Developing India's National Adaptation Plan

Consultation on the National Adaptation Plan (NAP)

21 July 2025

Contents

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Context Setting for NAP

Vision & objectives of the NAP process

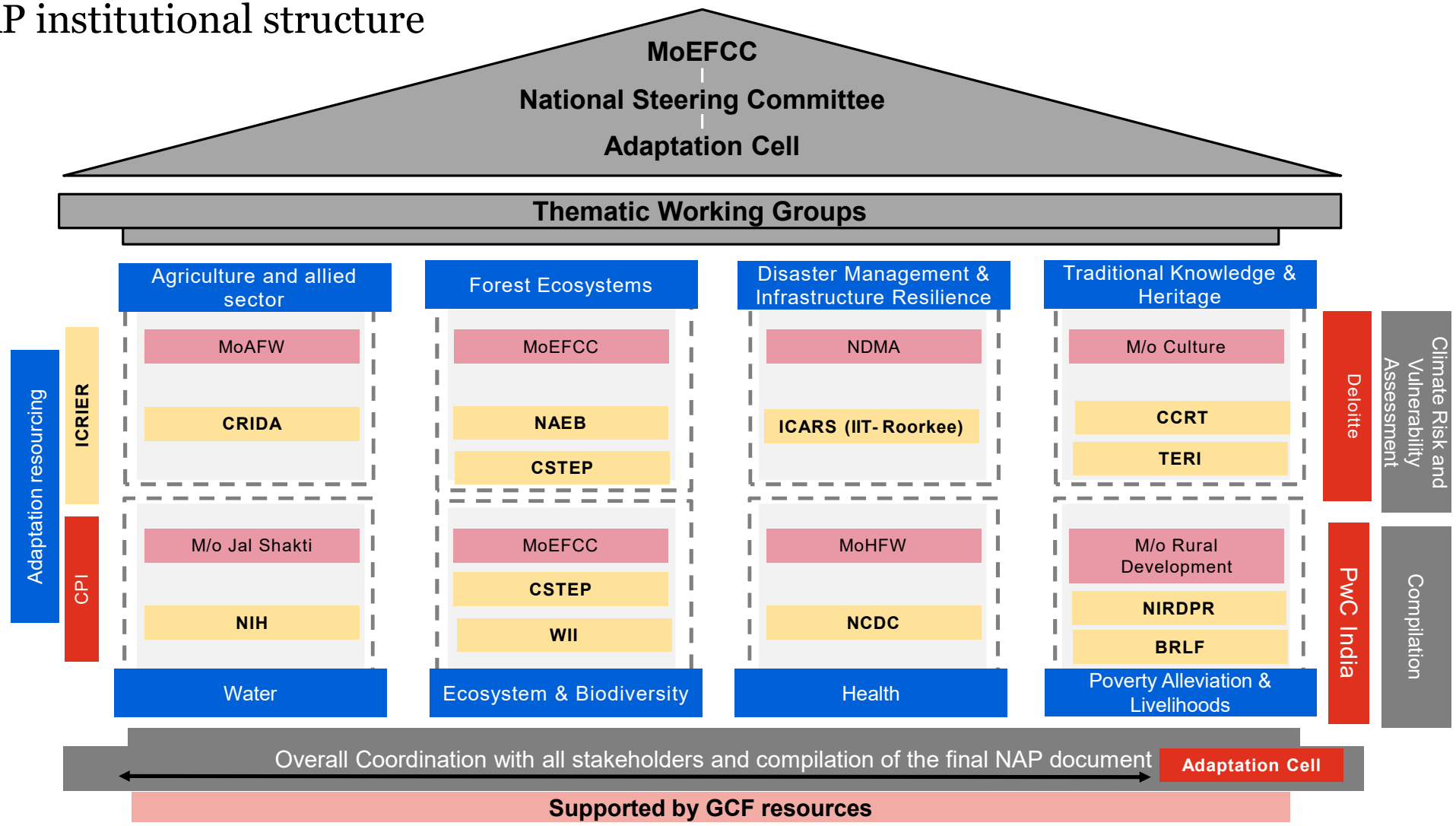
Vision

- Mainstreaming climate adaptation into policies, budgets and developmental frameworks.
- Foster climate-resilient development to make people, ecosystems and economies more resilient and better prepared to deal with present and future climate risks and vulnerabilities.

Objectives

01	Understand current and future climate risks and vulnerabilities
02	Identify and address medium and long term priorities for climate adaptation
03	Establish systems, policies, measures and capacities to ensure strengthened adaptation planning, budgeting and implementation

NAP institutional structure



2

NAP Document: Structure

Approach Adopted

11 national adaptation priorities developed, aligned with Viksit Bharat, SDGs, and climate risks.

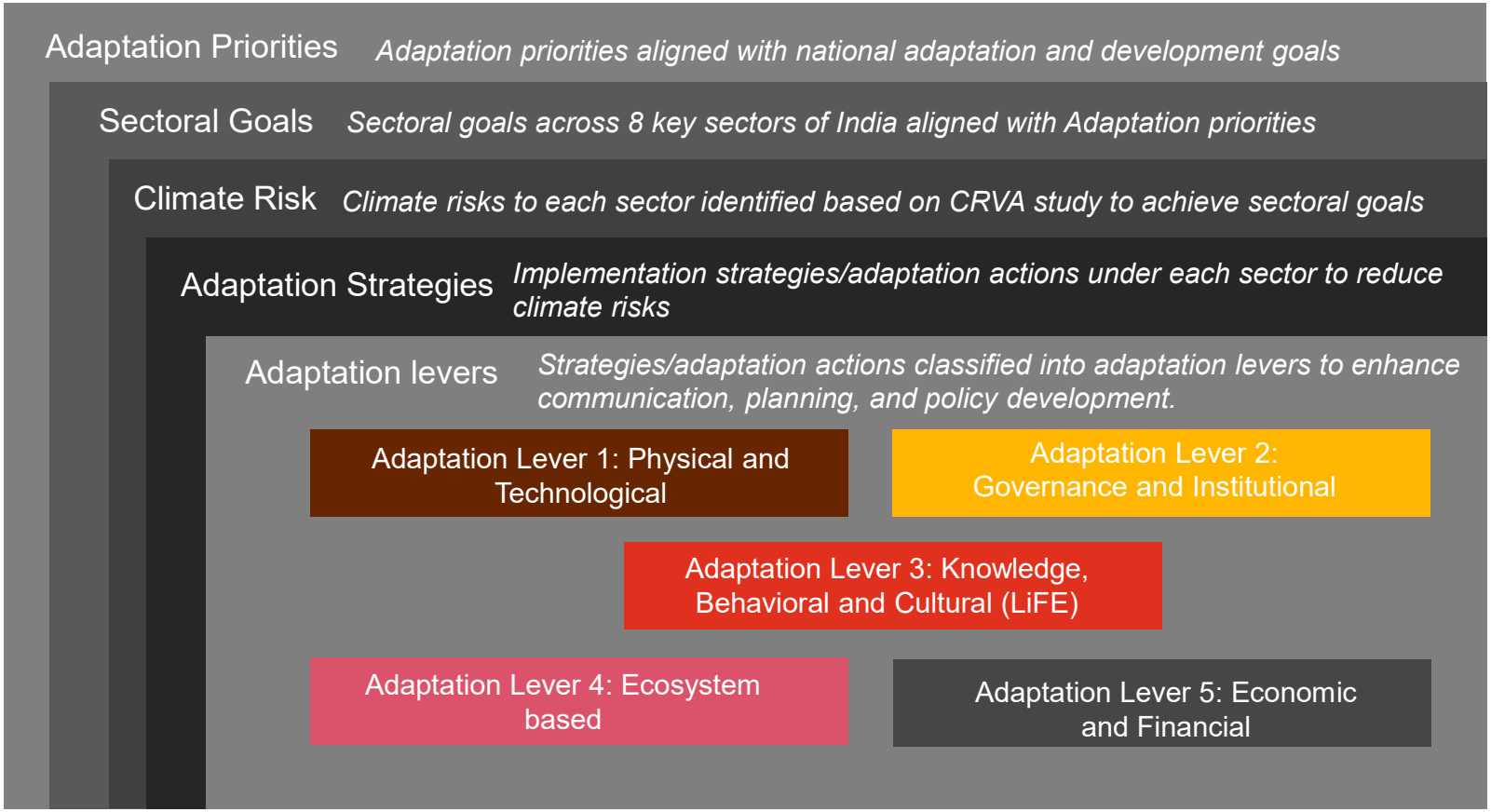
Climate risks identified for **8 key sectors**.

Sectoral adaptation goals defined in line with 11 national priorities.

Adaptation actions designed under each goal, categorized into **5 cross-cutting levers**:

- **Physical & Technological**
- **Governance & Institutional**
- **Knowledge, Behavioural & Cultural (LiFE)**
- **Ecosystem-based**
- **Economic & Financial**

Arriving at the national adaptation plan for each sector



Adaptation priorities

1. Develop robust strategies to protect communities from climate variability and natural disasters, focusing on vulnerable populations to enhance resilience.

2. Implement climate-resilient agricultural practices to ensure food security, nutrition, and sustainable livelihoods.

3. Promote urban environments that are resilient to climate impacts, improving living conditions and overall well-being.

4. Utilize ecosystem-based approaches (EbA) and traditional knowledge to conserve forests and biodiversity, enhancing ecosystem & human health and community welfare.

5. Embed climate adaptation strategies within governance frameworks for effective planning and management.

6. Encourage innovation and capacity-building initiatives to strengthen climate change adaptation efforts, including the deployment of suitable technologies.

