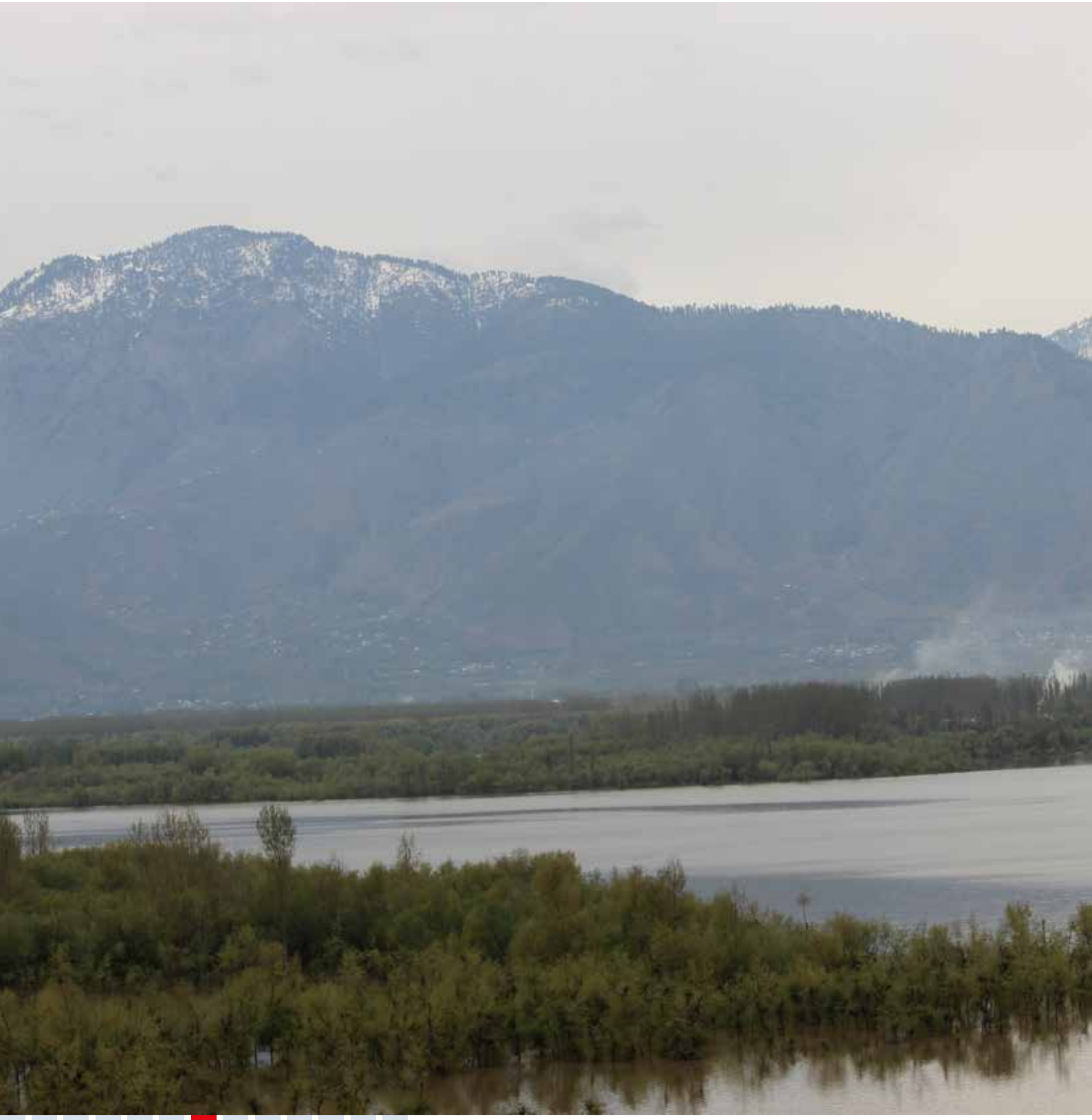
COMPARATIVE ANALYSES OF SAPCCs FROM HIMALAYAN STATES



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IHCAP Indian Himalayas Climate Adaptation Programme

Climate Change Programme

Strategic Programs, Large Initiatives and Coordinated Action Enabler (SPLICE)

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

सत्यमेव जयते

About Indian Himalayas Climate Adaptation Programme (IHCAP)

(Strengthening Capacities on Climate Science and Adaptation in the Indian Himalayas)

IHCAP is a project under the Global Programme Climate Change (GPCC) of the Swiss Agency for Development and Cooperation (SDC), and is being implemented in partnership with the Department of Science and Technology, Government of India. The goal of the project is to strengthen the resilience of vulnerable communities, and to enhance the capacities of research institutions, communities and decision makers.

Objectives

- Strengthening capacities for adaptation planning and implementation in Himachal Pradesh through research, training and capacity building
- Scientific capacity building in the field of Glaciology and related areas
- Facilitating dialogues between Himalayan states and key stakeholders for mainstreaming climate change concerns into development planning

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COMPARATIVE ANALYSES OF IHR SAPCCs

Contents

ABBREVIATIONS/ACRONYMS

Acronym	Expanded Form
BAU	Business As Usual
BEE	Bureau of Energy Efficiency
CBA	Cost Benefit Analysis
CC	Climate Change
CCL	Climate Change Leaders
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Lamps
CNG	Compressed Natural Gas
DBT	Department of Biotechnology, Government of India
DoS	Department of Space, Government of India
DRR	Disaster Risk Reduction
DSIR	Department of Scientific and Industrial Research, Government of India
DSM	Demand-Side Management
DST	Department of Science and Technology, Government of India
EBPM	Evidence Based Policy Making
GHG	Greenhouse Gas
GoI	Government of India
GoN	Government of Nagaland
GSI	Geological Survey of India
HP	Himachal Pradesh
ICT	Information and Communication Technologies
ICIMOD	International Centre for Integrated Mountain Development
IDSP	Integrated Diseases Surveillance Programme
IHCAP	Indian Himalayas Climate Adaptation Programme
IHR	Indian Himalayan Region
IMD	Indian Meteorological Department
IPCC	Intergovernmental Panel on Climate Change
JNNSM	Jawaharlal Nehru National Solar Mission
KM	Knowledge Management
LED	Light Emitting Diode

ABBREVIATIONS/ACRONYMS

Acronym	Expanded Form
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
MEA	Ministry of External Affairs
MHA	Ministry of Home Affairs
MoA	Ministry of Agriculture
MoD	Ministry of Defence
MoEF&CC	Ministry of Environment, Forests & Climate Change
MoES	Ministry of Earth Sciences
MoWR	Ministry of Water Resources
NAPCC	National Action Plan on Climate Change
NGOs	Non-Governmental Organizations
NMEEE	National Mission for Enhanced Energy Efficiency
NMGI	National Mission for Green India
NMSA	National Mission for Sustainable Agriculture
NMSH	National Mission on Sustainable Habitat
NMSHE	National Mission for Sustaining the Himalayan Ecosystem
NMSKCC	National Mission on Strategic Knowledge on Climate Change
NRHM	National Rural Health Mission
NWM	National Water Mission
PPP	Public-Private Partnerships
REDD	Reducing Emissions from Deforestation and Forest Degradation
SAPCC	State Action Plan on Climate Change
SREX	IPCC report Managing the Risks of Extreme Events and Disasters to Advance Climate Change
SSC	State Steering Committee
UCCC	Uttarakhand Centre on Climate Change, Kumaon University
UCOST	Uttarakhand Council on Science and Technology
UED	Uttarakhand Environment Directorate
UNFCCC	United Nations Framework Convention on Climate Change
WUA	Water Users Association
WWF	World Wide Fund for Nature

ABBREVIATIONS/ACRONYMS

Acronym	Expanded Form
J&K	Jammu and Kashmir
UK	Uttarakhand
HP	Himachal Pradesh
Skm	Sikkim
Asm	Assam
Meg	Meghalaya
Man	Manipur
Nag	Nagaland
Miz	Mizoram
ArP	Arunachal Pradesh
WB	West Bengal
Tri	Tripura

EXECUTIVE SUMMARY

The report compares different aspects of the State Action Plans on Climate Change (SAPCCs) such as the climate profile, vulnerability assessments, sector-wise climate change strategies and climate change action plans in the Indian Himalayan Region (IHR). It also examines SAPCCs in relation to the National Missions under the National Action Plan on Climate Change (NAPCC) and the relative degree of linkages articulated in IHR SAPCCs.

The states covered in the report include Jammu and Kashmir, Uttarakhand, Himachal Pradesh, Sikkim, Assam, Meghalaya, Manipur, Nagaland, Mizoram, Arunachal Pradesh, West Bengal and Tripura.

The report has been compiled under the Indian Himalayas Climate Adaptation Programme (IHCAP). IHCAP is a project under the Global Programme Climate Change (GPCC) of the Swiss Agency for Development and Cooperation (SDC), and is being implemented in partnership with the Department of Science and Technology, Government of India.

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Photo © Mustafa Ali Khan/IHCAP

Indian agriculture remains predominantly rainfed covering about 60% of the country's net sown area and accounts for 40% of the total food production.

INTRODUCTION

ANALYSES FRAMEWORK AND REPORT STRUCTURE

Analyses Framework

The structure of the State Action Plan on Climate Change, as sug-gested by the Ministry of Environment, Forests and Climate Change consists of three parts as given below: Part A - introduction, state profile and the state's climate profile (including emissions inventory and vulner-ability analyses), Part B - sectoral strategies for dealing with climate change, and Part C – action plan matrices including proposed budgets.

Table 1 below shows broad structure suggested by MoEF for SAPCCs:

Part A: Introduction, State and Climate profiles
1. Description of regional/state-level context; statement of issues and problems
1.1 Regional development issues and priorities vis-à-vis national priorities and NAPCC
1.2 Baseline assessments: general social, economic, ecological and demographic data on which analyses and scenarios will be built
1.3 Identification of main local stakeholders
2. Assessment of Vulnerability to Climate Change
2.1 Development of Climate Change scenarios, i.e. projection of possible climate changes at relevant spatial and temporal scales
2.2 Assessment of the physical and economic impact of and vulnerability to climate change in the most vulnerable sectors (agriculture, water, forestry and biodiversity, coastal-zone management, health, tourism, urban, etc.)
2.3 Assessment of impact of and vulnerability to climate change on vulnerable groups
3. Greenhouse gas (GHG) emissions and energy needs inventory
3.1 Assessment of GHG emissions by sector (transport, buildings, industry, waste, agriculture and forest) and sub-sectors
3.2 Assessment of energy needs and expected GHG emissions under different scenarios on a time series
Part B: Climate Change Strategy
4. Review of existing sectoral (including energy, transport, agriculture and allied, industry and forestry) policies and strategies to identify priorities
5. Description of main entry points, opportunities, trade-offs identified in each sector, including potential synergies and trade-offs identified between priority adaptation and mitigation measures
6. Identification of possible options to achieve policy objectives and identified priorities (affordability, social acceptance, and feasibility of natural solutions over engineering solutions wherever applicable)
7. Identification of criteria to assess identified options
8. Cost–benefit analysis (CBA) to assess environmental, social and economic costs of identified options (CBA should take into consideration, among other factors, GHG emission reductions, job creation, energy access, local pollution reductions, improved biodiversity and livelihoods), and comparison of these options
9. Assessment of adaptive capacity and feasibility of implementing the options
10. List of prioritized mitigation and adaptation options. SAPCC should include the additional issues specific to the state, which are not covered under the eight Missions. (e.g. tourism, disaster risk reduction, human health, etc.)
Part C: Climate Change Action Plan
11. List of measures (short and long-term) needed to implement these strategies (natural, engineering and locally suitable solutions), including timeframe and sequence for implementation
12. List of (public and private) on-going and planned initiatives (who is doing what, where, how much is allocated) including national as well as international (Clean Development Mechanism (CDM), carbon markets, reducing emissions from deforestation, forest degradation (REDD+), etc.)
13. For each priority option, identification of existing financial instruments to implement it and of possible matching policy/financing instruments to attract and drive direct investment towards lower-carbon/climate-resilient activities (optionally in the form of sectoral 2010-2020 roadmaps)
14. Cost implications for the implementation of SAPCC. What are the existing allocations and how much are the additional resources to be mobilized. Also, potential sources for resource mobilization have to be indicated
15. Design of monitoring and evaluation (M&E) system (governance, indicators, etc.) and M&E implementation arrangements
16. Review of institutional implementation arrangements and capacity needed to implement identified measures along with the requited capacity development plan

For the purpose of this report, the introduction and state profiles are not taken into consideration. It begins by comparing the climate profiles and subsequently Parts B and C. While tabulating comparisons between the various aspects of IHR SAPCCs, key observations, takeaways or open questions are also included, apart from analysing points of commonality and divergence, where applicable.

