Breeding studies on major crops for tolerance/resistance	Sustainable Agriculture	2	1	2	1.7	61	17
27	SAG/7	Organic Farming (additional 12,000 ha area under organic cultivation)	Sustainable Agriculture	3	2	3	2.7	1	1
28	SAG/8	Soil Testing and SHC preparation of 174,000 numbers	Sustainable Agriculture	2	1	2	1.7	61	17
29	SAG/9	Development of water use efficient micro irrigation methods and individual/community farm ponds	Sustainable Agriculture	3	2	3	2.7	1	1
30	SAG/10	Developing sustainable soil, water and crop management practices	Sustainable Agriculture	2	2	2	2	46	8
31	SAG/11	Increasing crop intensity in Traditional Conventional Land	Sustainable Agriculture	2	1	2	1.7	61	17
32	SAG/14	Cross breeding of local cattle through Artificial Insemination using Frozen Semen (FS)	Sustainable Agriculture	2	1	2	1.7	61	17
33	SAG/19	Distribution of Day Old Chicks (LIT bird) to beneficiaries & BLBH	Sustainable Agriculture	2	2	2	2	46	8
34	SAG/20	Capacity Building and trainings of farmers	Sustainable Agriculture	2	2	2	2	46	8
35	SAG/N/1	Market Development (e-NAM)	Sustainable Agriculture	2	1	2	1.7	61	17
36	SAG/N/2	Skill Development	Sustainable Agriculture	2	1	2	1.7	61	17
37	SAG/N/3	Assistance to the FPO/FPC	Sustainable Agriculture	3	2	2	2.2	32	4
38	SAG/N/4	Fruits & commercial plantation crop	Sustainable Agriculture	2	2	3	2.5	6	3
39	SAG/N/5	Vegetable Cultivation	Sustainable Agriculture	2	2	2	2	46	8
40	SAG/N/6	Cultivation of spices	Sustainable Agriculture	2	2	2	2	46	8
41	SAG/N/7	Cultivation of open field flowers	Sustainable Agriculture	2	2	2	2	46	8
42	SAG/N/8	Mushroom cultivation	Sustainable Agriculture	2	2	2	2	46	8
43	SAG/N/9	Support for composite fish farming (100 ha./ year)	Sustainable Agriculture	2	2	2	2	46	8

44	SAG/N/10	Support for Integrated Pig cum fish farming (100 ha./ year)	Sustainable Agriculture	2	2	2	2	46	8
45	SAG/N/11	Ranching of Fish seed in natural and open water bodies (1000 ha. per year)	Sustainable Agriculture	2	1	2	1.7	61	17
46	SAG/N/12	Training/ Awareness programme including fixing of hoardings (2000 no. beneficiary per year)	Sustainable Agriculture	2	1	2	1.7	61	17
47	SAG/N/13	Reclamation of old ponds (500 ha./ year)	Sustainable Agriculture	2	1	3	2.2	32	4
48	SAG/N/14	Development of Bio villages	Sustainable Agriculture	2	1	3	2.2	32	4
49	SAG/N/15	Establishment and strengthening of College biotech clubs	Sustainable Agriculture	1	1	2	1.5	79	25
50	SAG/N/16	Setting of DNA clubs	Sustainable Agriculture	1	1	2	1.5	79	25
51	GTM/18	Facilitating greater investment for realising true potential of rubber wood	Sustaining Himalayan Ecosystem and GTM	1	1	1	1	83	5
52	SHE/N/1	Bamboo Resource Development	Sustaining Himalayan Ecosystem and GTM	2	1	2	1.7	61	5
53	SHE/N/2	Facilitation of inoculation of agar trees on private lands	Sustaining Himalayan Ecosystem and GTM	2	1	2	1.7	61	1
54	SHE/N/3	Green Corridor Development	Sustaining Himalayan Ecosystem and GTM	2	2	3	2.5	6	4
55	SHE/N/4	Agroforestry plantation on RoFR land	Sustaining Himalayan Ecosystem and GTM	2	1	3	2.2	32	5
56	SHE/N/5	Silvipasture/ fodder trees development, along with plantation of NTFP and RET species	Sustaining Himalayan	2	1	2	1.7	61	1