7. Develop gender inclusive and sustainable strategies sensitive to climate change to support disadvantaged groups, ensuring equity and fairness.

8. Pursue national growth and poverty alleviation while maintaining ecological integrity and optimizing resource management.

9. Facilitate partnerships with civil society, local government units, and public-private collaborations for effective adaptation initiatives.

10. Mobilize finance for adaptation by accessing public, multilateral and private funds and promoting climate resilience.

11. Enhance monitoring and evaluation processes to improve adaptation actions, while fostering regional cooperation for knowledge exchange and best practices

Arriving at the national adaptation plan for each sector

Lever	Description
Adaptation Lever 1: Physical and Technological	Building resilience of physical infrastructure and technology (including EWS, hazard mapping) to build resilience of communities
Adaptation Lever 2: Governance and Institutional	Strengthen institutions to enhance management and planning processes by incorporating adaptation actions into national and sub-national sectoral plans to improve decision-making related to climate change.
Adaptation Lever 3: Knowledge, Behavioral and Cultural (LiFE)	Capacity building, Communication, Behavior change, preservation of traditional knowledge as well as generation and transfer of new research to support decision making among communities and local institutions for effective climate adaptation
Adaptation Lever 4: Ecosystem based	Ecosystem based solutions to preserve natural resources and increase resilience to climate variability
Adaptation Lever 5: Economic and Financial	Creation / revision of incentive mechanisms, funding schemes, contingency funds for emergencies/ disasters

Table of Contents of the NAP

Section	Title / Focus	Total Pages
Cover Page, Foreword, Acknowledgement		
List of Abbreviations, tables, Glossary		TBD
Executive Summary	Overview of the NAP, its structure, key focus areas, and intended outcomes	
1. Background	Climate change context, UNFCCC decisions, key concerns	
2. National Vision and Mandate	Vision, objectives, and formulation principles of NAP	
3. Sectoral Adaptation Plans	Agriculture, Health, Forestry, Biodiversity, Heritage, Disaster Management, Water, Poverty	
4. Adaptation Resourcing	Expenditure Analysis and Forecasting	
5. Implementation Strategies	Institutional structure, monitoring, evaluation, and learning, Locally led adaptation, capacity building, financing strategies	
6. Conclusion	Way Forward	
References and Annexures		
Total (Approximately)		**80 -100**

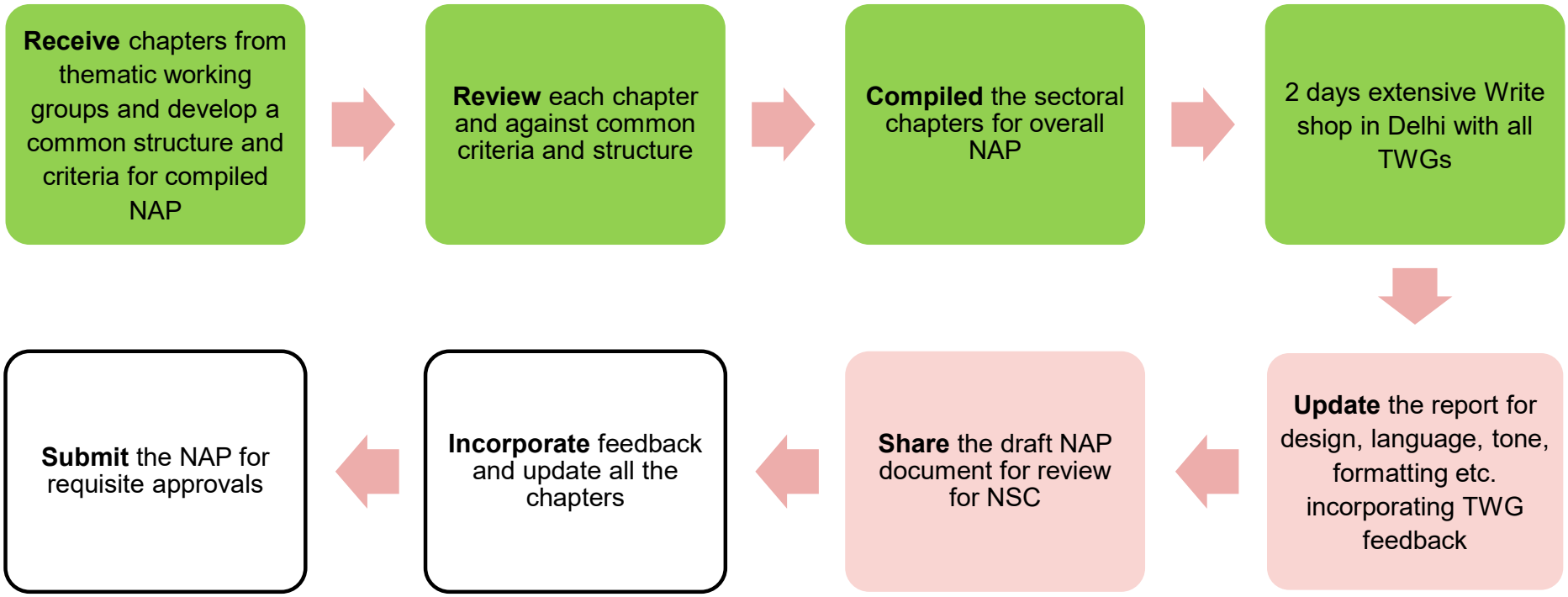
Note: Cover page, Foreword, Acknowledgement and References sections are not included in the page count

3

Sectoral Chapters

Process followed to compile sectoral chapters

- The compilation of sectoral chapters started with receiving detailed chapters from the TWG based on NAP guidance document
- Each chapter was then reframed into a common template to ensure consistency, coherence and accuracy



Completed	Yet to done	Current stage

Review of Sectoral Chapters for India's NAP- Summary and Rationale

Rationale

The standardized structure of the sectoral chapters is designed to incorporate information that systematically communicate the impacts of climate change and assist in planning and resource allocation.

Criteria for evaluation

- Comprehensively stated climate risks and impacts
- Adaptation strategies addressing identified climate risks and vulnerabilities
- Clearly defined implementation plan in terms of sectoral goals, strategies and timelines
- Synergy between the implementation plan and broader development goals
- Linkages with other sectors and other cross cutting theme such as gender and private sector

Key questions answered by sectoral chapters

1

Why is the sector important?

Establishes the significance and priority of the sector to India's broader development goals and growth story

2

What is the major climate threat to the sector?

Provides a comprehensive understanding of how climate change affects each sector which is crucial to determine where attention and resources should be directed to minimize adverse impacts

3

What needs to and can be done?

Outlines actionable adaptation strategies and timelines that can be implemented to address key climate risks and vulnerabilities to the sector while addressing the development needs of the country

Cross-Cutting Themes

Gender Mainstreaming

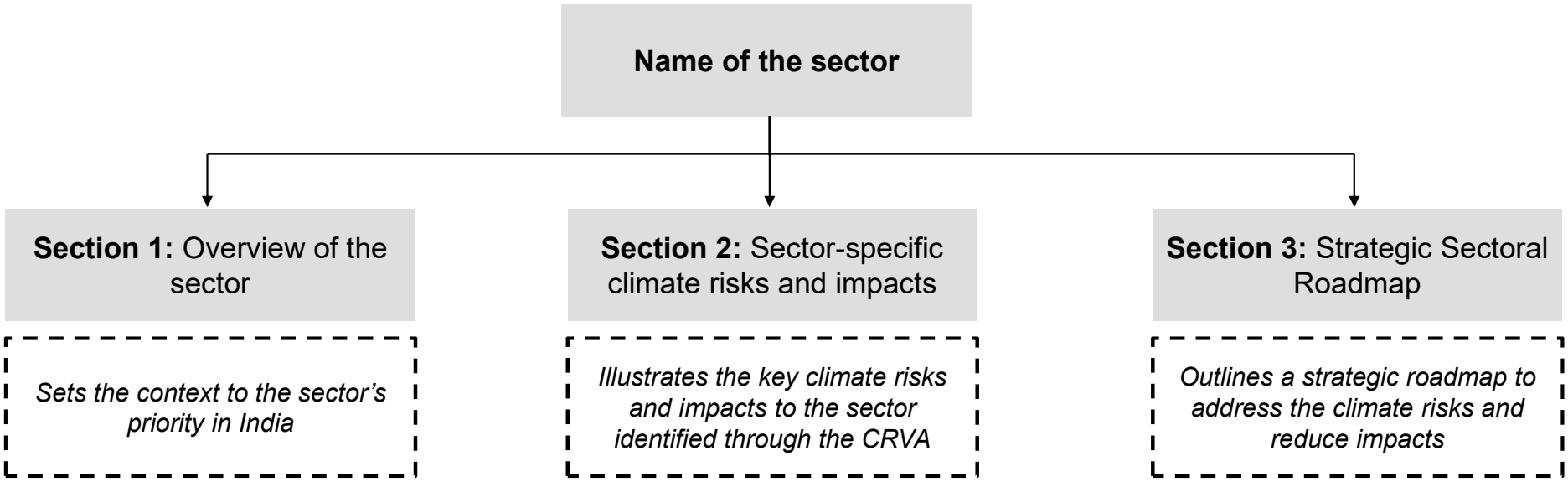
- Gender considerations were embedded across strategies goals, and sector-specific actions
- Climate risk and vulnerability assessments integrated **sex-disaggregated indicators** to ensure gender-responsive analysis.
- **Gender-specific case studies** and examples were included across all **sectoral chapters**, demonstrating practical applications and impact.