Given that overarching governance and institutional arrangements are critical to the implementation of SAPCCs, these are considered separately for analyses as opposed to looking at these as part of Part C.

The impact of climate change on agriculture could result in problems with food security and may threaten the livelihood activities upon which much of the population depends.

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CLIMATE PROFILES AND VULNERABILITY

CLIMATE PROFILES

The climate profile section is arguably the most important aspect of SAPCCs as it sets out the overall climate change context for which plans are laid out. For comparative analyses, this report considers three aspects of climate profile sections/chapters of IHR SAPCCs – (a) climate data and information (b) overall vulnerability assessments and methods (c) sectoral vulnerability assessments.

Climate data

Table 2 below shows climate data covered under IHR SAPCCs:

IHR SAPCC	Common Climate Information/Data Covered	Divergences/Additions
Jammu and Kashmir	➢ Annual rainfall data (1980 – 2006); Temperature and Relative Humidity data (1985 – 2008 and 2001 – 2008)	➢ Reduced snowfall over the years ➢ Snow and glacier melt even in winters
Uttarakhand	➢ Rainfall (1968-2008 for Pantnagar and Almora), temperature (1968-2005 for Pantnagar and Almora)	➢ Snow cover trend data (1972-2010) ➢ Glacier changes and retreat data across select watersheds (1972 - 2010) ➢ Drought incidents
Himachal Pradesh	➢ District-wise classification of climate patterns ➢ Temperature data (1901-2002); Precipitation data (1866-2006)	➢ Altitudinal variation in snowfall (1974-2005) ➢ Changes in glaciers ➢ Frequency of extreme weather events ➢ GHG emissions inventory
Sikkim	➢ Annual average maximum and minimum temperature trends and annual rainfall trends in Sikkim (1983 – 2000)	
Assam	➢ Annual rainfall data (1951 – 1980); Temperature data (1961 – 1990)	➢ Brief GHG emissions inventory notes
Meghalaya	➢ Annual rainfall data (1971 – 2005); Temperature data (1901 – 2002)	➢ Extreme precipitation events ➢ Drought and flood events
Manipur	➢ IMD high-resolution daily gridded datasets (0.5 x 0.5 degrees) (1954-2011)	
Nagaland	➢ Annual rainfall data (1971 – 2005); Temperature data (1901 – 2002)	➢ Extreme precipitation events ➢ Drought and flood events

IHR SAPCC	Common Climate Information/Data Covered	Divergences/Additions
Mizoram	➢ Annual rainfall data (1986 – 2005); Temperature data (1986 – 2005); Relative humidity data (1986 – 2005)	
Arunachal Pradesh	➢ Long-term analysis of trends in observed seasonal precipitation and temperature in Arunachal Pradesh using Indian Meteorological Department (IMD) gridded data	➢ GHG emissions inventory
West Bengal	➢ Annual rainfall data (1901 – 2003); Temperature data (1969 – 2005)	➢ Specific delineation for northern and southern districts ➢ Cyclones and storm surges (1900 – 2008) ➢ Sea level rise (data from 4x4 Assessment)
Tripura	➢ NA (as a separate section/ chapter)	➢ Climate information subsumed under various sectoral sections

Overall Vulnerability Analyses

Table 3 below shows overall vulnerability analyses covered under IHR SAPCCs:

IHR SAPCC	Vulnerability/Impact Analyses	Divergences/Additions
Jammu and Kashmir	➢ Climate change projection predicated on 4x4 report, 2010 – mid-year 2035 scenarios	
Uttarakhand	➢ Climate change projection predicated on 4x4 report, 2010 – mid-year 2035 scenarios	➢ World Wide Fund for Nature (WWF) India's study of the Ganga Basin ➢ Interim report of Uttarakhand Centre on Climate Change (UCCC), Kumaon University (fairly detailed) ➢ Uttarakhand State of the Environment Report 2012 by Uttarakhand Council on Science and Technology (UCOST), Uttarakhand (DST) - highlighted various aspects of climate vulnerability ➢ *A few examples of documented 'perceptions' of climate change and its impacts primarily from the standpoint of grassroots communities (Climate Variability and Change in the Himalayas: Community Perceptions and Responses, International Centre for Integrated Mountain Development (ICIMOD) 2011)* ➢ Articulated need for detailed vulnerability analyses
Himachal Pradesh	➢ Climate change projection predicated on 4x4 report, 2010 – mid-century 2035 scenarios	➢ *District and block-level mapping of sensitivity, exposure and adaptive capacity* ➢ *Vulnerability index at block levels*
Sikkim	➢ Climate change projection predicated on 4x4 report, 2010 – mid-century 2035 scenarios	➢ *"Perceived" changes in climate and its impacts*
Assam	➢ Climate change projection predicated on 4x4 report, 2010 – mid-century 2035 scenarios	➢ *Existing policy gaps*

IHR SAPCC	Vulnerability/Impact Analyses	Divergences/Additions
Meghalaya	➢ Climate change projection predicated on 4x4 report, 2010 – mid-century 2035 scenarios	➢ *State specific projections using Precis A1B SRes mid-century scenario (2021 – 2050s) across districts*
Manipur	➢ Climate change projection predicated on 4x4 report, 2010 – mid-century 2035 scenarios	➢ *State specific projections using Precis A1B SRes mid-century scenario (2021 – 2050s) across districts* ➢ *Socio-Economic Vulnerability based on the source of livelihood*
Nagaland	➢ Climate change projection predicated on 4x4 report, 2010 – mid-century 2035 scenarios	➢ *State specific projections using Precis A1B SRes mid-century scenario (2021 – 2050s) across districts*
Mizoram		➢ *State specific projections using Precis A1B SRes mid-century scenario (2021 – 2050s) across districts*
Arunachal Pradesh		➢ *State specific projections using Precis A1B SRes mid and end-century scenarios (2021 – 2050s; 2071-2098) across districts*
West Bengal		➢ *State specific projections using Precis A1B SRes mid and end-century scenarios (2021 – 2050s; 2071-2098) across districts*
Tripura		➢ *Climate change vulnerability profile generated by integration of adaptive capacity and climate sensitivity profiles (TERI)* ➢ *Impact due to sea level rise in deltaic region of Bangladesh (owing to proximity to Bangladesh)* ➢ *Socio-Economic Factors: Poverty and Vulnerability*

Sectoral Vulnerability Analyses

Table 4 below shows sectoral vulnerability analyses covered under IHR SAPCCs:

IHR SAPCC	Sectoral Vulnerability Analyses	Divergences/Additions
Jammu and Kashmir	➢ Climate change projection predicated on 4x4 report of 2010 – for Agriculture, Water, Human Health and Forests ➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	
Uttarakhand	➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	
Himachal Pradesh	➢ Separate short notes on possible vulnerabilities under each focus sector	
Sikkim	➢ Separate short notes on possible vulnerabilities under each focus sector	➢ *Vulnerability assessment of rural communities (with proxy indicators to determine sensitivity, exposure, and adaptive capacity*
Assam	➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	➢ *Poverty impacts*
Meghalaya	➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	➢ *Assessments based on modelling on agriculture (INFOCROP), forests (IBIS), water (SWAT)* ➢ *Assessment of socio-economic vulnerability (employment, vulnerable groups, infrastructure deficit, human development)*
Manipur	➢ Climate change projection predicated on 4x4 report of 2010 – for Agriculture, Water, Human Health and Forests ➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	➢ *Assessments based on modelling on agriculture (INFOCROP), forests (IBIS), water (SWAT)*
Nagaland	➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	➢ *Assessments based on modelling on agriculture (INFOCROP), forests (IBIS), water (SWAT)*

IHR SAPCC	Sectoral Vulnerability Analyses	Divergences/Additions
Mizoram	➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	➢ *Assessments based on modelling on agriculture (INFOCROP), forests (IBIS), water (SWAT)*
Arunachal Pradesh	➢ Impacts on water and forests using Intergovernmental Panel on Climate Change's (IPCC) SRES A1B scenario (PRECIS)	
West Bengal	➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections, with delineation of northern and southern districts	➢ *Impacts on water (SWAT modelling)* ➢ *Delineation of impacts specific to ecosystems such as the Himalayan region and the Sunderbans*
Tripura	➢ Climate change projection predicated on 4x4 report of 2010 – for Agriculture, Water, Human Health and Forests ➢ Separate short notes on possible vulnerabilities under each focus sector sub-sections	➢ *Assessments based on modelling on agriculture (INFOCROP), forests (IBIS), water (SWAT)*

KEY DISCUSSION POINTS/QUESTIONS

The above comparative analyses tables yield several discussion points/ questions:

» It can be seen from the above that there are some differences in climate information data sets used across IHR – to what extent will this issue be addressed in future revision of SAPCCs?

» It can be seen from the table above that while many states have used generic vulnerability assessment information (primarily from the 4x4 Report), some have used more advanced scientific methods including climate modelling. The questions arising out of this observation are as follows:

» To what extent has the availability of modelling information with some states influenced adaptation actions in their SAPCCs; or how much additional value has the results of the modelling added to the respective SAPCC?

- *Is there a need/scope for a common approach and methodology framework to vulnerability analyses across IHR for future revisions to SAPCCs?*

- *IHR states have limited capacity to carry out vulnerability assessment.*

It was observed that even states that had assessed vulnerability using scientific methods had done so through agencies outside of the state. Given that building capacities for scientific data gathering and analyses is one of the key objectives of NMSHE, and that most SAPCCs articulate the need for building such capacities, can there be en-abling mechanisms for building such capacities within each IHR state?

- *To what extent do generic state-level vulnerability assessments help considering that adaptation actions are almost always sector specific?*

» Some of the states have included information/data on extreme weather events. This is in line with the IPCC report 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change (SREX),' which clearly outlines the need for incorporation of disaster risk reduction (DRR) into climate adaptation planning and implementation. The recent extreme precipitation events in western IHR and their impacts only serve to amplify the importance of such data.

» An important aspect that has been included briefly in two SAPCCs is the anecdotal information on "perceived" climate change and its impacts. Documenting community perceptions of climate change can be a valuable tool in understanding local impacts and local adaptation planning in addition to scientific data and vulnerability assessments.

» As outlined in one of the SAPCCs, it is also important to map key aspects of sensitivity, exposure and adaptive capacity at sub-state and block levels, not only in general but also for specific focus sectors.

» Articulation of policy gaps based on vulnerability assessments is a step towards mainstreaming climate concerns into development agenda.

The Himalayan ecosystem is fragile and diverse. It includes over 51 million people who practice hill agriculture and remains vulnerable

Photo © CEE

GOVERNANCE AND INSTITUTIONAL ARRANGEMENTS

The Ministry of Environment, Forests and Climate Change had articulated the need for a review of institutional arrangements for implementation as well as design of monitoring and evaluation systems as part of Part C under the Climate Change Action Plan. These and other key aspects relating to overarching governance and institutional arrangements are being considered separately in this section since they are of criti-cal importance to SAPCCs. Areas for comparison include articulation of vision statements, overall approach, overarching mechanisms for governance, convergence and coordination, monitoring mechanisms, capacity building and awareness generation, improving scientific knowledge, evidence base and understanding of climate change and its impacts, connecting science, practice, and policy, roles of non-gov-ernment players, and poverty and equity concerns. Table 5 below gives a snapshot view of presence or absence of these in IHR SAPCCs.

Table 5: Presence or absence of various overarching governance and institutional aspects in IHR SAPCC.

Key Elements	J&K	UK	HP	Skm	Asm	Meg	Man	Nag	Miz	ArP	WB	Tri
Vision	●	●	●		●			●				
Overall approach	●	●	●		●		●	●	●			
Overarching governance mechanisms, institutional design	●	●	●		●	●	●	●	●	●		●
Monitoring mechanisms	●	●	●		●		●	●		●		●
Capacity building; awareness generation	●	●	●		●	●	●	●		●	●	●
Improving scientific knowledge and evidence base and connecting science, practice, and policy	●	●	●			●	●	●		●	●	●
Roles of agencies other than the government	●	●	●			●	●	●		●		●
Poverty and equity concerns	●	●	●					●		●		●

In terms of location of sections on the overarching governance mechanisms and institutional design/coordination arrangement aspects within SAPCCs, there is wide variation. (see Table 6 below):

Table 6: Location of sections relating to overarching governance mechanisms and institutional design/coordination arrangements in IHR SAPCCs

IHR SAPCC	Location of sections relating to overarching governance mechanisms and institutional design/coordination arrangements
Jammu and Kashmir	➢ Separate chapter/section on "Policies, Programmes and Institutional Mechanisms"
Uttarakhand	➢ Separate chapter/section on "Overarching State Framework"
Himachal Pradesh	➢ Under chapter/Section on "Climate Change Strategy for HP"
Sikkim	NA
Assam	➢ Separate chapter/section for "Institutional Arrangements"
Meghalaya	➢ Under chapter/section "NAPCC and Meghalaya" and under "Cross-cutting Issues"
Manipur	➢ Under "Introduction" and under "Analysis and Synthesis"
Nagaland	➢ Separate chapter/section on "Overall Approach and Framework"
Mizoram	➢ Under chapter/section "Formulation of SAPCC"
Arunachal Pradesh	➢ Under chapter/section "Cross-cutting Issues and Integrated Approach"
West Bengal	NA
Tripura	➢ Under chapter/section "Cross-cutting Issues"

Examples of how SAPCCs have articulated various overarching governance and institutional aspects are given in the tables below.