			Ecosystem and GTM						
57	SHE/N/6	Soil and moisture conservation along with optimum utilisation of check dams	Sustaining Himalayan Ecosystem and GTM	2	2	3	2.5	6	1
58	SHE/N/7	Forest Protection with community development	Sustaining Himalayan Ecosystem and GTM	2	2	3	2.5	6	5
59	SHE/N/8	Intensive management of eco-parks and protected areas	Sustaining Himalayan Ecosystem and GTM	2	1	2	1.7	61	5
60	WM/1	Creation of new minor storage/ irrigation tanks	Water Mission	2	2	3	2.5	6	1
61	WM/2	Protection and Conservation of large wetlands/ waterbodies	Water Mission	2	2	3	2.5	6	1
62	WM/11	Installation of SBTW and DTW for irrigation	Water Mission	2	2	3	2.5	6	1
63	WM/14	Iron Removal Plant (IRP)	Water Mission	2	1	1	1.2	82	12
64	WM/15	Surface Water Treatment Plant (SWTP)	Water Mission	2	2	2	2	46	5
65	WM/17	Groundwater Treatment Plant (GWTP)	Water Mission	2	2	2	2	46	5
66	WM/18	Installation of SBTW/DTW /Spot Sources (like OHP, Mark-II, Ring well etc) for drinking Water	Water Mission	2	2	3	2.5	6	1
67	WM/N/1	Flood Protection/Anti erosion work at vulnerable location along the bank of different Rivers and streams	Water Mission	2	2	2	2	46	5
68	WM/N/2	Flood protection/anti erosion work	Water Mission	2	2	2	2	46	5
69	WM/N/3	Raising & strengthening of Existing Embankment	Water Mission	2	1	2	1.7	61	9
70	WM/N/4	Creation of New embankment	Water Mission	2	1	2	1.7	61	9
71	WM/N/5	Cane/Bamboo plantation along the toe of New and existing embankment in 201.4 km	Water Mission	2	1	2	1.7	61	9
72	HEL/1.1	Task force Meeting to draft health sector plan for heat and air pollution	Health Mission	2	1	3	2.2	32	2
73	HEL/3.1	Sensitization workshop/ meeting of the state programme officers and district level health officers	Health Mission	2	1	2	1.7	61	7
74	HEL/3.2	Trainings of Medical Officers, Health Workers and	Health Mission	2	2	3	2.5	6	1

		Programme Officers under NPCCHH (National Program on Climate Change and Human Health)							
75	HEL/N/1	Greening of Health Sector; DH/CHC as per IPHC guidelines	Health Mission	2	1	3	2.2	32	2
76	HEL/N/2	Life extension of existing roof top off grid solar power plant (power back up and hot water supply) with replacement of batteries and AMC contract for 5 years in different hospitals (DH-2/ CHC-11/ PHC-66) in Tripura by TREDA	Health Mission	2	1	3	2.2	32	2
77	HEL/N/3	Disease Vulnerability Assessment relevant to Climate Change	Health Mission	2	1	3	2.2	32	2
78	HEL/N/4	IEC activities	Health Mission	2	2	2	2	46	6
79	SKM/N/1	Strengthening of the State Climate Change Cell under the NMSKCC in terms of capacity building	Strategic Knowledge Mission	2	2	3	2.5	6	1
80	SKM/N/2	Mass awareness programs for Govt. officials, public and students for spreading climate awareness and adoption of an environment friendly lifestyle	Strategic Knowledge Mission	2	2	3	2.5	6	1
81	SKM/N/3	Vulnerability & Impact Mapping across various sectors, GHG Accounting & Climate Modelling for the State of Tripura	Strategic Knowledge Mission	2	2	3	2.5	6	1
82	SKM/N/4	Spatial temporal surveys to monitor changing land use patterns, environmental changes, irrigation systems, forest resource and crop disease surveillance using space technology	Strategic Knowledge Mission	2	1	3	2.2	32	4
83	SKM/N/5	Develop a Centre for Excellence to address all research issues and technology development and demonstration issues in terms of climate change	Strategic Knowledge Mission	2	1	3	2.2	32	4