Private Sector Engagement

- Private sector components are integrated in the sectoral chapters, resourcing chapter as well as spread across pillars of implementation strategy
- Distinction is made between Community organizations, Academia and Businesses
- Identification of enabling factors to incentivize private sector engagement focusing on both supply chains as well as finance.

Structure of the sectoral chapter

Each sector has been organized in the following structure:



Agriculture and Allied sectors (1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Potential impacts		
	Climatic	Non-climatic	Direct impact	Indirect impact	Socio-economic consequences
Drought	• Changing rainfall patterns/ deficit rainfall • Prolonged dry spells	• Inadequate irrigation infrastructure • Over-extraction of groundwater • Soil degradation	• Yield reduction, especially in rainfed crops (e.g. cereals, pulses, oilseeds, cotton) • Increase in fodder scarcity and reduced productivity and of livestock • Reduction of soil moisture	• Reduction in farm incomes	• Increased poverty and rural to urban distress migration • Increased burden on women
Flood	• Intense/extreme rainfall	• Unplanned urbanization • Deforestation • Inadequate drainage infrastructure • Inadequate flood defenses	• Crop damage and yield losses in crops such as rice, maize • Disruption of harvest schedules and quality loss • Loss of fisheries and livestock production • Soil erosion leading to degradation of soil quality • Damage to infrastructure	• Loss of livelihoods	• Increased poverty and rural to urban distress migration • Higher rebuilding costs • Increased health risk • Increased burden on women
Heat wave and Extreme heat	• Rising temperatures	• Soil degradation and moisture loss • Occupational exposure • Water scarcity and irrigation demands • Deforestation and loss of tree cover • Unsustainable land use practices	• Decline in crop yields and animal productivity • Increased mortality rates in livestock. • Increase in pest and disease outbreaks	• Impact on health and productivity of farmers and labourers working on fields.	• Higher healthcare costs • Increased debt levels • Rural to urban distress migration • Health implications on women
Cyclone	• Heavy rainfall • Saltwater intrusion	• Proximity to coast areas • Inadequate infrastructure • Socioeconomic factors such as limited access of high number of small and marginal landholdings to resources (e.g.- crop insurance)	• Damage to field and horticultural crops and livestock, fisheries • Damage to built infrastructure	• Significant financial strain on farmers.	• Increased poverty and rural to urban migration • Higher recovery costs
Sea level rise and Coastal flooding	• Coastal erosion • Increased soil salinity	• Freshwater availability • Land subsidence • Coastal development • Deforestation of coastal habitats	• Sea water intrusion into groundwater affecting crop and fish production • Soil erosion	• Decline in crop productivity	• Settlement displacement
Cold Wave	• Prolonged cold spells	• Sensitivity of crops like wheat, mustard, and potatoes to sudden temperature drops • Inadequate protective infrastructure • Limited access to resources such as seeds for cold-tolerant crops, crop insurance, and financial aid.	• Frost damage to rabi crops (e.g. wheat, peas) and decline in crop production, livestock health • Harvest delays	• Loss of rural livelihoods due to extreme cold	• Malnutrition risks • Increased financial distress

Agriculture and Allied sectors (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Sectoral goals	Adaptation Priorities
• Drought • Flood • Heat wave and Extreme heat • Cyclone • Sea level rise and Coastal flooding • Cold Wave	**Goal 1:** Enhanced climate-resilience of agricultural production and livelihoods	2,4,8
	Goal 2: Improved natural resource management (water, soil, environment)	2,4,8
	Goal 3: Institutional capacity enhanced	6,7,9,11
	Goal 4: Increased access to risk management instruments	6,7,10

Sectoral Roadmap: Total of 4 Goals and 18 Strategies

Sectoral Goal	**Adaptation Strategies**	Levers	**Timeline for implementation**
Enhanced climate-resilience of agricultural production and livelihoods	Encourage the use of climate-resilient crop and livestock varieties while promoting integrated farming through crop diversification and agro-forestry.	Lever 1	Medium term
	Implement micro-irrigation techniques like drip and sprinkler systems, utilize soil-test based fertilizer applications for optimal nutrient use, and adopt water-efficient rice cultivation methods such as DSR, SRI, and AWD to improve water use efficiency and nutrient management:	Lever 1	Short term
	Enhance livestock resilience through better shelter management, nutrition practices with mineral mixtures, and fodder scarcity management via silage making, alongside enabling timely sowing of crops using technology.	Lever 1, 4	Medium term
	Support conservation agriculture and organic farming, promote improved fishing technologies, and advance ecosystem-friendly practices for long-term sustainability.	Lever 1, 4	Medium term
Improved natural resource management (water, soil, environment)	Promote integrated soil and water conservation by implementing in situ conservation measures, on-farm and community-based rainwater harvesting systems, including check dams and ground-water recharge initiatives.	Lever 1, 5	Short term
	Develop and promote climate-resilient watershed management and ecosystem-based adaptation approaches to manage water resources effectively.	Lever 2	Medium term
Institutional capacity enhanced	Create and bolster local organizations such as Self-Help Groups (SHGs), Water User Associations (WUAs), and Farmer Producer Organizations (FPOs) to empower community-level adaptation initiatives.	Lever 2	Short term
	Conduct targeted programs to build the capacities of government agencies, non-governmental organizations, PRIs, and farmers, ensuring a multi-stakeholder understanding of climate adaptation needs.	Lever 2	Short term
Increased access to risk management instruments	Develop and promote the adoption of diverse insurance products—crop, livestock, weather-based, and disaster insurance—to mitigate agricultural risks.	Lever 4	Short term
	Create and strengthen mechanisms that provide financial and social safety nets for farmers and agricultural labor, ensuring protection against unforeseen challenges.	Lever 3,2	Short term

Poverty Alleviation and Livelihoods (1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Potential impacts on Sectors				
	Climatic	Non-climatic	Water	Health	Forestry	Ecosystem and Biodiversity	Agriculture
Drought	• Erratic rainfall patterns • Prolonged dry spell	• Poor access to drinking water, sanitation, health and irrigation infrastructure and services • Lack of / poor planning and maintenance of appropriate Water harvesting structures	• Water scarcity and exacerbated threats such as waterborne disease and malnutrition among high MPI and low-income households.	• Logistical challenges and resource shortfalls • Limited health services increasing risk of disease outbreaks	• Reduced yield of forest products • Undermining of forest cover and depletion of biomass resources • Impact on water availability and agricultural productivity	• Reduced groundwater recharging • Degraded ecosystem services • Biodiversity loss through habitat drying and forest fires	• Destruction of integrated Livelihood practice of smallholder farmers • Loss of Livestock and uncertain/ varying crop yields
Flood	• Changing Rainfall Patterns • Coastal Flooding and Storm Surges	• Severe pollution and siltation of water bodies • Lack of /Poor planning and maintenance of WHS	• Higer incidences distress migration • Unsafe water and sanitation	• High instances of waterborne diseases, • Inadequate access to curative care.	• Disrupted access to forest-based livelihoods • Loss of grazing and pastureland	• Increased soil Erosion, plant death, and degraded land • Pollution of freshwater sources	• Crop loss, Livestock loss, destruction of small-scale freshwater aquaculture • Distress migration.
GLOF	• Intense rainfall • High Temperatures • Ice Avalanches • Seismic Activity	• Fragile Himalayan ecosystems • Land degradation and deforestation • High dependence on climate sensitive livelihoods such as agriculture and tourism	• Degradation, loss and pollution of water resources • Infrastructure loss leading to exposure to further hazards like landslides and floods	• Lack of access to health infrastructure and services • Polluted drinking water sources	• Diminish access to forest resources • Destruction of forest-based livelihoods	• Disruption of water availability for downstream populations • Loss of biodiversity-rich areas and habitat fragmentation	• Damage to irrigation systems, and degradation of agricultural land • Crop loss, damage to critical infrastructure for connectivity and agricultural operations. • Damage to livestock
Rainfall-Induced Landslide Risk	• Extreme Rainfall • Seismic Activity	• Deforestation and Land-Use Changes • Unregulated Infrastructure Development • Runoff-prone landscapes	• Enhanced risk of fatality, displacement, collapse of infrastructure, • Rapid/ sudden siltation of water bodies	• Limited healthcare access	• Loss of forest cover • Loss of livelihood from NTFPs • Loss of pasture/ grazing land	• Forest cover loss, habitat fragmentation, and topsoil erosion	• Damage to irrigation infrastructure • Damage to crops • Livestock damage
Sea Level Rise and Coastal Flood Risk	• Rising global temperatures • Changes in ocean currents	• Degradation of coastal ecosystems • Land subsidence • Glacial melting	• Salination of freshwater sources • Erratic water supply • Pollution of existing water resources	• Decreasing Health resilience of vulnerable people • Low availability of clean water	• Destruction of mangroves • Degradation of soil health • Accumulation of toxic compounds • Long-term livelihood insecurity	• Flooding of wetlands • Increased susceptibility to erosion • Growing fragmentation of the ecosystem • Damage to fisheries	• Reduced agriculture productivity, food insecurity • Loss of property, crop loss due to waterlogging, salt-water intrusion.
Cyclone	• Rising Sea Surface Temperatures • Changing Atmospheric Patterns	• Coastal Development and Encroachment • Increased deforestation • Lack of urban planning	• Rural and urban water supply disruptions • Increased risks of flooding in low-lying coastal areas	• Extensive damage to infrastructure • Flooding can lead to waterborne diseases	• Deforestation and habitat loss • Weak post-cyclone buffer for recovery • Compromised coastal defense and simultaneously degrading vital livelihood resources	• Reduction to the natural buffer strength of coastal environments • Saltwater intrusion, flooding can lead to ecosystem alteration/ fragmentation, loss of habitat for various species	• Crop loss, reduced yields • Storm surges can cause saltwater intrusion, • Changes in land use, cropping pattern
Heat Wave and Extreme Heat	• Rising temperatures	• Soil degradation and moisture loss • Water scarcity and irrigation demands • Deforestation and loss of tree cover • Unsustainable land use practices	NA	• Enhanced exposure and risks for informal sector and vulnerable people	• NA	• Degradation ecosystems with limited /no capacity for self-restoration • Food insecurity and livelihood distress	• Crop diversity loss, creating price instability • Risk to heat-sensitive crops. • Increased dependency on welfare schemes
Forest Fire	• Extreme weather conditions	• Topographical factors • Accumulation of dry vegetation, deadwood, and organic soil • Less area of water bodies	• Loss of vegetation cover • Disruption in watershed • Reduction or loss of freshwater	• Increased risk of pathogen exposure and related disease incidences	• Destruction of crucial biomass resources • Weaken social and ecological resilience	• Land-use and habitat shifts • Loss of forest biodiversity and related ecosystem services	• Disrupted input supply chain of sustainable agriculture • Loss and damage to irrigation
Cold Wave	• Prolonged cold spells	• Inadequate protective infrastructure • Limited access to resources such as seeds for cold-tolerant crops, crop insurance, and financial aid.	• Disruptions in water supply • Reduced water levels in rivers and reservoirs • Decreased water quality	• Increased mortality among vulnerable populations • Increased strain on health infrastructure	• Disruption of forest ecosystems, shifts in species distribution	NA	• Declining agricultural cycles • Damaged crops through frosts. • Prevalence of diseases and deaths to livestock and animals