Table 7: Examples of Vision Statements in IHR SAPCCs

IHR SAPCC	Vision Statement
Jammu and Kashmir	"To alleviate poverty and achieve a sound socio – economic situation of its population through reduction in vulnerability factor of climate change." ➢ Bulleted descriptive points for above
Uttarakhand	"Through its SAPCC, the Government of Uttarakhand commits itself to fostering inclusive, sustainable and climate-resilient growth and development of the state. " ➢ Narration of planned actions by the state to support the vision
Himachal Pradesh	Has outlined two goals as vision statements, one each for adaptation and mitigation: ➢ "To develop a package of adaptation measures, aimed at protecting the health of people, water resources, agri-horti production, urban and rural infrastructure, and hydropower generation" ➢ "To work towards becoming a low carbon/carbon neutral economy as a means of promoting sustainable development in Himachal Pradesh as well as a means of contributing to national efforts to reduce GHG emissions."
Assam	"The Assam SAPCC envisages a sustainable and climate resilient development pathway through a synergistic combination of adaptation & mitigation measures with focus on research, appropriate technology, capacity creation and governance."
Nagaland	"The Government of Nagaland commits itself to help the state achieve its developmental goals through a path that will enable conservation of its natural resources without compromising on livelihoods and food security. The state visualizes the Action Plan to serve the dual purpose of integrating climate concerns in its developmental plans into the future and achieve a low carbon inclusive growth, while ensuring complementarity with and contributing to the national agenda on climate change."

Table 8: Examples of articulation of overall approach in IHR SAPCCs

IHR SAPCC	Articulated Approach
Jammu and Kashmir	Focuses on science – policy interface and knowledge – management and dissemination system to ensure that climate change decisions are informed by best available information. Examples of stated overall approach include: ➢ Prioritization of adaptation and mitigation interventions in various sectors ➢ Mainstreaming of climate change response into all planning reform activities ➢ Use of incentives and disincentives including regulatory and economic measures to promote behavioural change that would support the transition to low carbon society and economy ➢ Mainstreaming climate change in education system as a major priority paradigm
Uttarakhand	➢ Overall approach will be to create and define an overarching climate response framework at the state government level as also develop flexible sector-specific response strategies and actions while keeping in mind the overall vision as articulated above. Key articulated elements of the approach include: ➢ Acknowledgement that climate change escalates the already existing vulnerabilities (social, ecological, economic and cultural) ➢ Accelerating inclusive economic growth, promoting sustainable development, securing and diversifying livelihoods and safeguarding ecosystem services ➢ Integration of climate change strategy into regular developmental planning process ➢ Adaptation as primary component, while leveraging opportunities for mitigation ➢ Equal emphasis on both 'hard' and 'soft' adaptation approaches
Mizoram	➢ To strategize adaptation and mitigation initiatives towards emission stabilization and enhance resilience of ecosystems ➢ To ensure that there is no strategic disconnect with the national policy with respect to the stated positions
Manipur	➢ Directional approach including the enhancement of the existing and planned programmes with technical assessment and approach as laid down by NAPCC; Mission (as under the NAPCC) Approach used in the state

Table 9: Examples of articulation of overarching governance and institutional mechanisms in IHR SAPCCs

IHR SAPCC	Mechanisms and Articulation
Jammu and Kashmir	➢ Articulated under 'Policies, Programmes and Institutional Mechanism' ➢ The state to establish a Climate Change Centre o To function as Secretariat of Committee under Chief Secretary o To set up CC database and information system for use by all sectors ➢ State climate change committee to ensure overall climate change activities in the state ➢ Sectoral departments and agencies to be responsible for implementing the activities in their sectors and periodically report to Climate Change Committee under Chief Secretary ➢ Convergence of Government projects, plans, schemes with SAPCC to better utilize human, fiscal and technical resources ➢ State Disaster Management Division to incorporate climate change into disaster preparedness and response process
Uttarakhand	Framework includes: ➢ Reviewing all state policies and revising these as necessary to articulate and integrate climate concerns ➢ Articulation and integration of climate change considerations into development strategies, plans and programmes ➢ Strengthening institutional decision-making mechanisms and processes (including monitoring and evaluation) to ensure cross-sectoral coordination related to climate change ➢ Development and adoption of appropriate management approaches including regulatory, incentive-based and innovation-based approaches to encourage appropriate adaptation and mitigation measures ➢ Development and strengthening of institutional capacity for climate-related disaster risk reduction and management ➢ Already constituted the State Committee on Climate Change to provide an overarching governance framework and guidance to the state's climate agenda – under the Chief Secretary, and comprising 29 members including Principal Secretaries in charge of various line departments as well as other senior government personnel ➢ State Forest Department (currently nodal department for development of SAPCC) to play an interim role as the nodal agency for overseeing all operational aspects implementation. Once proposed Uttarakhand Environment Directorate (UED) comes into being, this role will be transferred to it ➢ Envisages setting up of CC Cells in all focus sector departments ➢ Other sectors to be co-opted from time to time
Himachal Pradesh	➢ State-level Governing Council on CC under Chief Minister ➢ Executive Council under the Chief Secretary to oversee all implementation and monitoring ➢ State Department of Environment, Science and Technology is the nodal agency, State Centre on CC set up to evolve strategies and programmes on an on-going basis and also build scientific and technical capacities ➢ Working groups, sub-groups to be set up, cross-departmental coordination mechanisms to be set up for coordination

IHR SAPCC	Mechanisms and Articulation
Assam	➢ Three-tier framework with Task Forces as the base and Chief Secretary's Office as the top most authority along with an intermediate Steering Committee that is coordinated by the Department of Environment and Forests, Government of Assam ➢ Steering committee comprises heads of the respective task forces ➢ Nodal Departments for each Task Force have been tentatively identified and would be subject to further review and necessary approval
Meghalaya	➢ Meghalaya State Council on CC and Sustainable Development as Apex body to oversee and coordinate implementation ➢ Project management agency supported by experts to develop implementation guidelines for each sector and to develop baseline ➢ Multi-sectoral coordination and convergence mechanisms outlined ➢ Articulated building in triggers for mainstreaming CC into sectoral policies and programmes
Nagaland	➢ Review of all state policies and revise these as necessary to articulate and integrate climate concerns and other measures as in Uttarakhand ➢ SSC under the Chairmanship of the Chief Secretary and comprising 15 members including Commissioner and Secretaries in-charge of various line departments as well as other senior government personnel with Apex role of overseeing implementation ➢ Advisory Panel, comprising 4-5 sector experts will be constituted, and be tasked with assisting the State Steering Committee in its role ➢ Nodal agency/department (currently Forest department) overseeing the operational aspects of SAPCC implementation will be supported closely by other state-level departments; close coordination with all such departments will also be ensured ➢ Other departments/agencies to be co-opted as necessary
Mizoram	➢ Climate Change Council of Mizoram under the Chief Minister will coordinate state action plan for assessment, adaptation and mitigation of climate change ➢ Executive Council headed by Chief Secretary ➢ Respective missions shall be taken care of and attended to by the individual departments
Arunachal Pradesh	➢ Constitution of Climate Change Cell/Authority under Department of Environment and Forest may be considered for coordination among various departments ➢ The Department will act as a facilitator to provide a framework for integration, planning, monitoring and assessment ➢ Line departments to oversee and implement focus sector activities

Table 10: Examples of articulation of overarching monitoring mechanisms in IHR SAPCCs[1]

IHR SAPCC	Mechanisms and Articulation
Jammu and Kashmir	➢ State Climate Change Committee will also be responsible for regular monitoring of the implementation of the state's climate change adaptation policy and action plans ➢ State Climate Change Centre would have additional responsibility to monitor and maintain database on climate change activities to be undertaken in Jammu and Kashmir ➢ Annual reports of concerned sectors to include section on progress on SAPCC activities
Uttarakhand	➢ M&E framework articulated, with roles and responsibilities at various levels, and includes specific roles for line departments and their field functionaries, climate change cells, nodal department at the state level, and overseen by State Committee on Climate Change ➢ Outlines reporting frequency ➢ Includes internal reviews of implementation progress and performance on a half-yearly basis ➢ External third party reviews and evaluations proposed ➢ Detailed and robust monitoring framework to be developed, including specific methodologies, protocols and templates for monitoring and reporting
Himachal Pradesh	➢ Executive Council under the Chief Secretary to oversee monitoring ➢ State Department of Environment, Science and Technology as nodal agency will monitor implementation ➢ Detailed reporting template to be drawn up for monitoring implementation ➢ Publication of annual implementation status report envisaged
Assam	➢ Articulated in a separate chapter ➢ Task forces drawing up monitoring plans for the strategies identified under respective thrust area and department with Department of Environment and Forests coordinating ➢ Regular annual reporting of the implementation of strategies on the basis of performance/process indicators that may serve as milestones in the implementation timeline
Nagaland	➢ Expected that reporting will take place on a quarterly basis at all levels, internal reviews of implementation progress and performance on a half-yearly basis ➢ External third-party evaluation during mid-2014 to critically examine implementation and recommend course corrections, and another similar external evaluation will be carried out at the end of 2017 ➢ A detailed and robust monitoring framework will be developed including specific methodologies, protocols, and templates for monitoring and reporting as part of the process of developing detailed work plans under SAPCC
Arunachal Pradesh	➢ Line departments have their inbuilt monitoring mechanism which may take care of monitoring and evaluation once trained

1 Does not include monitoring activities that may be specified under various focus sectors.

Table 11: Examples of articulation of capacity building and awareness generation issues in IHR SAPCCs

IHR SAPCC	Mechanisms and Articulation
Uttarakhand	➢ Recognizes that overall awareness of climate change and its impacts in Uttarakhand is limited ➢ Two key desired outcomes articulated measures to achieve these outlined: o Significantly improved awareness of climate change and its impacts in the government at all levels as well as in communities, civil society and the private sector in the state o Enhanced capacities of government line departments and agencies at all levels to analyse, plan, converge, implement and monitor programmes addressing climate change and its impacts ➢ *The state will examine the possibility of incorporating climate change related modules into the educational curriculum across various levels, including the development of specific academic programmes on climate change at university levels*
Nagaland	➢ Articulated the need for significantly improved awareness of climate change and its impacts at all levels of the government as well as in communities, civil society and private sector in the state; and the need for enhanced capacities of the government line departments and agencies at all levels to analyse, plan, converge, implement and monitor programmes addressing climate change and its impacts ➢ State intends to initiate and foster a range of ongoing awareness and capacity building measures aimed at above ➢ *The state will examine the possibility of incorporating climate change related modules into the educational curriculum across various levels, including the development of specific academic programmes on climate change at university levels* ➢ Appropriate non-governmental agencies will be co-opted as necessary to support the awareness and capacity building processes ➢ *Nagaland will also explore the scope for expansion and revitalization of Climate Change Leaders (CCL) network, and develop a cadre of committed CCLs across the state*
West Bengal	➢ Setting up of the State-level Institute for Climate Change. Apart from research and research integration, the Institute will carry out training and capacity Building – Emphasis on skill development, at all levels, across various sectors to help communities become sufficiently empowered with know-how and specific required skills, necessary for adaptation to CC

Table 12: Examples of articulation of scientific knowledge and evidence base building and connecting science, practice and policy in IHR SAPCCs