ANNEXURE 2

Activity wise assumptions for Emission Reductions/ Avoided Emissions

1. **SM/2- Installation of 1000 Biogas Plants**

Assumptions- Comparison is made for emissions between firewood and natural gas for cooking purpose. Average daily fuel woodconsumption per household taken as 5.4 kg, for which annual CO_2 emission is 319 t CO_2. Fuelwood is replaced by biogas plant per household. average household use of LPG is 140.4 kg (275.18 litres), annually. 6 m^3 of a digester produces 3.5 m^3/ day of biogas (here 3 m^3 digester is taken as an example). Calorific value of LPG is 46-51 MJ/m^3 and Biogas is 20 MJ/m^3.

2. **SM/2- Promotion and facilitation of Off-grid or decentralized renewable energy generation for electrification, cooking and other thermal energy requirement**

Assumptions- Installed capacity of Small Hydro power (MW). Installed capacity is 16.01 MW and potential capacity is 46.86 MW.Small hydro plant running at 40% PLF, for 24 hours a year and grid emission factor0.79.

3. **SM/N/1- Conversion of Off grid Solar Power Plants to Hybrid Solar Power Plants**

Assumptions- Installation of Solar lights. Comparison is made between kerosene lamps and solar powered LEDs. Kerosene lamp with 55 lumens emits 0.139 t CO_2/ year. Replacement of kerosene lamps with solar powered LEDs. 192936 is the number of solar LED lights in the State and 292601 is the number targeted by TREDA.

4. **SM/N/3- Installation of 25 KWp Micro grid Solar Power Plant at 6 remote villages/ hamlets in Tripura**

Assumptions- Installed solar capacity (MW) targeted is 25 KWp. 6 Solar power plants running for 9 hours in a year with PLF 17-25% (20%/ 0.2) with grid emission factor0.79.

5. **SM/N/5- Installation of Off-grid/ Hybrid Solar Power Plants (Maximum Capacity- 25KWp) at Government schools, hostels, police stations and other public service institutions in RESCO model**

Assumptions- Solar power plant running for 9 hours in a year with PLF 17-25% (average taken as 20%), grid emission factor0.79. No. of buildings under RESCO model can be taken into account.

6. **EE/8- Distribution of LED bulbs in 16 villages, that is 2 villages per district**

Assumptions- Number of Household in 16 villages, with 4 LED per household (12 Watt).
It is assumed that same luminosity is provided by both CFL(13-18W) and LED (7-10W). A difference of 8W is observed in CFL and LED. Assuming that operating hours is 10 hours in a year. Using LED will reduce the electricity consumption as CFL. Average Household size is taken as 250, in 16 villages, 4 LED per HH of 12 W. Grid emission factor considered 0.79.

7. **EE/N/3- Replacement of agriculture pump sets by star labeled pump in 8 villages (one from each district)**

Assumptions- 1300 Solar pump installations is targeted in the State. In Tripura, average land holding is 0.56 ha. therefore, capacity of solar pumps used is taken as 2HP, electricity consumption taken as 1.49 kW, hours of operation from 9 AM to 3 PM for 90 days a year, grid emission factor 0.79.

8. **Facilitating greater investment for realising true potential of rubber wood**

Assumptions- Carbon sequestration of*Hevea brasiliensis*is taken at an average of 36.7 tons CO_2 per ha per year. Tripura State has planned for 30000 ha. Tree age considered at 5, 10, 15 and 20 years. Average CO_2 equivalent 11.39 megagram per ha per year.

9. SHE/N/1- Bamboo Resource Development

Assumptions- One hectare of bamboo stands absorbs about 17 tonnes of carbon per year. 6000 hectare area of bamboo plantation is planned by the Department till 2030.