Poverty Alleviation and Livelihoods (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Sectoral goals	Adaptation Priorities
• Drought • Flood • GLOF • Rainfall-Induced Landslide Risk • Sea Level Rise and Coastal Floods Risk • Cyclone • Heat Wave and extreme heat • Forest Fire • Cold Wave	**Goal 1:** Promote inclusive livelihood diversification and enhanced incomes for sustainable development	1, 2, 4, 8, 10, 12, 16
	Goal 2: Improve access of vulnerable communities to climate resilient livelihood technology and infrastructure	1, 3, 4, 7, 9, 10, 16, 17
	Goal 3: Empower women and vulnerable communities through capacity enhancement, financial inclusion, and institution building to achieve better quality of life.	1, 5, 6, 7, 9, 16, 17

Sectoral Roadmap: Total of 3 Goals and 18 Strategies

Sectoral goals	**Adaptation Strategies**	**Levers**	**Timeline for implementation**
Promote inclusive livelihood diversification and enhanced incomes for sustainable development	Implement vocational training programmes for green jobs and entrepreneurship skill to enhance economic participation of socially and economically disadvantaged groups in urban and rural communities.	Lever 2, 3	Short term
	Implement financial literacy and entrepreneurship development programmes tailored for marginalised groups such as women, smallholder farmers, and indigenous communities	Lever 3, 5	Short term
Improve access of vulnerable communities to climate resilient livelihood technology and infrastructure	Construct climate-resilient infrastructure in rural areas through existing schemes such as MGNREGS, focusing on water conservation and afforestation in an area-based planning approach	Lever 1	Short to medium term
	Engage marginalised groups in decision making process governance mechanisms to strengthen their access to climate resilient infrastructure	Lever 2, 3	Short term
Empower women and vulnerable communities through capacity enhancement, financial inclusion, and institution building to achieve better quality of life.	Embed formal community institutions in the governance framework to enable democratic participation and climate resilient practices at the panchayat and village level	Lever 2	Medium to Long term
	Build capacities of institutions at the panchayat, block, district and state level to strategise, plan and implement adaptation action based on contextual challenges	Lever 2	Medium to Long term
	Improve access of women to finance and agricultural advisory services	Lever 3, 5	Short term

Water (1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Potential impacts on Sectors		
	Climatic	Non-climatic	Direct Impact	Indirect Impact	Socio-Economic consequences
Drought	• Erratic rainfall patterns • Prolonged dry spells • Increased evapotranspiration due to rising temperatures	• Over-extraction of groundwater • Inadequate irrigation infrastructure • Limited water storage and management infrastructure	• Depletion of surface and groundwater resources • Poor access to potable water and sanitation	• Impact on water intensive industries • Reduced agricultural yields • Rising costs for farming • Impact on Livestock	• Stress on marginal farmers and women • Migration from drought-prone areas
Flood	• Intense monsoon events • Increased frequency of extreme rainfall • Rising sea levels and cyclonic activity contribute to frequent inundation in coastal states	• Unplanned urbanization • Deforestation • Economic and development activities in floodplains • Inadequate drainage infrastructure • Inadequate flood defenses	• Flash floods and inundation of low-lying urban areas • Damage to water infrastructure (pipes, tanks, treatment plants) • Contamination of drinking water (due to sewage overflow, runoff)	• Soil erosion leading to degradation of soil quality • Reduced crop productivity • Damage to critical infrastructure • Increase in waterborne diseases	• Habitat loss, especially in floodplains • High recovery costs and increased insurance burden
GLOF	• Rising temperatures leading to accelerated glacial melt • Heavy rainfall and cloudbursts	• Unstable moraine-dammed lakes • Economic and development activities in fragile ecosystems • Limited early warning and response mechanisms	• Sudden flooding damaging valley infrastructure and loss of lives • Disruption to irrigation and water supply downstream • GLOF induced erosion and landslides	• Damage to roads, power, and communication, affecting water management and emergency response • Silting of rivers and reservoirs • Impact on health due to increase in waterborne diseases	• High economic losses in high-altitude regions • Loss of settlements and farmlands downstream
Rainfall Induced Landslides	• Heavy rainfall • Monsoon variability (intensity and timing)	• Deforestation and land-use changes • Poor drainage facilities and slope erosion • Unregulated construction. on unstable terrains	• Damage to hill reservoirs, intake structures, and water lines • Slope erosion compromising water source quality	• Road blockages affect emergency water supply and services	• Tourism loss in hill regions • Higher recovery costs
Sea Level Rise and Coastal Flooding	• Thermal expansion of oceans • Changing ocean currents • Storm surges	• Unregulated coastal constructions • Subsidence Loss of mangroves and other natural coastal barriers	• Saline water intrusion into freshwater aquifers and estuaries • Disruption to fisheries • Erosion and accretion of coastlines • Damage to stormwater and sewage networks in urban coastal areas	• Livelihood loss in agriculture and fisheries. • Contamination of freshwater aquifers and freshwater bodies	• Increased food insecurity • Habitat and livelihood loss in coastal areas • Insurance and relocation costs
Cyclone	• Rising sea surface temperatures • Shifts in atmospheric circulation and wind patterns • Storm surges and extreme rainfall	• Inadequate protective infrastructure • Unchecked coastal encroachment • Limited early warning and evacuation systems	• Damage to infrastructure from high winds and extreme rainfall, leading to floods • Breakdown in water and energy supply and sanitation networks	• Long-term disruption of coastal economic activity • Salinization of inland water sources	• Mass displacement and economic hardship • Increased vulnerability of marginalized communities in coastal regions

Water (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Sectoral goals	Adaptation Priorities
• Drought • Flooding • Glacial Lake Outburst Flood (GLOF) • Rainfall Induced Landslides • Sea Level Rise and Coastal Flooding • Cyclone	**Goal 1:** Improve climate-related data collection, monitoring, and early warning systems	1, 5, 11
	Goal 2: Develop and strengthen climate-resilient water infrastructure	1, 2, 3, 4, 5, 6, 10
	Goal 3: Promote efficient, equitable, and sustainable water management practice	1,2, 3, 8, 9
	Goal 4: Strengthen community engagement and build local capacity for climate-resilient water management	4, 6, 7, 8, 10

Sectoral Roadmap: Total of 4 Goals and 24 Strategies

Sectoral goals	Adaptation Strategies	Levers	Timeline for implementation
Improve climate-related data collection, monitoring, and early warning systems	Establish and strengthen real-time monitoring networks for flood, GLOF, rainfall induced landslides, drought, cyclones, and coastal salinity ingress.	Lever 1	Short Term
	Improve prediction systems for rainfall variability using advanced modeling and data analytics technologies.	Lever 1	Short to Medium Term
	Development and implementation of advanced flood early warning systems and improve flood hazard atlas coverage.	Lever 1	Short Term
Develop and strengthen climate-resilient water infrastructure	Investment and expansion of water storage infrastructure, such as dams, reservoirs, irrigation and canal systems, and artificial groundwater recharge systems, rainwater harvesting systems	Lever 1	Medium Term
	Develop climate resilient infrastructure w.r.t flood, drought, cyclone, sea level rise etc., such as improved drainage systems, permeable pavements, stormwater collection tanks, rainwater collection systems, desalination plants etc.	Lever 1	Medium to Long Term
Promote efficient, equitable, and sustainable water management practices	Develop decision support systems for Integrated Water Resource Management (IWRM) frameworks incorporating climate projections.	Lever 2	Medium Term
	Enhance effective government/private and inter-departmental coordination for location-specific sustainable water management and optimal recycling	Lever 2	Short to Medium Term
Strengthen community engagement and build local capacity for climate-resilient water management	Launch water conservation along with water quality awareness campaigns and educational programs to increase public awareness.	Lever 3	Short Term
	Raising awareness of farmers, local communities, and other key stakeholders to promote sustainable water usage and preparedness for floods, droughts etc.	Lever 3	Short Term
	Promote and fund research and development initiatives focused on site-specific, multi-component adaptation strategies.	Lever 5	Medium Term