IHR SAPCC	Mechanisms and Articulation
Jammu and Kashmir	➢ Separate section on Knowledge Management ➢ Identifies weaknesses in knowledge processes and priorities to address these ➢ Focuses on science – policy interface and knowledge management and dissemination system to ensure that climate change decisions are informed by best available information ➢ Scope of work includes: o To compile, integrate and synthesize multi-scale knowledge on climate variability and climate change o To use long-term observation data and integrated system modelling tools o To communicate and identify new knowledge that may enhance awareness and support learning process of societies to cope with CC and climate extremes in both immediate and long–term time scales o To render support for science and technology capacity building at national and local level to achieve a climate-resilient society o To coordinate and engage in national and international research and development services and networks in the area of climate and development ➢ Articulates need to establish a Strategic Knowledge Management Centre for Climate Change (SKMC-CC) ➢ Actions would include establishing knowledge network nodes, village knowledge centres, including training of institutions and knowledge networks ➢ Articulates the role of information and communication technologies (ICTs) in KM for CC
Uttarakhand	➢ Recognizes limited availability of vulnerability info-base vis-à-vis climate change and its impacts on the state, its economy, and its various sectors and communities ➢ Seeks to achieve the following outcomes (which are linked to the overall KM Strategy under SAPCC): o Development of detailed climate vulnerability and risk analyses covering all districts, as well as specific analyses pertaining to each of the sectors addressed in SAPCC o Improved scientific evidence base and coordination mechanisms between scientific research and academic institutions (including both national and state-level agencies) for building a scientific data and evidence base for the state o Collation of available scientific information and data on climate change pertaining to the state o Documentation (on an on-going basis) of people's perceptions on climate change and its impacts, and where appropriate, establishing if these have scientific basis and validity ➢ Linkages of the above and intent to build robust evidence-based policy making articulated ➢ Proposes State Climate Change Cell and activities for a clearing house mechanism that aggregates the available evidence base and tracks all ongoing and planned research programmes that may have relevance to the state ➢ Mechanisms to foster dialogue with and between scientific research and academic agencies

IHR SAPCC	Mechanisms and Articulation
Himachal Pradesh	➢ Articulates data and data mechanisms gaps for evidence-based policy making (EBPM) and intervention planning ➢ *Highlights the need for systematic observations; proposes observational and monitoring network under NMSHE and cooperation with neighbouring states* ➢ Outlines need to build scientific and research capacities ➢ Proposes to undertake several activities under the aegis of the Strategic Knowledge Mission on: o Research on key domains of climate change o Climate Modelling o Strengthening of observational networks and data generation o Creation of research infrastructure
Meghalaya	➢ Articulates cross-cutting knowledge needs at various levels: o At local levels - Locale specific databases, scenarios, assessments and monitoring networks o At state level – research networks, state level databases, scientific and policy models, state-wide and area specific scenarios, technology inventories o At National Mission interface level – interface with IPCC assessments, global and regional databases and data sets, scenario assessments ➢ Articulates the need to focus on widening of awareness and understanding of CC and impacts. Steps include: o Mainstreaming CC concerns into policies and practice o Integration of KM practices in the CC domain including research and creation of data mechanisms and databases, scientific climate modelling and scenario generation, generation of baselines, etc.
Nagaland	➢ Recognizes limited availability of vulnerability info-base vis-à-vis climate change and its impacts on the state, its economy, and its various sectors and communities ➢ Seeks to achieve the following outcomes (which are linked to the overall KM strategy under SAPCC): o Development of detailed climate vulnerability and risk analyses covering all districts, as well as specific analyses pertaining to each of the sectors addressed in SAPCC o Improved scientific evidence base and coordination mechanisms between scientific research and academic institutions (including both national and state-level agencies) for building scientific data and evidence base for the state o Collation of available scientific information and data on climate change pertaining to the state o Documentation (on an ongoing basis) of people's perceptions on climate change and its impacts, and where appropriate, establishing if these have scientific basis and validity ➢ Linkages of the above and intent to build robust evidence-based policy making articulated

IHR SAPCC	Mechanisms and Articulation
Arunachal Pradesh	Critical areas identified include: ➢ Climate change vulnerability assessment studies across sectors ➢ Strengthening of database and infrastructure for climate-related data collection and analysis ➢ Documenting traditional practices, local knowledge and folk traditions ➢ IPR and traditional knowledge protection ➢ Creating database and identifying trends and climate responses Areas of research include: ➢ Prepare and upgrade environmental status reports with special emphasis on climate change ➢ Document biodiversity status and traditional and folk knowledge ➢ Create climate change-related databases and identify responses to climate change ➢ Creation of the necessary data and information infrastructure, modelling capabilities, etc. ➢ Development of information systems to meet the specific information needs of the various line departments dealing with various sectors
West Bengal	➢ Envisages setting up of a state-level institute for CC – aiming towards formulation of strategic knowledge (encompassing climate change issues, energy security and food security) for sustainable development with economic growth of the state vis-à-vis country in eco-friendly manner ➢ Articulates imperative to understand the performance criteria- what is really happening to environmental resources like air, water and forests in response to "geo-bio-cultural" interactions ➢ Primarily, the institute will play a catalytic role in tracking research being conducted by different departments/institutions/organizations in the state and also undertaking its own ➢ The institute will act as a "Knowledge Domain" for "Transitional Research," i.e., to foster exchange of data related to climate change, good practices and policy initiatives across the states/adjacent countries with similar physiographic provinces, e.g. Bangladesh, Pakistan, Sri Lanka and Myanmar ➢ The institute will also carry out training and capacity building – Emphasis on skill development at all levels, across various sectors to enable communities become sufficiently empowered with know-how and specific required skills necessary for adaptation to CC

Table 13: Examples of articulation of roles of agencies other than the governments in IHR SAPCCs

IHR SAPCC	Mechanisms and Articulation
Uttarakhand	Extensive articulation of possible roles for private sector including: ➢ Recognises the role private sector is already playing in contributing to the state's economy; a range of public-private partnership (PPP) initiatives and projects are underway in the state through the Uttarakhand PPP Cell ➢ Recognizes the potential role of private sector for pooling resources and expertise and for scaling up climate change adaptation (especially in terms of climate-resilient infrastructure and low-carbon goods and services) and mitigation initiatives by way of explicit incorporation of climate concerns into project frameworks ➢ Recognises that the private sector has great potential and competency for bringing innovative solutions and scale to the various models for climate change adaptation shaped by the civil society and/or government institutions ➢ Recognizes the huge potential and the need for private sector to play a critical role in sectoral initiatives in primary sectors as well bringing in new management practices, technologies and technology transfer, innovation, capital and investments, capacity building The state also recognises the role of the financial sector and financial institutions and articulates that: ➢ FIs will have a critical role to play in sectoral initiatives, bringing in new financial practices, products, innovation, capital, investments, etc. ➢ FIs have already been active in the primary sector, such as providing crop insurance, etc. However, the experience has been mixed Similarly, the state recognizes that civil society and voluntary organizations have played critical roles in shaping the development landscape of not only Uttarakhand, but also of the nation. ➢ Envisages vital roles in the context of climate change since civil society has the potential to deliver programmes and services to communities and to bridge the roles of not only the government and community, but also of scientific research institutions and the private sector with government and the community ➢ Envisages civil society roles in capacity building at various levels, providing inputs to SAPCC on poverty, equity and livelihood concerns, providing outreach and extension services, playing bridging roles, documenting community perceptions and best practices, undertaking participatory research, knowledge networking, and contributing to expanding the available evidence base on climate change Likewise, the state recognises that international/external agencies play significant roles in supporting developmental initiatives and bringing in technical assistance to the state. ➢ Envisages that international organizations will also play a significant role in supporting various aspects of SAPCC implementation; the state will therefore proactively seek opportunities for collaborative partnerships with such organizations, especially in the context of external support—financial support, technical assistance and advisory services, bringing in international best practices, knowledge management and networking, inter-state and regional dialogues on climate change, especially in the context of Himalayan states
Himachal Pradesh	➢ Envisages roles for NGOs, Mahila Mandals, Eco-Clubs, etc. ➢ Envisages that private sector activities for mitigation and adaptation would be encouraged ➢ Considers private sector as a major potential generator of green jobs

IHR SAPCC	Mechanisms and Articulation
Meghalaya	➢ Envisages that the State Council on CC and Sustainable Development will forge partnership with the private sector, academic institutions and civil society to facilitate the implementation of various proposed actions in the state

Table 14: Examples of articulation of poverty and equity concerns in IHR SAPCCs

IHR SAPCC	Mechanisms and Articulation
Uttarakhand	➢ Recognizes CC can have disproportionately adverse impacts on the poor, women, children and aged and can also impact livelihoods ➢ Outlines need for developmental planning to explicitly integrate poverty, livelihoods and equity concerns ➢ Explicit articulation that the state's inclusive climate change policy will be guided by gender equality; gender mainstreaming in adaptation focused programmes and schemes, expected to empower women and not work only for their welfare ➢ The state to mainstream gender equity by equipping all participating departments and agencies to undertake gender analysis of all programmes and schemes and implement solutions to empower women to adapt to climate change ➢ The above to be done through broad-based gender and equity sensitization activities, involvement of gender experts at various levels and constituting a gender empowerment sub-committee within each Climate Change Cell ➢ The state recognizes that policies, programmes and schemes empower women and men if these: a) create assets for women and men alike b) create equal opportunities for income-generation activities and for exercising control over that income through, for example, creating institutional arrangements to encourage women to actively engage with markets c) lead to reduction of labour and drudgery for both women and men d) lead to equal participation of women as informed decision-makers in mainstream institutions to help shape laws, policies and programmes that impact their lives and livelihoods ➢ The state will also explore all aspects of changes needed to implement gender-responsive climate adaptation plans; details articulated
Nagaland	➢ The state recognizes that integrating responses and adaptation measures into local level poverty reduction strategies is an imperative and an enormous challenge ➢ Articulates that each sector will, where appropriate, incorporate and explicitly articulate poverty, equity and livelihood concerns in their policies, plans and budgetary processes
Arunachal Pradesh	➢ Gender sensitivity and gender sensitive adaptation measures mentioned ➢ Poverty reduction oriented impact assessment methodologies, implementation and policy reviews articulated with a view to benefit key poor and vulnerable groups ➢ Monitoring poverty outcomes articulated
Tripura	➢ Separate sub-section on socio- economic factors: Poverty and Vulnerability ➢ Poverty concerns also articulated through the document under various sectoral sections

KEY DISCUSSION POINTS

As can be seen from Tables 5 – 12 above, there are significant variations in the approach to and articulation of overarching institutional arrangements and governance frameworks.

» Some IHR SAPCCs such as Uttarakhand and Nagaland have dedicated chapters on these, while in most others, these are either subsumed under 'cross-cutting issues,' or not articulated at all.

» Interestingly, SAPCCs that have well-articulated governance and institutional mechanisms do not have a monitoring and evaluation framework.

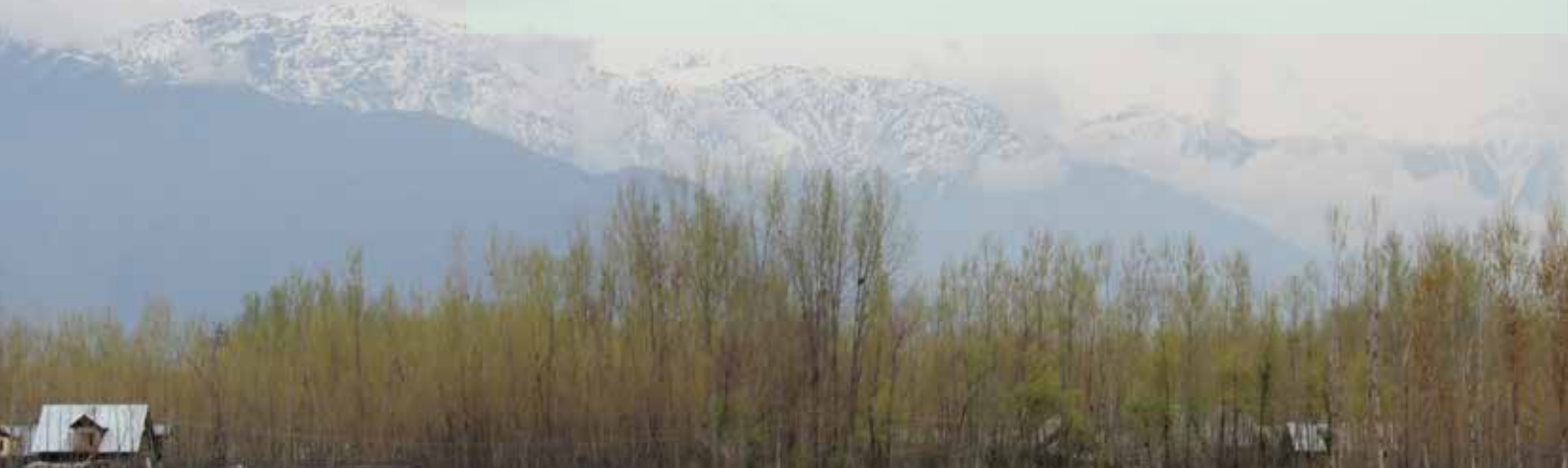
» Building awareness, especially among the younger generations, through inclusion of climate change issues into educational curricula, as articulated by some states and the initiative to identify and foster climate change leaders and champions in Nagaland SAPCC are important divergences.