Health (1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Potential impacts on Sectors		
	Climatic	Non-climatic	Direct Impact	Indirect Impact	Socio-Economic consequences
Heatwave and Extreme Heat	• Rising Temperatures and Climate Change	• Urban Heat Island Effect • Occupational and Outdoor Exposure • Limited Access to Cooling in Healthcare facility • Water Scarcity and Dehydration Risks	• Heat stress, dehydration, and heat-related illnesses especially in vulnerable populations • Prolonged, severe exposure to extreme heat leading to heat exhaustion and heatstroke • Reduce productivity and mental health impacts	Reduce access to power, water or transportation leading to: • Increased water and food-borne diseases • Increased accidental injuries • Increased respiratory illnesses due to air pollution	• Increased expenditure on healthcare • Increased debt levels • Impact on women's health such as adverse reproductive outcomes including preterm delivery, congenital defects, hypertension, respiratory and cardiovascular disease.
Flood	• Changing Rainfall Patterns • Coastal Flooding and Storm Surges	• Deforestation and Land Use Changes • Urbanization and Encroachments • River Overflow and Poor Embankment Management	• Exposure to contaminated flood waters • Spread of vector-borne and waterborne diseases • Floods restricting access to healthcare services • Physical impact on humans such as injuries and drowning • Challenges in ensuring continuity of essential health services due to access and workforce related issues	• Malnutrition and waterborne diseases in areas with incessant flooding • Impacts health supply chains which are essential for delivery of maternal, child health	• Displacement and migration • Food insecurity triggered by impacts on agriculture
Sea Level Rise and Coastal Flooding	• Global Climate Change • Storm Surge	• Land Subsidence • Deforestation of Coastal Habitats	• Increased humidity and warmer waters, leading to a surge in vector-borne diseases such as malaria and dengue • Increase of waterborne diseases and deteriorating sanitation • Injuries, displacement, and outbreaks of infectious diseases	• Increasing exposure to contaminated water sources	• Strain on healthcare infrastructure • Impact on health due to displacement from property/homes/ancestral land
Cyclone	• Rising Sea Surface Temperatures • Changing Atmospheric Patterns	• Coastal Development and Encroachment • Inadequate Health Infrastructure • Limited Early Warning and Health Preparedness	• Injuries and mortality • Waterborne diseases, and increased vector-borne disease outbreaks such as malaria and dengue	• Disease outbreaks, inadequate sanitation • Loss of access to health care	• Delayed emergency response • Overcrowding in emergency shelters • Disruption of access to healthcare
Drought	• Erratic rainfall patterns	• Over-extraction of groundwater • High dependence on rainfed agriculture • Limited health infrastructure and emergency preparedness • Low socio-economic resilience	• Dehydration and waterborne diseases • Higher morbidity and mortality rates due to drought-induced health stressors	• Compromise access to safe drinking water, • Malnutrition, increase in vector-borne diseases	• Displacement and migration • Unsafe conditions for women due to inaccessibility of water and sanitation facilities
Rain Induced Landslide	• Extreme Rainfall and Cloudbursts	• Deforestation and Land-Use Changes • Unregulated Infrastructure Development • Poor Drainage and Soil Erosion	• Injury and mortality • Heightened risk of food and waterborne diseases and limiting access to clean drinking water	NA	• Disruption of emergency medical responses • Disruption of access to healthcare

Health (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard`	Sectoral goals	Adaptation Priority
Addressing the sequence- • Heatwave and extreme heat • Flood • Cyclone • Drought • Rainfall induced Landslide • Coldwave	**Goal 1:** Enhance awareness and engagement within the medical community and vulnerable population groups on climate change induced health impacts to ensure informed decision-making and improved health outcomes.	1,6,7
	Goal 2: Strengthen health system resilience and responsiveness to Climate Sensitive Diseases (CSDs) through comprehensive training, capacity building, and specialized team development.	6,7
	Goal 3: Strengthen climate-health surveillance and response system at national, state, district, and facility levels.	6,7,11
	Goal 4: Enhancing climate resilient and sustainable infrastructure and services for heat-related illnesses and extreme weather events preparedness and response	1,3,6,9,10
	Goal 5: Foster collaboration with other critical sectors to integrate climate related health concerns as a priority agenda.	5, 6, 9

Sectoral Roadmap: Total of 5 Goals and 19 Strategies

Sectoral goals	Adaptation strategies	Levers	Timeline for implementation
Enhance awareness and engagement within the medical community and vulnerable population groups on climate change induced health impacts to ensure informed decision-making and improved health outcomes.	Development and dissemination of IEC material on health sector impacts of climate change	Lever 3,2	Short to medium term
	Sensitization of population groups, vulnerable groups including maternal and childcare, elderly through frontline health workers and various community health platforms -	Lever 3,2	Short to medium term
Strengthen health system resilience and responsiveness to Climate Sensitive Diseases (CSDs) through comprehensive training, capacity building, and specialized team development.	Organize training of state nodal officers, district nodal officers, medical officers and healthcare personnel	Lever 3,2	Short to medium term
	Training and sensitization of private, AYUSH and community health workforce	Lever 3,2	Short to medium term
Strengthen climate-health surveillance and response system at national, state, district, and facility levels.	Operationalization of Health Cell established in all states/districts	Lever 2	Short term
	Regular meetings of State and District level taskforce by all states/districts	Lever 2	Short term
Enhancing climate resilient and sustainable infrastructure and services for heat-related illnesses and extreme weather events preparedness and response	Strengthening healthcare infrastructure to be prepared to EWEs including heat preparedness, flood, and cyclone preparedness	Lever 1	Medium to Long term
Foster collaboration and research with other critical sectors to integrate climate related health concerns as a priority agenda.	Develop joint action plan with other dept./ organizations in view of their capabilities to advance health adaptation measures including with think tanks, UN organizations, Centers of excellence and technical and financial agencies	Lever 2	Short to medium term

Disaster Management and Infrastructure sector (1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Potential impacts on Sectors		
	Climatic	Non-climatic	Direct Impact	Indirect Impact	Socio-Economic consequences
Urban Flooding	• Intense or extreme rainfall • Rapid snowmelt • Cloud Burst	• Deforestation • Erosion and siltation of riverbeds • Inadequate drainage infrastructure	• Loss of human lives • Death of animals and livestock • Loss of dwellings and houses • Damage to Infrastructure • Disruption of Essential Services	• Spread of vector-borne and waterborne diseases • Death due to electrocution	• Psychological stress and trauma • Disruption of food distribution and local markets • Crop loss and post-harvest damage
Riverine Flooding	• Intense or extreme rainfall • Rapid snowmelt • Cloud Burst	• Deforestation • Erosion and siltation of riverbeds • Inadequate drainage infrastructure	• Loss of human lives • Death of animals and livestock • Loss of dwellings and houses • Damage to Infrastructure • Disruption of Essential Services	• Spread of vector-borne and waterborne diseases • Death due to electrocution	• Psychological stress and trauma • Disruption of food distribution and local markets • Crop loss and post-harvest damage
GLOF	• High temperatures • Snow avalanches or landslides	• Seismic activity • Presence of critical infrastructure in high- risk zones • Atmospheric black carbon and brown carbon • Inadequate monitoring and early warning System	• Loss of human lives • Death of animals and livestock • Loss of dwellings and houses • Damage to Infrastructure • Disruption of Essential Services	• Increased risk of gender-based violence and trafficking	• Psychological stress and trauma • Disruption of market activities • Loss of livestock • Increased burden on women and children in accessing water
Coastal Flooding	• Extreme rainfall • Thermohaline circulation changes • Sea level rise	• Loss of coastal mangroves and coral reefs • Sea bed rise • Inadequate flood defense systems • Inadequate drainage infrastructure	• Loss of human lives • Death of animals and livestock • Loss of dwellings and houses • Damage to Infrastructure • Disruption of Essential Services	• Spread of vector-borne and waterborne diseases • Pathogen-related illnesses	• Psychological stress and trauma • Disruption of market activities • Loss of livestock • Loss of aquaculture • Loss in tourism
Landslides	• Erratic rainfall patterns	• Seismic activity • Soil saturation and Slope erosion • Lack of landslide hazard zonation • Inadequate drainage infrastructure • Inadequate preparedness	• Disruption of Essential Services and Supplies in affected areas • Environmental issues including biodiversity loss	• Psychological stress and trauma • Structural damage to dams, reservoirs, and hydropower facilities • Loss of medical supplies	• Disruption of market activities • Loss of farmlands • Impacts on agro-forestry industry • Disruption of financial systems and services • Decline in tourism
Cyclones	• Warm sea surface temperatures • Atmospheric instability	• Inadequate monitoring and early warning system • Inadequate and inefficient cyclone-specific planning in DDMPs	• Loss of human lives • Death of animals and livestock • Loss of dwellings and houses • Damage to Infrastructure • Disruption of Essential Services	• Spread of vector-borne and pathogen-related diseases	• Psychological stress and trauma • Increased risk of gender-based violence and human trafficking
Droughts	• Deficient precipitation • Shift in monsoon patterns	• Unsustainable and water-intensive cropping patterns • Over-extraction of Groundwater • Limited or absent rain water harvesting systems	• Reduction in agricultural productivity • Water and soil stress • Environmental Stress • Health and livestock damage	• Financial loss to farmers	• Greater burden on women • Psychological stress, trauma and farmer suicides
Heatwaves	• El-Nino effect	• Unplanned urbanization • Deforestation • Greenhouse gas (GHG) emissions	• Loss of lives • Health impacts • Loss of flora and fauna	• Loss of heat-sensitive crops	NA

Disaster Management and Infrastructure Resilience (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Sectoral goals	Adaptation Priorities

• Floods
  ○ Urban flooding
  ○ Riverine flooding
• GLOF
• Coastal flooding
• Cyclones
• Landslides
• Heatwaves
	Goal 1: Improving climatic extreme related disaster risk assessments, early warning, and communication	1, 3, 5, 6, 7

	Goal 2: Reducing vulnerability to climate extreme disasters (including infrastructure resilience, social inclusion, and nature-based solutions)	1, 2, 3, 4, 5, 6, 9, 10
	Goal 3: Improving disaster preparedness, response, and recovery (including ensuring greening of response and adaptive recovery)	1, 3, 4, 5 ,6, 7, 8, 10
	Goal 4: Improving Polices, planning, governance and promoting innovations and capacities	5, 6, 7, 9, 11

Sectoral Roadmap: Total 4 Goals and 24 Strategies

Sectoral goals	Adaptation strategies	Lever	Timeline for implementation
Goal 1: Improving climatic extreme related disaster risk assessments, early warning, and communication	Develop high-resolution drought risk maps using remote sensing and climate data, and install robust early warning systems for floods, glacial lakes, landslides, and urban heat, linked to critical infrastructure and community response protocols.	Lever 1	Short Term
	Establish multi-channel, multi-lingual communication systems using technologies like Cell Broadcast and the Common Alert Protocol to ensure timely dissemination of warnings across diverse stakeholder groups.	Lever 1	Short to medium term
Goal 2: Reducing vulnerability to climate extreme disasters (including infrastructure resilience, social inclusion, and nature-based solutions)	Strengthen climate-resilient infrastructure across rural and urban areas, including water supply, drainage, transport, health, education, and energy systems.	Lever 1	Short to Medium-term
	Promote ecosystem-based approaches such as reforestation, mangrove restoration, wetland conservation, and slope stabilization to buffer climate impacts and enhance natural resilience.	Lever 4	Medium-term
Goal 3: Improving disaster preparedness, response, and recovery (including ensuring greening of response and adaptive recovery)	Build inclusive local capacities for disaster preparedness and response by training institutions, communities, and disaster management authorities with a focus on gender sensitivity and traditional knowledge	Lever 3	Short to Medium-term
	Promote community-based monitoring, early warning systems, and participatory hazard mapping (including for floods, droughts, cyclones, landslides, and GLOFs) with active engagement of women, youth, and Indigenous communities	Lever 3	Short to Medium-term
Goal 4: Improving Polices, planning, governance and promoting innovations and capacities	Promote community water budgeting, sustainable irrigation, and conduct regular vulnerability assessments at the community and district levels to inform drought preparedness plans	Lever 3	Short Term
	Enforce zoning laws to restrict construction in flood-prone and high-risk areas, while promoting proper sustainable land use and integrating coastal zone management in urban planning	Lever 2	Short to medium term

Traditional Knowledge & Heritage (1/2)

Mapping of key climate hazards

Key sectors	Drivers of Risk	Sectoral impacts
Agriculture	**Climatic:** • Rising temperatures • Erratic rainfall patterns • Shifting precipitation patterns • Prolonged drought conditions • Saline water intrusion due to sea-level rise	• Disruption in practices of indigenous agriculture, resulting in loss of knowledge systems • Traditional rice cultivation is being threatened in Sundarbans and parts of Kerala due to saline water intrusion affecting soil fertility • Challenges to indigenous farming due to erratic rainfall
Water	**Climatic:** • Erratic rainfall patterns • Prolonged drought conditions • Receding glaciers • Landslides triggered by heavy rainfall **Non-Climatic:** • Falling groundwater levels	• Threat to traditional water harvesting structures like the stepwells, Beris, Taankas, Johads and Khadins, • Disruption in reliance on glacial meltwater for irrigation in the Himalayan region of Ladakh and Himachal Pradesh • Threat to traditional agricultural and pastoral practices in cold desert ecosystems
Forestry	**Climatic:** • Shifting precipitation patterns • Rising temperatures • Global climate change • Frequent forest fires due to a drier climate **Non-Climatic:** • Growth of invasive species	• Collection of Non-Timber Forest Products (NTFPs) such as medicinal herbs, honey, resins, and wild fruits for sustenance and income is affected • Depletion of plant and animal biodiversity affects sacred groves across various forest regions • Destruction of valuable herbal and resin-producing species
Health	**Climatic:** • Changing climatic conditions • Shifting precipitation patterns **Non-Climatic:** • Habitat degradation • Depletion of critical natural resources	• Medicinal plant species integral to indigenous healing practices are becoming scarce or losing their medicinal potency • Threat to medicinal herbs and associated indigenous knowledge systems • Disruptions in traditional preventive healthcare systems
Disaster and Infrastructure	**Climatic:** • Sudden-onset extreme weather events such as cyclones, flash floods, and cloudbursts • Intense and erratic rainfall triggering flash floods and landslides • Extreme heat and heat waves **Non-Climatic:** • Rising sea levels and coastal erosion	• Decline in practices like utilizing oral histories to identify safe zones and plan settlements • Decline in traditional knowledge-based warning systems for climate hazards • Increased vulnerability to disaster risks for indigenous communities • Threat to low-lying coastal areas and traditional silt houses • Increased vulnerability of heritage sites

Traditional Knowledge & Heritage (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Strategic goals	Adaptation priorities
• Extreme Heat and Heat Waves • Erratic Rainfall and shifting Precipitation Patterns • Prolonged Drought Conditions and Falling Groundwater Levels • Saline Water Intrusion and Rising Sea Levels • Displacement Due to Recurring Floods and Landslides • Frequent Forest Fires and Habitat Degradation • Sudden-Onset Extreme Weather Events • Intense and Erratic Rainfall Triggering Floods and Landslides	**Goal 1:** Digitization and community-led documentation of Indigenous Traditional Knowledge	1, 7, 4, 7, 9, 11
	Goal 2: Incentivize Traditional ecological practices through green economy models	9, 10, 11
	Goal 3: Enhance Traditional Knowledge and Heritage use in climate-resilient agriculture and water conservation	1, 4, 5, 6, 11
	Goal 4: Strengthen institutional support for community-based DRR and climate action using indigenous knowledge	4, 5, 9

Sectoral Roadmap: 4 Sectoral Goals and 19 strategies

Sectoral goals	Adaptation strategies	Levers	Timeline for implementation
Digitization and community-led documentation of Indigenous Traditional Knowledge	Conduct audits of climate-relevant traditional knowledge systems across regions and sectors	Lever 2,3	Short term
	Institutionalize community knowledge-sharing platforms at the state level	Lever 3,2	Medium term
Incentivize Traditional ecological practices through green economy models	Introduce incentives such as adaptation grants, PES schemes, and carbon credits for communities practicing TKH-based resilience	Lever 3,2	Medium term
Enhance Traditional Knowledge and Heritage use in climate-resilient agriculture and water conservation	Identify pilot zones where TK-based adaptation is already practiced	Lever 3	Short term
	Issue directives for mandatory TKH inclusion in State Action Plans on Climate Change (SAPCCs)	Lever 5	Short term
Strengthen institutional support for community-based DRR and climate action using indigenous knowledge	Establish multi-stakeholder task forces involving government, academia, civil society, and community elders	Lever 5	Short term
	Amend key legislation, including the Biological Diversity Act, Forest Rights Act, and Environment Protection Act, to incorporate TKH	Lever 5	Medium term
	Fully integrate TKH into India's Nationally Determined Contributions (NDCs) and National Communications to the UNFCCC	Lever 5	Medium term