» Seven out of eleven IHR SAPCCs have articulated mechanisms relating to building scientific knowledge and evidence base and developing/adopting mechanisms for connecting science, practice, and policy. This emphasizes the relevance and importance of these actions towards mainstreaming climate concerns into developmental agendas.

» It is widely known that climate change disproportionally impacts the poor, women, the very young, and the very old and further exacerbates the already existing vulnerabilities of these sections of the society. As such, articulation of poverty and equity concerns and developing mechanisms for mainstreaming these into policy and SAPCC implementation frameworks, as has been articulated in some SAPCCs, are key divergences.

Photo © CEE

The Himalayas house one of the largest resources of snow and ice and its glaciers which form a source of fresh water for the perennial rivers such as the Indus, the Ganga, and the Brahmaputra



FOCUS SECTORS

This section of the report focuses on two broad comparative analyses themes--(a) analyses of the key aspects of each focus sector under SAPCCs and (b) the linkages between SAPCCs and the eight National Missions under NAPCC -- to examine degrees of commonality and divergence.

FOCUS SECTORS UNDER SAPCCs

Table 15 below presents a comparison of focus sectors selected by IHR states in their SAPCCs. The table shows the sectors that are common across IHR SAPCCs as well as divergence in selection of sectors and in nomenclature and clubbing of some sectors.

Table 15: Comparison of focus sectors in IHR SAPCCs

Sectors	Common to	Divergence	Key Observations
Agriculture and Allied (horticulture, animal husbandry, fisheries)	All	• Subsumed under Sustainable Livelihoods in Assam • Subsumed under Ecosystems, Biodiversity and Sustainable Livelihoods in Manipur • Livestock and Animal Husbandry as separate sections in Uttarakhand • Horticulture as separate section in Arunachal Pradesh	• Most common sectors are Agriculture (and allied sectors) and Forests and Biodiversity • Water, Energy and Sustainable Habitat are the next most common sectors, with only a single state exclusion in each • Least included sectors are Industries and/or Mining, and Bio-resources • Disaster management – sector of enormous potential significance common to only four states (all Western Himalayan, plus Assam)

Sectors	Common to	Divergence	Key Observations
Forest and Biodiversity	All	• Biodiversity and Ecosystems as separate Sections in Himachal Pradesh • Ecosystem, Biodiversity and Livelihood Sustainability as a separate section in Manipur • Under Green Tripura Mission in Tripura	
Water Resources	All, except Assam	• Not a focus sector in Assam • 'Water Security' in Sikkim • 'Sustainable Water Management' in Meghalaya	
Energy	All except Sikkim	• Subsumed under Forests and Biodiversity and Urban and Rural Habitats in Sikkim • Not articulated as a focus sector in Meghalaya, but agendas under Solar and Enhanced Energy Efficiency Missions • Enhanced Energy Efficiency Mission in Manipur • Separate Enhanced Energy Efficiency Mission and Solar Missions sections in Arunachal • 'Energy Efficiency and Renewable Energy' in West Bengal • Under Enhanced Energy Efficiency in Tripura; Separate chapter on Solar and Non-Conventional Energy	
Sustainable Habitat/Urban Planning/Development	All, except West Bengal	• Not a focus sector in West Bengal • Rural included in Sikkim • Subsumes urban transport in Nagaland	
Health	J&K, Uttarakhand, Assam, Nagaland, Manipur, Mizoram, Tripura	Not a focus sector in other states	

Sectors	Common to	Divergence	Key Observations
Knowledge Management/Strategic Knowledge	Meghalaya, Arunachal, Manipur, J&K, Tripura	• Not a focus sector in other states • However, well articulated strategies in some, e.g., Uttarakhand and Nagaland as overarching strategy; or under cross-cutting in some others • 'Institute for Climate Change Studies' in West Bengal	
Disaster Management/Natural Disasters	J&K, Assam, Uttarakhand, Himachal	Not a focus sector in other states	
Transport	Uttarakhand and Sikkim (focus on Urban Transport)	• Not a focus sector in other states or very little emphasis • Subsumed under Urban in Nagaland	
Sustainable Himalayan Ecosystem	J&K (focus on Forests and Biodiversity); Manipur (in combination with biodiversity and sustainable livelihoods); and Tripura	• Not a focus sector in other states or subsumed under various other sectors or under cross-cutting issues	
Industries and/or Mining	Meghalaya (mining), and Uttarakhand (industries)	Not a focus sector in other states	
Tourism	Sikkim, J&K, Uttarakhand, Himachal	• Focus on eco-tourism, in combination with forests, biodiversity and wildlife in Sikkim • Not a focus sector in other states	
Bio-resources	Only Assam	• Not a focus sector in other states or subsumed under other focus sectors such as agriculture or forests and biodiversity	
Roads	Only Uttarakhand	• Not a focus sector in other states	

COMPARISON OF SELECT FOCUS SECTORS ACROSS IHR SAPCCS

In order to compare key action areas in focus sectors across IHR SAPCCs, four (to limit the overall length of the report) sectors have been chosen for analysis:

» Agriculture

» Water

» Energy

» Health

Agriculture

Table 16: Comparison of agriculture sector chapters/sections in IHR SAPCCs

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Jammu & Kashmir	*Subsumes horticulture, floriculture, animal husbandry and dairying* ➢ Enhancing food production ➢ Strengthening maize-based subsistence farming ➢ Strengthening vegetable growing farming system ➢ Protecting livestock system ➢ Developing agricultural water use efficiency ➢ Strengthening and modernization of horticulture industry in the state Key research areas: ➢ Climate change modelling - assessing crop factors/coefficient of water use under increased/variable temperature regimes ➢ Climate change adaptations - improving irrigation management and water use efficiency in horticulture; improving interaction of water and fertiliser use in horticulture ➢ Climate Change Mitigation	➢ Some themes/areas that appeared commonly included crop diversification, focus on rain-fed/dryland agriculture, soil and moisture conservation, development of more resilient varieties of crops, protection/promotion of traditional varieties, integrated pest management, strengthening institutional mechanisms and extension services, and awareness and capacity building ➢ Less common themes/areas of action included policy reviews, gender concerns, *jhum* optimization, and protection and enhancement of aquatic ecosystems
Uttarakhand	➢ Research and evidence base generation (multiple projects/studies) and building research capacity ➢ Revitalization of rain-fed agriculture ➢ Resource conservation technologies, pest surveillance, traditional knowledge in agriculture ➢ Policy reviews and changes (e.g., incentives for resource conservation, integrated and diversified farming systems, promoting organic farming, pricing of resources, credit for transition to adaptation technologies) ➢ Investments in infrastructure for water management and soil conservation ➢ Greater insurance coverage for the sector ➢ Improved information, knowledge base and dissemination of information on climate changes and options to adapt to them ➢ Supporting the role of women in adaptation, including promoting women's involvement in decision-making processes and implementation ➢ Gender-disaggregated data mechanisms	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Himachal Pradesh	➢ Support research to improve understanding of the implications of climate change for agriculture at the state, sectoral and regional levels, including: o vulnerability assessments of regions and agricultural activities o effects of climate change on seasonal variability and reliability, and on climate extremes o understanding barriers to adaptation and opportunities to adapt ➢ Increase resilience of farming systems and regions to climate change, and help agri-businesses identify where changes may be needed for the long-term investment strategies ➢ Enhance current programmes and structures to incorporate climate change adaptation considerations into natural resource management, rural support and adjustment, research and development and plant and animal health, pest and weed policies and programmes, and environmental management systems ➢ Develop decision support tools, pilot adaptation options, inform and encourage adaptation, and engage industry in participatory research, communication and review ➢ Strengthen important ongoing development initiatives to reduce vulnerability to climate change ➢ Focus on innovative policies	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Sikkim	*Subsumes horticulture and animal husbandry* Agriculture ➢ Introducing new varieties ➢ Popularization of indigenous varieties ➢ Crop diversification ➢ Integrated Pest Management ➢ Seed Production and Certification ➢ Water management system ➢ Soil Conservation Measures ➢ Reduce weather-related risks ➢ Institutional strengthening ➢ Monitoring of climate change programmes ➢ Risk Management ➢ Prospect of Farm Mechanization Horticulture ➢ Introducing new varieties ➢ Popularization of indigenous varieties ➢ Crop diversification ➢ Rejuvenation of large cardamom ➢ Ginger disease management programme ➢ Rejuvenation of Sikkim mandarin oranges ➢ Improve floriculture programmes ➢ Production of off-season vegetables ➢ Integrated Pest Management ➢ Water management system ➢ Reduce weather-related risks ➢ Monitoring of climate change programmes ➢ Risk Management Animal husbandry ➢ Strengthen disease investigation system ➢ Preventive health measures ➢ Improve cattle sheds ➢ Breeding practices ➢ Feed and fodder development ➢ Dairy development ➢ Livestock-based diversified livelihood activities (piggery and poultry) ➢ Institutional strengthening ➢ Risk management	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Assam	*Subsumes livestock, fisheries sectors* Research and technology development: ➢ Impacts assessment (crops, livestock and fish species) ➢ Studies on weather pest relationships ➢ Developing database on genotypes of local crop varieties (mainly rice varieties) and identification of suitable varieties for different agro-climatic zones in the context of climate change impacts. Special emphasis on developing genotypes for tolerance to biotic/abiotic stress, e.g., drought, flood, disease and pest resistance ➢ Developing decision support system combining database of crop, soil, weather and modern information tools (with simulation models, remotely sensed information, use of GIS platforms) to provide drought/flood alerts, monitoring the vegetation condition, develop crop yield forecasts and identify best agronomic practices ➢ Proper research on making agriculture possible on soil degraded due to sand deposition as well as on restoration of such soil to reclaim productivity ➢ Documentation of indigenous technical knowledge and its standardization in the context of climate change adaptation ➢ Restructuring or re-designing of crop calendar and cropping systems/patterns and crop adaptability. Define land use suitability classes at watershed/micro-watershed level for the entire state and renewal of the classification every five years to deal with changes occurring to agricultural land due to natural and anthropogenic factors ➢ Identification and documentation of traditional practices for fisheries ➢ Research for standardization of local air breathing fish; and new candidate species to be taken care Policy measures: ➢ Review and reframing of State Agriculture Policy in the context of climate change vulnerability, incorporating the strategic guideline for each of the agro-climatic zones by a) establishing linkage of agricultural policy with those on water and land use so that they become synergistic and complementary to one another, especially with respect to irrigation and other means of water harvesting for agricultural uses and b) introduce and promote insurance of crop, farm land and livestock by ensuring minimum risk for farmers ➢ Fiscal support for soil conservation strategies in cultivable wasteland of the state (land reclamation and water distribution): Restoration of soil degraded due to deposition of sand to recover its productivity along with incentives and subsidies to affected farmers ➢ Fiscal incentives for promotion of agro-forestry in different agro-climatic zones, with special attention to the hill areas for improvization of traditional agricultural practices like shifting cultivation (*jhum*), to reduce ill effects on environment and increase productivity ➢ Strengthening the role of farm cooperatives ➢ ACZ wise crop planning based on strategic knowledge partnerships between government agencies and research organizations/ agri-universities Institutions and governance: ➢ Introduction of surveillance to monitor and combat fish disease from district headquarters ➢ Strengthening the role of farm cooperatives ➢ Strategic knowledge partnerships between government agencies and research organizations/agri-universities ➢ Mechanism for inter-departmental collaboration and coordination Capacity Building ➢ Sensitize Kissan Bandhus and farmers in general regarding potential climate change impacts and the adaptation choices ➢ Awareness and capacity building of extension staff on the issues of climate change risks and adaptation ➢ Pilot demonstration projects on information support systems in every agro-climatic zone of the state ➢ Training of departmental officials, upgradation of training institutes in terms of infrastructure and scientific backup involving universities, ICAR institutes, and the fishery college ➢ Awareness among fisherman and livestock owners ➢ Development of seed and fodder banks in flood-prone areas at the panchayat level	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Meghalaya	*Subsumes horticulture, livestock sectors* ➢ Assessment of soil quality and soil moisture content for better productivity through generation of climatic information ➢ Impact assessment of paddy cultivation and promotion of rainwater harvesting through construction of eco-friendly mini check dams ➢ Increasing the area under perennial fruit plantation crops and low volume high value crops to help cope with uncertain weather patterns ➢ Management of climate change impact on Horticulture ➢ Improving post-harvest management such as cold chain for perishable crops and winter cultivation practices ➢ Optimization of *jhum* cultivation through conservation of arable land, water utilization management, parallel cultivation of alternative crops ➢ Promotion of organic farming through usage of compost and vermi compost ➢ Breeding and production of varieties with stress tolerant and resistant attributes ➢ Assessment study and demonstration of Systematic Rice Intensification (SRI) cultivation ➢ Local mass production of such varieties for distribution to the farmers as substitutes to lesser tolerant varieties - setting up of 'Planting Material Production Centres' ➢ Capacity building of farmers in latest cropping techniques specially evolved to counter adverse effects of climate change ➢ Assessment of impact of climate change in livestock and reduction of impact of vector-borne diseases through vaccination of farm animals, breeding policy for climate-resilient sector	
Manipur	*Subsumes horticulture, livestock sectors* ➢ Integrated pest management, mixed farming ➢ Conservation of native crop varieties with scientific approach at the community level ➢ Market institutionalization at district level and inter-districts marketing network ➢ Paddy-cum-pisciculture in hilly regions ➢ Medicinal plants and farm production through community with qualification and scientific definition of the species ➢ Promotion of Indigenous Traditional Knowledge with skill development and human resource development ➢ Rain-fed agriculture with climate (flood, drought) and pest-resistant crop varieties through farmers capacity building and skill development ➢ Application of modern scientific approach in agriculture and horticulture with different crop varieties and organic farming/macro management mode of agriculture with top-down approach, i.e., from agronomist to farmer level ➢ Encouragement of indigenous fish culture and climate-resistant breed at fishermen level ➢ Encouragement of indigenous and climate-resistant livestock research and development, human resource development, more information, new technology including monitoring of agriculture and allied sectors	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Nagaland	*Subsumes livestock, fisheries sectors* Research and Development ➢ Enhancing Research and Coordination ➢ Introducing New Varieties ➢ Promotion of Indigenous Cultivars ➢ Crop Intensification ➢ Organic Farming ➢ Study on Status of Riverine Fishes and Identification of Resilient Varieties Scaling up no regret interventions ➢ Seed Production and Certification for Producing Drought Resistant, HY local varieties ➢ Protected Cultivation ➢ Land Resource Inventory ➢ Watershed Development Programmes ➢ Reclamation and Amendments of Soils ➢ Creation of Irrigation Potential ➢ Promotion of Drip Irrigation ➢ Preventive Health Measures for Livestock ➢ Genetic Improvement of Livestock ➢ Production of Quality Fish Seeds ➢ Reclamation of Derelict Water Bodies for Fisheries Development Enhancing Extension Services ➢ Institutional Strengthening ➢ Crop Diversification ➢ Awareness Creation ➢ Reduction in Weather-Related Risks ➢ Planning Agriculture According to Crop Zones ➢ Risk Management to Address Crop Failures ➢ *Jhum* Optimization ➢ Post-Harvest Technology and Value Addition ➢ Mineral Mixture Mapping ➢ Feed and Fodder ➢ Production of Quality Fish Seeds and Infrastructure Improvement	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Mizoram	*Subsumes horticulture, fisheries* ➢ Development of land (levelling, bundling, etc.) for Wetland Rice Cultivation (WRC) on available lands having 0-10% slope and improvement of existing Wetland Rice Cultivation (WRC) ➢ Developing data base on genotypes of local crop varieties (mainly rice varieties) and identification of suitable varieties for different agro-climatic zones ➢ Impact assessment of paddy cultivation through agricultural inputs such as crop varieties, Kharif crops and promotion of rainwater harvesting and construction of eco-friendly mini check dams for irrigation ➢ Assessment study and demonstration of Systematic Rice Intensification (SRI) cultivation and capacity building to train farmers in latest rice cropping techniques specially evolved to counter adverse effects of climate change ➢ Optimization of *jhum* cultivation through conservation of arable land, water utilization management, parallel cultivation of alternative crops and alternative *jhum* control to livelihood ➢ Construction of hill slope terraces for conservation of moisture and cultivation of foodgrain, vegetable, pulses and oilseed crops ➢ Increasing the area under perennial fruit plantation crops and low value high volume crops to help cope with uncertain weather patterns ➢ Management of climate change impact on horticulture and climate risk management studies ➢ Improving post-harvest management such as cold chain for perishable crops and winter cultivation practices ➢ Promotion of organic farming through usage of compost and vermicompost ➢ Adoption of Integrated Pest Management for improved crop yield, preparedness to tackle emerging scenarios of pests and capacity building for stakeholders ➢ Research study on livestock disease and establishment of early warning systems and capacity building of stakeholders ➢ Study on impact of climate change on the indigenous fauna of aquatic ecosystem and open waters ➢ Water storage and providing proper diversion channels to the existing ponds for drainage of catchment runoff during sudden heavy rains ➢ Providing extensive support and services to fishermen through establishment of district-level training centres ➢ Water bodies conservation for fishery sector and establishment of fishery units in reservoirs and riverine area	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Arunachal Pradesh	*Subsumes horticulture, livestock sectors* Identified vulnerability reduction measures in agriculture sector: ➢ Rehabilitation of Shifting Cultivation areas ➢ Improvement in current practice ➢ Use of high temperature tolerant varieties ➢ Rain Water Harvesting ➢ Crop diversification Identified vulnerability reduction measures in livestock sector: ➢ Water conservation structures ➢ Rain water harvesting ➢ Introduction of Fodder preservation techniques ➢ Installation of Feed block machines ➢ Disease surveillance and monitoring cell and continuous research on emergence of newer pathogens ➢ Research for development of low cost, eco-friendly housing design to mitigate heat stress ➢ Changes in nutritional regime to reduce enteric fermentation ➢ Massive fertility campaign Identified vulnerability reduction measures in horticulture sector: ➢ Identify and build on successful strategies of adaptation by the horticultural sector in the state to climate changes already experienced ➢ Develop Impact Assessments for all or major horticultural crops in the state ➢ Assess the vulnerability of all current production sites as well as potential sites or area expansion under various crops ➢ Long–term adaptation strategies by identifying the long-term opportunities and threats to horticultural sector and cropping systems ➢ Develop (in consultation with growers and their advisors) adaptation strategies, which are appropriate, practical, and economically sound ➢ Assess the economic benefits of agro-forestry in horticulture as well as the benefits it might bring for vulnerability reduction ➢ Identify additional export opportunities for Arunachal horticultural growers ➢ Identify alternative regions that may be suitable for production to take advantage of these market opportunities ➢ Develop horticulture specific forecasting tools that can be used for climate change and climate variability (especially temperature variability) related decision-making at a farm and regional scale ➢ Converting shifting cultivation affected areas into commercial horticulture production sites ➢ Wean away the shifting cultivators by assisting them in establishing commercial horticulture gardens as means of livelihood ➢ Identify and promote horticulture specific best management practices which minimize clearing of vegetation/forests for area expansion and also minimize GHG, and at the same time, promote the simultaneous goals of productivity, sustainability, adaptability and abatement ➢ Develop on-farm measures of GHG ➢ Assess the economic benefits of agro-forestry in horticulture as well as the benefits it might bring for vulnerability reduction ➢ Review and/or develop where necessary, best management practices for horticulture, which include vulnerability reduction components ➢ Assess the potential cost efficiencies of bio-energy and renewable energy sources for the horticultural sector Research and Development Priorities identified by the state include: ➢ Constant monitoring of climate change signals/climate variability and creating meteorological database/forecasting for decision support system ➢ Location specific development of vulnerability reduction technologies on various horticultural crops including emerging new pests and diseases attributed to climate change ➢ In situ/ex-situ conservation of germplasm of agricultural and horticultural importance/conservation of wild relative of agricultural and horticultural crops found in Arunachal Pradesh ➢ Investigation on use of existing wild germplasm for developing more climate change tolerant varieties ➢ Exclusive R&D on shifting cultivation in the state, its impact on climate change, documentation on loss of flora and fauna, etc. Dissemination of Climate Change Information has the following priorities: ➢ Massive awareness campaign on climate change vis-a-vis impact on horticulture ➢ Communicate climate change issues to growers, policy makers and all stakeholders ➢ Communicate scientifically-based information on observed climate trends, climate change projections and possible impacts	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
West Bengal	*Subsumes horticulture, fisheries, livestock* Agriculture: ➢ Appropriate crop diversification in various agro-climatic zones ➢ Introduction of new cultivars ➢ Encouraging indigenous cultivars ➢ Upscale Resource Conservation Technologies ➢ Effective soil nutrient management ➢ Promote organic ways ➢ Create seed banks ➢ Enhance livelihoods of small and marginal farmers ➢ Real time crop monitoring and weather forecasting ➢ Setting up agriculture BPOs ➢ Extend crop insurance to all small and marginal farmers Fisheries: ➢ Real time monitoring of Fish shoals ➢ Real time weather monitoring and forecasting ➢ Mapping vulnerable fisher folk settlements ➢ Forecasting and use of simulation modeling ➢ Mangrove plantation ➢ Promotion of canal fisheries ➢ Development of sewage-fed fisheries ➢ Protection and development of water bodies ➢ Providing life saving gears and equipment ➢ Promotion of solar light ➢ Block-level laboratory-cum-training centre for fishery extension officers ➢ Research Horticulture: ➢ Protection from heat in all zones below hill and terai zones ➢ Undertake research to help horticulture produce adapt to climate change ➢ Popularization of indigenous varieties ➢ Crop diversification ➢ Improve floriculture programmes ➢ Production of off-season vegetables ➢ Integrated Pest Management ➢ Water management system ➢ Reducing weather related risks Livestock: ➢ Encourage breeding of small ruminants for livelihood security ➢ Strengthen disease investigation system ➢ Preventive health measures ➢ Improved cattle sheds for alleviating heat stress in livestock ➢ Feed and fodder development ➢ Dairy development ➢ Capacity building of farmers ➢ Risk management	

IHR SAPCC	Key Action Areas	Examples of common elements and diver-gences
Tripura	➢ Rapid screening and strategy assessment of the state's agriculture policy ➢ Climate change impact studies on Coconut and Orange production ➢ Undertaking capacity building ➢ Risk management in agriculture and allied sectors o Disease forecasting o Trans-boundary disease problems o Yield Studies Meteorological Data Moisture Measurement Bench Marking Weather Based Insurance o Crop Insurance o DRR ➢ Breeding studies on major crops for tolerance/resistance (adaptive research- breeding and validation through multi-location testing) ➢ Establishing an effective institutional delivery mechanism to promote best practices on climate change o Identification of nodal farmers o Demonstration plot ➢ Utilization of bio-resources (organic wastes, plant wastes, leaf fall droppings, etc.) towards preparation of organic manure ➢ Developing livelihood–focused, people-centric integrated watershed development in rain-fed areas ➢ Development of water use-efficient micro irrigation methods and individual/community farm ponds ➢ Developing sustainable soil, water and crop management practices: (4,000 Ha drip irrigation and demonstration) ➢ Increasing cropping intensity in traditional conventional land (to achieve 300% cropping intensity) ➢ Improving monitoring and surveillance techniques including cropping cutting measures (electronic communication System, GPS and CB 40 Training Personnel) ➢ Research study on climate change impacts on the reproduction of Cattle, worm infestation, milk production and vector-borne diseases for domestic animals ➢ Adaptability good milch breed of cattle such as Sahiwal, Gir and Red Sindhi, Jursey and Holstein cross, rearing and biogas production with milk chilling plant ➢ Study on performance of broiler production at high temperatures ➢ Integrated watershed management for fodder and nutritional security ➢ Research study on supply of animal feedstock and feasibility of rubber seed cake as feedstock in drought seasons ➢ Adaptability of low-input technology like Kuroialer, Gramapriya and Kalinga Brown ➢ Capacity building and training of farmers ➢ Capacity building and welfare activities of fishing communities ➢ Impact assessment of climate change on fishery ➢ Study of impact of climate change on the indigenous fauna of aquatic ecosystem and open waters ➢ Mono crop plantation impacts on Fisheries ➢ Contingency crop planning o Land use planning in 40 Blocks of Tripura for sustainable agricultural development o Preparation of agro-climatic atlas (block-wise) o Assessment of seasonal soil moisture o Block-wise crop calendar o Farm Health Card ➢ Agro-meteorological data acquisition and management o Microclimatological Laboratory o Crop simulation model o Weather-based agro advisory at panchayat level o Setting up of new agro-met observatory at block level and centralized meteorological data assembling system ➢ Approach to increase cropping intensity with diversification options under variable climatic condition o Crop diversification with options of inter-crops o Collection and documentation of local crops and their adaptability o Development of suitable land use systems involving various cropping options in accordance with land topography o Research in cropping system in accordance with climatic variability ➢ Supply of plant nutrients in an eco-friendly way o Studies of microbial diversity and formulation of effective bio-fertilizer to increase the crop productivity under variable climatic scenario ➢ Establishment of Bio-control Unit to study the efficacy of various bio control agent for eco-friendly plant protection measures	