Ecosystem and Biodiversity(1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Ecosystems	Potential impacts on Sectors		
	Climatic	Non-climatic		Direct Impact	Indirect Impact	Socio-Economic consequences
Drought	• Erratic rainfall patterns • Prolonged dry spells	• Overextraction of groundwater • Land degradation. • Limited water storage and management infrastructure	Bundelkhand region, Banni grassland in Gujarat, parts of Deccan Peninsula Himalayan and Trans-Himalayan Arid and semi-arid, large parts of Deccan and Eastern Ghats West coast, East coast, Islands	• Increased fire frequency in grasslands • Loss of ecosystems • Drying up of peatlands • Increased intermittency of inundation • Loss of habitat	• Invasive alien species • Reduced water availability • Reduced groundwater recharge	• Reduced fodder availability • Decrease in tourism • Loss of resource-based livelihoods • Increased migration
GLOF	• Accelerated Glacial Melt. • Unstable Moraine-Dammed Lakes • Extreme Weather Events	• Limited Infrastructure and Response Mechanisms • Downstream Impacts on Settlements and Hydropower Projects	Himalayan belt and Terai region Himalayan region, especially in Ladakh and Spiti Glacial lakes Himalayan and Trans Himalayan wetlands	• Disruption in ecosystem dynamics (structure and function) and services • Soil erosion and degradation • Habitat and species loss	• Invasive Alien Species • Increase in sedimentation	• Loss of infrastructure impacting energy security (loss of transmission lines etc.) • Decrease of tourism
Rain Induced Landslides	• Intensified Rainfall and Cloudbursts • Seismic Activity in the Himalayas	• Deforestation and Land-Use Change • Infrastructure Expansion on Steep Slopes • Poor Drainage and Slope Erosion	Himalayan region, especially in Ladakh and Spiti Himalayas, Western Ghats	• Disruption in ecosystem dynamics (structure and function) and services • Soil erosion and degradation • Habitat and species loss • Increase in sedimentation	• Invasive Alien Species • Eutrophication	• Loss of livelihoods • Migration
Sea Level Rise and Coastal Flooding	• Global Climate Change • Natural Land Subsidence • Storm Surge	• Coastal Development • Man made Land Subsidence • Deforestation of Coastal Habitats	East coast, parts of West Coast, Islands	• Inward movement of coastal wetlands • Increase in coastal erosion • Change in species composition • Loss of seagrass meadows and potential "drowning" of coral reefs • Creation of new wetlands	• Increase in salinization	• Decline in productivity • Impact on livelihoods
Cyclone	• Rising Sea Surface Temperatures • Changing Atmospheric Patterns	• Coastal Development and Encroachment • Inadequate Infrastructure • Limited Early Warning Systems	East coast, West coast, Islands	• Physical damage to the wetland • Damage to vegetation (mangroves, seagrass meadows, coral reefs) • Habitat degradation	• Invasive Alien Species	• Loss of life and property • Loss of fish productivity • Diminished wetland ability to buffer coastal areas from storms
Extreme Heat and Heatwaves	• Rising Temperatures and Climate Change	• Limited Early Warning Systems • Limited Access to Cooling • Water Scarcity and Dehydration Risks	Bundelkhand region, Banni grassland in Gujarat, parts of Deccan Peninsula Thar desert in Rajasthan East coast, West coast, Islands	• Changes in grassland productivity • Loss of flora and fauna • Invasion of heat tolerant woody and shrub species	• Increased fire frequency • Phenological changes • Loss of pollinators • Loss of flora and fauna	• Impact on fish productivity • Reduced coastal protection • Health Hazards
Flood	• Changing Rainfall Patterns • Coastal Flooding and Storm Surges	• Deforestation • Urbanization and Encroachments • River Overflow and Poor Embankment Management	Coastal area of Andaman and Nicobar Islands, North-eastern floodplains Thar desert in Rajasthan Northeast	• Soil erosion and degradation • Land submergence • Salinity changes • Impacts to flora and fauna • Structural damage to the wetlands	• Invasive Alien Species • Pest Outbreak	• Increased migration • Decrease in tourism

Ecosystem and Biodiversity (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Sectoral goals	Adaptation priorities
• Flood • Drought • GLOFs • Rainfall induced landslides • Sea Level Rise and Coastal Flooding • Cyclone • Extreme Heat and Heatwaves	**Goal 1:** Enhance ecosystem resilience and climate buffering capacity	1,4,7, 10, 11
	Goal 2: Mainstream ecosystem-based adaptation (EbA) into climate and development planning	4, 5, 6,7,8, 10, 11
	Goal 3: Enhance climate resilience for ecosystem dependent communities.	1,7, 8, 10, 11

Sectoral Roadmap: Total 3 Goals and 19 Strategies

Sectoral Goals	Adaptation Strategies	Lever	Timeline for implementation
Enhance ecosystem resilience and climate buffering capacity	Implement proactive and sustained measures to control and eradicate Invasive Alien Species, minimizing their impact on native biodiversity and ecological stability.	Lever 4	Short term
	Apply ecological principles and promote adaptive management tools to restore and maintain ecosystems, aligning with changing climatic conditions and biodiversity needs.	Lever 4	Medium term
	Safeguard natural processes and habitat linkages critical for species movement, hydrological balance, and long-term ecosystem functionality.	Lever 2	Long term
Mainstream ecosystem-based adaptation (EbA) into climate and development planning	Implement climate-resilient land-use planning, ecological zoning and enforce it with satellite-aided land surveillance.	Lever 2	Long term
	Establish Regional Ecosystem Partnerships: Collaborate with South Asian countries on transboundary biodiversity conservation efforts.	Lever 2	Medium term
Enhance climate resilience for ecosystem dependent communities.	Promote climate-resilient livelihood practices, green enterprises and market linkages: Eco-tourism, women-led craft livelihoods, climate-resilient livestock and traditional livelihoods.	Lever 5	Short term
	Ensure gender mainstreaming by actively including women in governance, adaptation planning, decision-making, and benefit-sharing processes.	Lever 2	Short term
	Mobilize and support local communities in ecosystem stewardship through participatory governance, education, and equitable benefit-sharing mechanisms.	Lever 3	Medium term
	Integrate Indigenous Traditional Knowledge as part of national adaptation strategies.	Lever 3	Medium term

Forests (1/2)

Mapping of key climate hazards

Climate hazards	Drivers of Risk		Potential impacts on Sectors		
	Climatic	Non-climatic	Direct Impact	Indirect Impact	Socio-Economic consequences
Forest Fire / Wildfire	• Extreme weather conditions such as rising temperatures, erratic rainfall, low humidity, and strong winds	• Topographical factors such as steep slopes, terrain exposure, limited accessibility to fire spread and containment efforts • Accumulation of dry vegetation, deadwood, and organic soil • Less area of water bodies per 100 km²	• Loss and degradation of habitat • Changes in forest composition and structure • Species loss (flora & fauna) • Soil degradation • Increase in GHG emissions	• Encroachment of Invasive Alien Species • Impact on water quality • Loss of sequestration potential	• Loss of food, NTFPs and businesses: loss of livelihood • Loss of income to forest dependent communities • Health impacts • Increased human-wildlife conflict • Loss of human lives
Drought	• Erratic rainfall patterns • Prolonged dry spells • Increased evapotranspiration rates	• High soil moisture stress in forests due to land-use changes, deforestation, and topsoil erosion • Low coverage of dense forest • Accumulation of salts due to improper irrigation practices	• Changes in phenology • Productivity loss • Tree mortality	• Increase in fuel load • Potential fire outbreak • Pest outbreak • Change in species composition • Loss of sequestration potential	• Loss of livelihood • Increased human-wildlife conflict
Flood	• Altered hydrological regimes (shifts in monsoon intensity, extreme precipitation events, and changes in evapotranspiration)	• Deforestation and land degradation • Decline of riparian and wetland ecosystems • Unregulated forest road networks and infrastructure development • Unregulated embankments, reservoir operations, and excessive sediment deposition	• Soil erosion and degradation • Sediment deposition • Displacement and mortality of fauna	• Negative impacts on forest regeneration	• Disrupted access to forest resources • Reduced freshwater availability • Health impacts of forest dependent and forest fringe communities • Loss of lives
GLOF and cloudburst	• Atmospheric warming	• Geophysical & seismic instability • Land use changes & ecosystem degradation • Cryospheric & hydrological interactions	• Land inundation • Soil erosion and degradation • Soil sedimentation • Habitat modification/destruction • Displacement and mortality of fauna	• Change in species composition	• Loss of life and property
Rainfall induced landslide	• Intense/extreme rainfall	• Steep slopes and forest degradation • Unregulated infrastructure development • Seismic activity in geologically fragile regions • Poor drainage and soil erosion	• Soil erosion • Saltwater intrusion	• Increased salinization • Long term coastal forest degradation • Reduced freshwater availability	• Loss of fish productivity • Diminished wetland's ability to buffer coastal areas from future storms • Loss of life and property
Sea level rise	• Rising global temperatures • Changes in ocean currents	• Degradation of coastal ecosystems • Coastal erosion • Natural and human-induced land subsidence • Glacial melting	• Soil erosion • Saltwater intrusion	• Increased salinization • Long term coastal forest degradation • Reduced freshwater availability	• Loss of fish productivity • Diminished wetland's ability to buffer coastal areas from future storms • Loss of life and property
Cyclone	• Elevated sea surface temperatures & cyclone intensification • Cyclone-induced extreme precipitation & hydrological disruptions	• Forest and mangrove degradation • Coastal modifications & habitat fragmentation • Gaps in early warning systems, inadequate afforestation efforts, and poor post-cyclone restoration measures	• Tree mortality	• Shifts in hydrological cycles • Changes in nutrient cycles	• Decline in productivity • Loss of livelihood

Forests (2/2)

Mapping of key climate hazards to sectoral goals and adaptation priorities

Climate Hazard	Strategic goals	Adaptation priority
• Forest Fire/Wildfire • Drought • Flood • Glacial Lake Outburst Flood (GLOF) and cloudburst • Rainfall-induced landslides • Sea-level rise • Cyclone	**Goal 1:** Restore degraded forests	3, 5, 6, 10, 11
	Goal 2: Conserve forest habitats	4, 9, 10, 11
	Goal 3: Enhance the adaptive capacity of forest ecosystems	6, 7
	Goal 4: Reduce the risk of climate change for forest ecosystems and dependent communities	1, 7, 8

Sectoral Roadmap: 4 Sectoral Goals and 23 strategies

Sectoral goal	Adaptation strategies	Levers	Timeline for implementation
Goal 1: Restore degraded forests	Restore forested landscapes using native species in Trees Outside Forests and agroforestry systems, enhancing biodiversity and carbon sequestration.	Lever 4	Short Term
	Promote climate-resilient afforestation and reforestation practices, including anticipatory planting of species suited to changing climatic conditions across altitudinal and latitudinal gradients.	Lever 4	Medium Term
Goal 2: Conserve forest habitats	Recognize and protect sacred groves through legal provisions by integrating them into eco-sensitive zones within regional and national land use planning, and conduct awareness campaigns on their role in climate resilience, biodiversity conservation, and water security.	Lever 4	Medium Term
	Enhance conservation of threatened species with targeted programs and strengthen area-based measures like Community Conserved Areas (CCAs), Biodiversity Heritage Sites (BHS), and Sacred Groves for habitat continuity.	Lever 2	Medium Term
Goal 3: Enhance the adaptive capacity of forest ecosystems	Implement the National Forest Policy, 1988 to support climate-resilient forest management and conservation.	Lever 1	Medium Term
	Institutional capacity development for forest landscape restoration (preparedness of forestry institutions to address emerging climate challenges).	Lever 2	Medium Term
Goal 4: Reduce the risk of climate change for forest ecosystems and dependent communities	Establish decentralized renewable energy solutions like biogas and improved cookstoves to minimize reliance on fuelwood.	Lever 4	Short Term
	Collaborate with the Coalition for Disaster Resilient Infrastructure (CDRI) to help develop climate-resilient infrastructure in forested and adjoining regions.	Lever 4	Medium Term

4

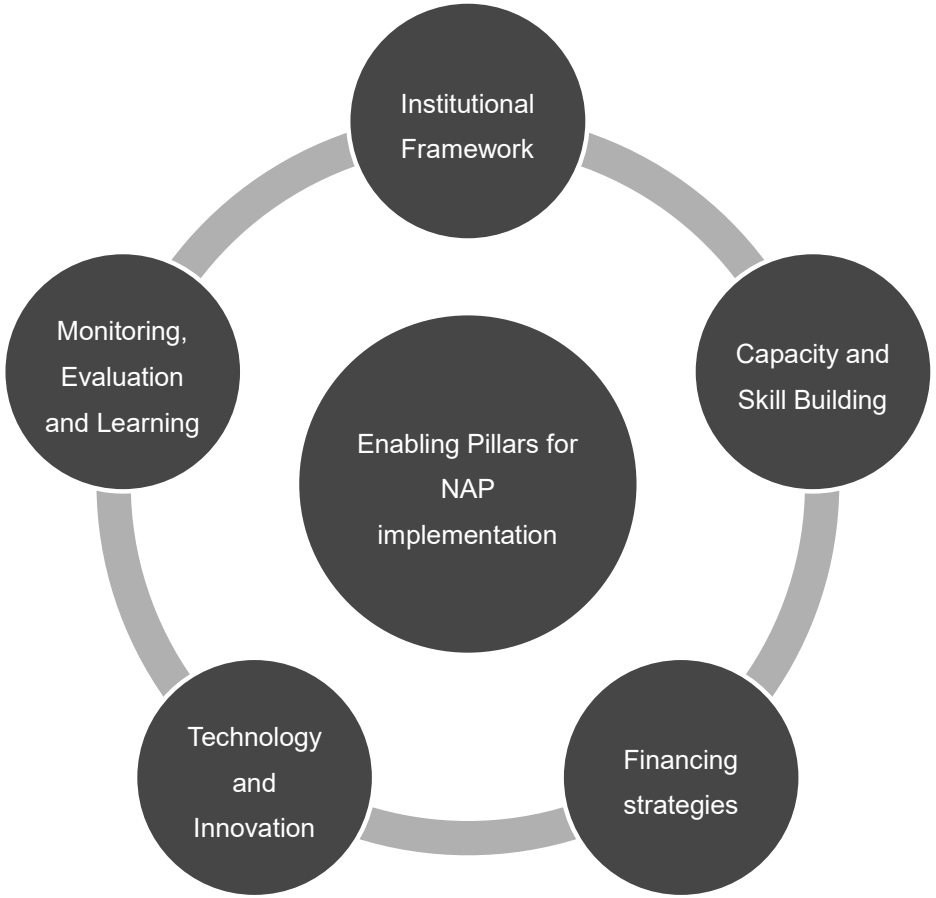
Implementation Strategies

Implementation Strategies

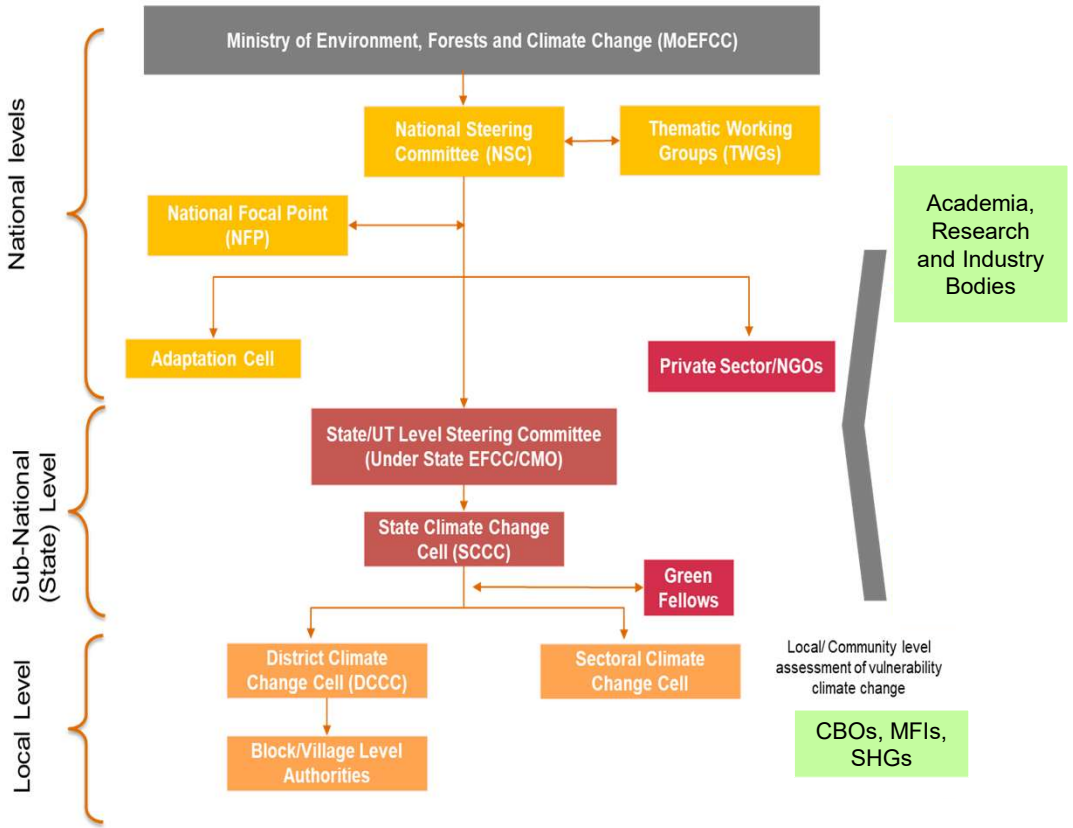
The implementation strategies for the NAP is built on five enabling pillars.

This section of the report covers:

- Institutional Structure: From national to local level and role of state and other stakeholders.
- Skills and capabilities required from policy makers to communities and private sector to support NAP implementation
- Financing and Resource Mobilization Strategies
- Technology and Innovation required for supporting NAP implementation
- MEL framework for assessing progress and reporting results.



Institutional Framework



- Whole of government, whole of society approach.
- Focus on Locally led adaptation.
- Role of different stakeholders involved.

Financing Strategies

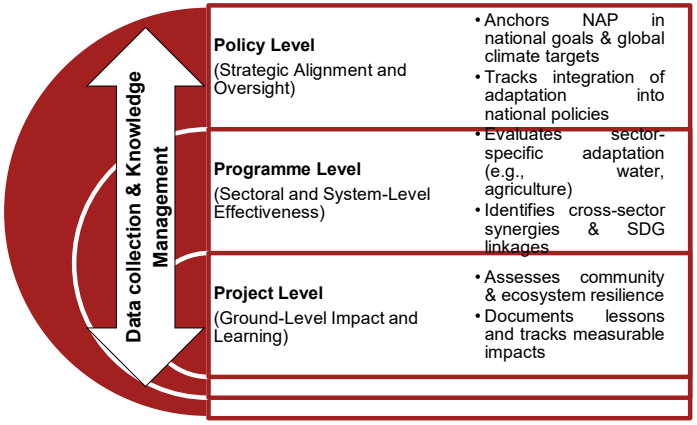
Organizing domestic resources	Unlocking the potential of the private sector	Strategically accessing international climate finance
• Develop a national adaptation investment and financing plan • Prioritize funding for Locally Led Adaptation	• Develop private sector engagement mechanisms • New and innovative financing mechanisms	• Strengthen international cooperation and funding access • Implement technical assistance programs for financing

- Mobilizing finance for adaptation projects
- Creating cross sectoral adaptation project pipelines.
- Create enabling environment for adaptation investments
- Building pro adaptation narratives to incentivize private sector participation
- Behavioral shifts to generate market mechanisms for adaptation projects.

Implementation strategies

Monitoring, Evaluation and Learning

- Three-tiered M&E framework to ensure that adaptation efforts are strategic, results-driven, and aligned with both national priorities and global commitments
- **The MEL design allows for decentralized evaluation but remains aligned with national-level reporting needs** (e.g., for UNFCCC/NDC/NAP/SDG updates)



Capacity and Skill Building

- **Capacity Building emphasizes on institutional strengthening, technical skilling, and integration of data-driven decision-making processes**
- Strengthening capacity for effective NAP implementation requires concerted efforts across several key domains outlined below:

Institutional Capacity Development

Technical Capacity Building

Community Level Capacity Engagement

Private Sector

Technology and Innovation

- Collating climate risk and vulnerability assessment data along with monitoring adaptation action
- Collaborations with private sector and research institutions to leverage innovative technology solutions.
- Promote adaptation oriented starts ups.

Decision support system

- Climate Data Service Portal, the Mausam App
- Climate Hazards and Vulnerability Atlas of India for assessing exposure to extreme weather events

Knowledge sharing and collaboration

- Greater coordination between relevant stakeholders.

Use of innovative technologies

- Supporting R&D and technology deployment across sectors.

Thank you!