Water

Table 17: Comparison of Water sector chapters/sections in IHR SAPCCs

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Jammu & Kashmir	➢ Better understanding of water resources ➢ Reassessment of water scenario in the state with reference to climate change o Projections of climate change and its effects on the three sub-basins o Hydrological models for forecasting of stream flows o Digital elevation models with the flood flow analyses o Flood control and their effect on hydrology of the basin ➢ Study of future climate scenarios through modelling ➢ Hydrological response in the basin for the climate change meteorology projections using SWAT model ➢ Increasing food and water security through speedy implementation of irrigation schemes and modernization/renovation of existing schemes and development of groundwater for irrigation and drinking water; dealing with flood in the changed climate scenarios ➢ Drought management ➢ Adjusting to increasing erosion and sedimentation ➢ Disaster management ➢ Better operation of the Indus Treaty	➢ Commonly articulated elements include the need for a state water policy, acknowledgement of scientific gaps and the need to augment these as well as developing scientific modelling based projections of the impacts of climate change, emphasis on capacity building and awareness generation, need to adopt water use optimization mechanisms, need to incorporate DRR mechanisms into sector planning and programming, and augmented storage. ➢ Key action areas that were less common included focus on conservation of aquatic ecosystems and appropriate technology adoption. Also, West Bengal, which has distinctive geographical regions has included action areas specific to its hill districts that fall in the IHR.

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Uttarakhand	➢ Development of an appropriate policy framework, with explicit cognisance of climate concerns ➢ Review of network of hydrological and hydro-met observation stations; collection of all necessary data (including on surface and groundwater) on an on-going basis for proper assessment of impacts of climate change in the Himalayan region ➢ Conservation of naulas, dharas and other kinds of springs ➢ Developing inventories of wetlands ➢ Incentivizing water harvesting, water use efficiency or encouraging leakage control programmes, recovery, recycling and reuse, developing regulations/ frameworks for in-house water withdrawals of industries ➢ Revision of the water tariff based on the cost recovery principle, promotion of water-efficient fixtures ➢ Steps to foster integrated water resources development and management planning, and seeking convergence among various water resources programmes and organizations ➢ Augmentation of storages over the surface as well as under the ground ➢ Review of water resources projects ➢ Mapping of all drinking water sources and identification of scarcity zones ➢ Promotion of traditional system of water conservation, including expeditious implementation of programmes for repair, renovation and restoration of such systems ➢ Examination of options for adopting a landscape approach to water resources management from a sustainable ecosystems and biodiversity conservation standpoint ➢ Empowerment and involvement of Panchayati Raj institutions, urban water bodies and primary stakeholders in the management of water facilities ➢ Incorporation of DRR methods ➢ Capacity development, education and awareness at all levels as high-priority agendas ➢ Documenting sectoral responses, learning what worked and what did not, dialogue and sharing of data and information, etc. ➢ Emphasis on the gender dimensions of water use and management ➢ Exploration of roles for leveraging private sector strengths	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Himachal Pradesh	➢ The State's Water Policy is being revisited in consultation with various line departments ➢ Water storages to deal with expected increase in demand and for hydropower generation ➢ Need for efficiency in water utilization and public awareness ➢ Improvements in existing strategies, innovation of new techniques resting on a strong science and technology base are needed to eliminate pollution of surface and groundwater resources to restore pristine quality ➢ Improved knowledge is needed to assist water managers to understand the wide range of impacts the climate change will have on surface and groundwater resources and the demand for water ➢ Potential areas of action: ➢ Research to address key knowledge gaps, current and projected demographic changes, and socio-economic analysis of impacts about climate o High quality projections of climate variables relevant to demand and supply/allocations of water resources o Understanding of impacts of climate change on water resources and dependent ecosystems o Methods and approaches for integrating climate change related risks into water management o Identify vulnerable riverbed areas and apply appropriate planning policies, including ensuring the availability of land, where possible, for migration of ecosystems ➢ Work with water intensive industry to ensure that climate change impacts and risks are incorporated ➢ Assessing the implications of changes in extreme rainfall events on water infrastructure, settlements, and environments of significance ➢ Using biophysical and socio-economic scenarios and inundation modelling ➢ Management of surface water resources ➢ Regulation of water resources ➢ Conservation of wetlands	
Sikkim	➢ Artificial recharge to revive springs by harvesting rainwater ➢ Reviving dried up hill top lakes ➢ Increasing base flow of critical streams by rain water harvesting ➢ Exploring possibility of harnessing stream water for meeting household and irrigation needs ➢ Increasing water storage capacity by building household, community and village-level reservoirs ➢ Formation of WUAs ➢ Pricing and regulation ➢ Periodical census of all minor irrigation schemes after every four years ➢ Adoption of innovative techniques viz. drip and sprinkler irrigation ➢ Proposal for enforcement of Irrigation Water Tax	
Assam	NA	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Meghalaya	➢ Formulation of water use policy ➢ Expansion of hydrometry network ➢ River health monitoring and environmental flow study ➢ Restoration and creation of water bodies ➢ Preparation and implementation of water management plan ➢ Agricultural zoning and capacity building of farmers ➢ Micro-hydel projects ➢ Development of flood/drought forecasting models ➢ Establishment of River Basin Authority	
Manipur	➢ Reduction/minimization of loss of water supply and efficient demand side management including water budget auditing ➢ Enhancement of water sources, catchment, forests and improvement of river/stream basin health on priority basis with peoples participation ➢ Averting disasters due to heavy precipitation and increase in extreme events like flood, drought, etc. ➢ Policy, regulatory, delivery options, technologies, research and development and human resources development, survey and monitoring for adapting the impacts of higher or shortage annual rainfall ➢ Watershed management, water harvesting (including rain water) at community level ➢ Conservation of water resources (wetland, lakes, rivers, major water bodies) and encouragement of indigenous and community pond/lake through PPP models	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Nagaland	Broad Actions: ➢ Planning and implementing activities that fit into the scope of the National Missions (Water and Green India) ➢ Climate Change Coordination Committee for the water sector ➢ Adopting a state water policy ➢ Building capacity of all stakeholders Specific Actions: ➢ Storing excess water received through heavier precipitation and increase in extreme events ➢ Efficient demand side management ➢ Averting disasters due to heavy precipitation and increase in extreme events (extreme rainfall, floods and droughts) ➢ Adapting to the impacts of higher annual average temperatures	
Mizoram	➢ Climate change impact assessment of present status of water resources like river, wetland, streams and lakes ➢ Finalization of plan for conservation and preservation of water resources ➢ Formulation of state water policy ➢ Catchment and command area treatment through riverine afforestation ➢ Capacity building of Water Resources department/Mizoram PHED for integrated water resources management ➢ Expansion of hydromet network and establishment of micro weather stations for regular monitoring ➢ Community tank management ➢ Promoting zero energy water purification for domestic water supply ➢ Renovation and development of traditional water harvesting system with scientific intervention at district level ➢ Capacity building of communities on adaptation options required for integrated demand side as well as supply side strategies during climate stressed conditions ➢ Impact assessment study of climate change on aquatic ecosystems	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Arunachal Pradesh	➢ Sustainability schemes to augment and share water resources in order to enhance the service efficiencies in the sector ➢ Source protection, gully plugging, check dam, catchment area protection, contour trenching, impounding reservoirs and artificial recharge ➢ Protect and enhance drinking water sources by prevention of forest cover loss due to anthropogenic reasons such as *jhuming*, etc. ➢ Watershed protection by afforestation ➢ Conjunctive use of water ➢ Plantation to incentivize *Jhum* to reduce fallow period ➢ Afforestation and protection of forests ➢ Capacity development ➢ Optimum use of water ➢ To adopt non-water consuming eco-san toilets ➢ Re-use of water ➢ Water pricing ➢ Rationing ➢ Wise water use programme	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
West Bengal	Across the state: ➢ Scientific assessments for better understanding of impacts of CC ➢ Modernize irrigation system using drip, sprinklers systems ➢ Pricing and regulation ➢ Undertake periodical census of minor irrigation projects to check sustainability ➢ Variable Irrigation Water Tax on surface water use and groundwater use ➢ Extend compulsory rain water harvesting regulation in individual houses in all towns In hill districts: ➢ Undertaking rain water harvesting along hill slopes, especially in the recharge zones, to increase percolation of rain water ➢ Identification of natural aquifers in the region ➢ Development of reservoirs intercepting River Jaldakha, Manas, Sankosh and other rivulets for transfer of water from surplus basin to deficit basin in this region ➢ Construct check dams, wherever, feasible for the creation of water reservoirs for harnessing surface water ➢ Increase water storage capacity by building household, community and village-level reservoirs and repairing, renovating and restoring existing water bodies ➢ Detailed analysis of the Teesta Barrage Project needs to be carried out to understand future water flows and steps need to be taken to either augment water flow into the barrage or help excess water drain out without causing floods	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Tripura	➢ Creation of new minor storage/irrigation tanks- 400 ➢ Protection and conservation of large wetlands water bodies (like RudraSagar) ➢ Embankment raising in preventing high flood ➢ Development of GIS-supported database/status maps for all the existing water sources ➢ Information on status of runoff, water level, sedimentation during different seasons ➢ Extensive awareness generation programmes about water resource management ➢ River conservation measures and river health monitoring- sewerage Management ➢ Establish Basin Authority for river conservation and management ➢ Anthropogenic activities vs. climate change and their impact on landslide, soil erosion and decaying river courses of major rivers and other major water bodies of Tripura ➢ Formation of ecological monitoring and research cell in WR to coordinate with other research organizations for feedback ➢ Installation of STW/DTW for irrigation ➢ Groundwater recharge-position/scenario for the last 30 years in Tripura and groundwater modelling ➢ Impact of recent climatic changes on groundwater condition in Tripura: Monitoring and geo- electrical mapping for sustainable agriculture development ➢ Setting up iron removal plants to remove excessive presence of iron in water ➢ Setting up surface water treatment plants for supplying quality water ➢ Proper management of rural solid wastes and liquid wastes ➢ Assessment of arsenic contaminated water areas/bodies/groundwater sources ➢ Installation of SBTW/DTW/Spot Sources (like OHP, Mark-II, Ring well etc.) for drinking water ➢ Extensive awareness generation programmes about safe use of drinking water and sanitation ➢ Setting up of block-level water testing laboratory for drinking water parameters ➢ Setting up of a Scientific Research Laboratory for drinking water and waste water parameters	

Energy

Table 18: Comparison of Energy sector chapters/sections in IHR SAPCCs

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Jammu & Kashmir	➢ Setting up of an Energy Efficiency Forum ➢ Development of energy-related building codes, labelling and rating systems in collaboration with the Bureau of Energy Efficiency (BEE) ➢ Industrial Energy Efficiency Auditing and Benchmarking o Creating state-level product verification systems to ensure compliance systems (of labelling) o Harmonization of relevant test procedures and performance metrics for a number of agreed upon products ➢ Trade and investment promotion for energy-efficient technologies ➢ Developing and introducing measures for reducing energy consumption and greenhouse gas emissions o Buildings o Street Lighting o Urban water supply o Waste water o Municipal waste o Transport sector o Industrial sector ➢ Delivery options and demand side management ➢ Promotion of and systems for energy-efficient consumer products ➢ Solar Power Policy	➢ Common action areas include need for policy development for the sector, demand side management and efficiency improvements, technical improvements in transmission and distribution infrastructure and other non-technical measures to reduce technical and commercial losses, enhanced adoption of renewable energy and augmenting generation in general, capacity building, and the need for research and scientific studies to better understand the impacts of climate change on the sector. ➢ Less common action areas articulated were biomass substitution to reduce use of biomass fuels for cooking and heating and to reduce pressure on forests, promotion of cleaner fuels such as CNG and fuel conservation in transport.

IHR SAP-CC	Key Action Areas	Examples of common elements and divergences
Uttarakhand	➢ Use state-of–the-art technologies for improving scientific knowledge regarding direct and indirect parameters of environmental impact ➢ Key scientific knowledge base improvements to be taken up include collection of hydromet data on major rivers of Uttarakhand and their associated tributaries to assess impacts on hydropower sub-sector; similar initiatives will also be planned and undertaken by other sector agencies ➢ Identify and carry out a number of sector studies on climate change and potential impacts on the energy sector ➢ Each energy agency to be tasked with evolving specific objectives for Five-Year Plans ➢ At the level of the state government, several agencies to enlarge and redefine their goals and areas of operation to meet challenges posed by climate change o State Electricity Regulatory Commissions to develop regulatory measures that ensure higher energy efficiency, greater use of renewable energy, and other low-carbon activities that will ensure energy security, reduced local pollution and increased access to energy in areas where distributed and decentralized forms of energy production will be economically superior to conventional methods o The state government may also employ fiscal instruments to promote appropriate options and measures o Efforts will be undertaken to create capacity for regulatory measures, particularly for ensuring energy efficiency in new buildings as well as a programme of retrofits ➢ A number of multi-purpose projects are being planned to meet future needs of the population for not only Uttarakhand but also adjoining states such as Haryana, Uttar Pradesh, Delhi and Rajasthan ➢ To meet the power deficit in the state, gas-based power stations are being planned by Uttarakhand Jal Vidyut Nigam in partnership with the Gas Authority of India Limited, which will contribute to green energy ➢ Augment current thrust on improvements in transmission systems to reduce losses and minimize impact on the environment ➢ Augment efforts for promoting the use of solar power, especially in offices and for lighting in open areas; give significant additional thrust to promoting/fostering solar energy usage, setting up of new solar energy projects, and expansion of existing initiatives ➢ The following DSM augmentation measures will be immediately emphasized (a) promoting the use of energy-efficient pumps and motors in the state; (b) promoting energy-efficient lighting, including compact fluorescent lamps (CFLs) and light emitting diodes (LEDs); and (c) investing in building consumer awareness about energy-efficient equipment and energy conservation measures ➢ Enhance ongoing efforts to sensitize end users and communities in general. Additional emphasis will be placed on efforts in this direction. Building public awareness will be vital in supporting implementation of the SAPCC. This will be achieved through state portals, media engagement, civil society involvement, curricula reform, and recognition/awards, and detailed plans for these will be developed by state energy agencies ➢ Analyse and incorporate policies and actions that are in synch with the relevant national missions under NAPCC such as the Solar Mission and the Mission for Enhanced Energy Efficiency, as well as to promote elements such as the 'green building concept, in line with the National Mission for Sustainable Habitats ➢ Energy efficiency improvements and adoption of improved technologies at all levels to be proactively promoted ➢ Setting up mini/micro hydro-projects, upgrading traditional watermills, installation of off-grid/grid-based solar power projects under the Jawaharlal Nehru National Solar Mission and installation of waste-to-energy, biogas and biomass projects will also be given additional emphasis ➢ Energy sector agencies to examine the option of setting up a joint climate change cell ➢ Periodical capacity building and training of staff/personnel ➢ Develop a separate equity focused strategy to address rural energy security including substitution efforts for reducing fuel wood consumption ➢ Develop rigorous monitoring protocols for implementation of initiatives under the SAPCC	
Himachal Pradesh	NA – unreadable pages available in PDF	

IHR SAPCC	Key Action Areas	Examples of common elements and divergences
Sikkim	➢ Ensure 100 percent energy access for rural habitations ➢ Improved efficiency of energy use in transport and introduction of bio-fuel mix in fossil fuel, and increased use of compressed natural gas (CNG) ➢ Greater emphasis for promoting solar water heaters, liquefied petroleum gas (LPG) and ensuring access to alternate and cheap forms of energy and fuel-efficient devices will help in substantially reducing pressure on these forests ➢ Biomass substitution - promoting use of alternative sources of energy for heating and cooking purposes ➢ Developing and deploying renewable energy and energy-efficient technologies to increase penetration ➢ Initiation of state renewable energy mission ➢ Energy-efficient street lighting ➢ Explore waste to energy solutions ➢ Pilot energy-efficient buildings; make this mandatory for all government buildings ➢ Energy generation through Pico/Micro hydels ➢ Introducing hotel and home-stay licensing regulations with a phase in period to comply with energy efficiency measures ➢ Remote location monasteries and tourism facilities to be connected by renewables	
Assam	Research and technology development: ➢ Sector specific studies to determine the scale of interventions needed to promote efficiency in industrial processes ➢ Detailed technical assessments to assess the potential of renewable energy applications and identify regions and technologies required ➢ Assessment of demand side management measures to check the increasing power demand and options to reduce supply side losses ➢ Energy need/demand assessment in all sectors including agriculture, industry, commercial sector, service and residential sector up to the next 50 years Policy measures: ➢ Adoption of standards for industrial processes and incentivizing increased uptake of these standards by launching a programme for mandatory energy audits in all commercial and industrial facilities ➢ Incentives and subsidies for uptake of renewable technologies such as solar thermal technology for industrial and commercial heating, water heating in hostels, hotels etc.; solar home lightening systems in rural areas to replace kerosene lamps; solar street lightning; small, micro and mini hydel power plants ➢ Regulatory mechanisms to reduce both commercial and technical T&D losses Institutions and governance ➢ Exploring international mechanisms such as CDM, and national mechanisms such as perform, achieve and trade (PAT) to facilitate policy implementation ➢ Weighing the option of smart industrial clusters ➢ Identification of responsibility canters and enabling community-level engagements for renewables such as biomass and biogas Capacity building ➢ Training of skilled and un-skilled manpower including energy auditors, technicians, etc. to implement the programmes and policies ➢ Awareness generation for industries and local bodies on the appropriate renewable energy applications and energy-efficient processes	

IHR SAP-CC	Key Action Areas	Examples of common elements and diver-gences
Meghalaya	➢ Undertaking hydrology study of existing hydro power sources in light of observed and projected impact of climate change and framing adaptation measures ➢ Functional reorganization and institutional development of the State Energy Department ➢ Establishment of evacuation corridor and strengthening of transmission and distribution network ➢ Demarcation of hydro-power potential in the state with site specific capacity mapping ➢ Life cycle analysis of existing hydro power plants and implementation of renovation and modernization measures ➢ Reduction of technical and commercial losses ➢ Facilitating overall village electrification ➢ Promoting energy-efficient practices in the state ➢ Creating state energy conservation fund ➢ Maximising harnessing of renewable energy for the purpose of power generation ➢ *Maximising and judicious utilisation of renewable energy resources for household energy requirement*	
Manipur	➢ Promotion of grid interactive power generation option using renewable energy technology ➢ Promotion of off-grid intervention of solar energy technology ➢ Promoting small and medium hydro power projects ➢ Drafting of the state energy policy ➢ Reduction of technical and commercial losses ➢ Facilitating development and propagation of non-conventional renewable energy usage ➢ Promoting energy-efficient practices in the state ➢ Promoting fuel conservation in transport sector ➢ Promoting demand side energy efficiency and management measures ➢ Capacity building of the energy sector towards promotion of EC measures	
Nagaland	➢ Vision in the sector is to ensure energy access to all ➢ Current programmes that needs scaling up are: o Technical and commercial loss reduction programmes o Energy conservation and efficiency programmes o Implementation of "sustainable habitat" programmes and putting in place legal framework for "green buildings" o Implementation of the Solar Mission o Coordinated effort with the Green India Mission to reduce the use of traditional biomass for cooking and heating o Strengthen Centre of Excellence on Renewable Energy studies, Dimapur ➢ New interventions that are envisaged include: o To set up "decentralized renewable energy solutions," primarily through a combination of small hydro (pico or mini or micro), solar, small wind generators and biogas plants to ensure 24x7 clean energy supply at the village level o Implement renewable energy projects addressing livelihood concerns, strengthening value chains of agriculture and other products o Promoting energy efficiency and sustainable use of electricity at all levels and categories of usage o Enhancing domestic power generation and increasing resilience of the energy sector o Limited unbundling	

IHR SAP-CC	Key Action Areas	Examples of common elements and diver-gences
Mizoram	➢ Increase renewable energy generation share in the state ➢ Promoting micro hydro power generation ➢ Maximizing use of solar energy resources by implementation of 1 MWp grid interactive Solar PV ➢ Promoting off-grid renewable energy applications ➢ Incorporation of 100 systems of both 100 LPD and 200 LPD solar water heating systems in the state ➢ Pilot project installation of 100 numbers of 250 Wp solar PV power pack systems ➢ Implementation of 100 KWp standalone solar photovoltaic power plants for village electrification and to substitute grid power usage ➢ Reduce anticipated energy and peak demand in the business-as-usual scenario ➢ Penetration of energy-efficient devices in domestic sector facilitated by financial, supply chain and market incentives ➢ Deployment of energy-efficient lighting for public lighting ➢ Implementation of pilot energy-efficient projects and investment grade energy audits ➢ Capacity building of the state designated agency, energy departments ➢ Awareness creation of users and other citizens on energy-efficient measures and renewable energy application	
Arunachal Pradesh	Energy Efficiency Mission: ➢ Replacement of existing transformers with installation of amorphous core transformers or energy-efficient transformers ➢ Upgradation/replacement of existing size of conductor to reduce losses and to replace the time barred conductors ➢ Conversion of existing distribution system on LT line to high Voltage distribution system to reduce losses ➢ Replacement of existing defective meters; provision meters to un-metered consumers ➢ Providing low-cost light emitting diode base lamps for space lighting Solar Mission: ➢ Detailed project report (DPR) submitted for 100KWp Solar Power Plant at East Kameng district ➢ DPR submitted for 100KWp Solar Power Plant at Changlang district Policy measures ➢ Need to set up State Electricity Regulatory Commission (SERC) ➢ Need for power policy to diffuse the use of renewable energy in the state ➢ Need to implement 0.25% Renewable Purchase Obligation (RPO) ➢ To incorporate mandatory use of solar water heaters initially in government buildings in the state's building bye-laws ➢ The state renewable energy agency needs to be upgraded to a fully-fledged renewable energy department to look after the renewable energy sector headed by CEO of IAS/Chief Engineer level ➢ Priority should be given to National Solar Mission; state solar policy to be framed ➢ Need for more emphasis on policy approach to the CDM ➢ Marginal cess/surcharge from electricity consumers for promotion of use of renewables and energy conservation	

IHR SAP-CC	Key Action Areas	Examples of common elements and divergences
West Bengal	➢ Plan for reduced CO_2 emissions compared to business-as-usual scenario o Increase grid power generation from renewable o Solar PV for large-scale power (as it works in low and diffused solar radiation cases) in districts (e.g. Purulia, Bankura) where wasteland is available (or abandoned mine areas) o Replace use of grid power for certain end-uses through low temperature solar thermal – e.g. water heating ➢ Reduce anticipated energy and peak demand in BAU scenario o Demand-side energy efficiency measures in identified consumer categories through (a) efficient-device penetration facilitated by financial, supply chain and market incentives; (b) adequate financial incentives for lowering specific consumption and (c) state-led adoption for enabling critical volumes of devices and technologies in local market and breaking current cost barriers o Supply-side energy efficiency measures through (a) enabling lower system losses (technical and commercial) and (b) enabling improved efficiencies in energy production ➢ Risk mitigation of anticipated impacts from climate change through o Improved risk assessment of supply infrastructure (including lifeline infrastructure) for likely scenarios of climate change o Investment and implementation of infrastructure strengthening initiatives to cope with extreme events	

IHR SAP-CC	Key Action Areas	Examples of common elements and diver-gences
Tripura	➢ Conversion of open cycle gas-based thermal power plants to combined cycle systems ➢ T&D loss reduction ➢ Development of policy for mandatory use of efficient light particularly for commercial organizations in the state ➢ Conversion of conventional street lights to solar LED/CFL street lights ➢ Encourage use of solar energy in industries ➢ Policy development for mandatory energy audit in government buildings ➢ Research study to assess the potential of energy conservation across all sectors and designated con-sumers and designing of resource estimation and institutional structure required to address the energy efficiency issues ➢ Awareness and implementation for use of CFL and replacing incandescent lamps under Bachat Lamp Yojana, and Umbrella programme of BEE ➢ Development of policy to mandate ECBC adoption in the state ➢ Formulation of DSM project for TSECL ➢ Promotion of grid interactive power generation from solar and other renewable energy sources through declaration of State Energy Policy o Formulation and declaration of state energy policy for power generation through renewable energy sources o Declaration of Tariff Policy by Tripura Electricity Regulatory Commission for solar and other renewable power purchase o Facilitating private sector participation in solar power generation under JNNSM and/or other schemes of the Government of India through selection of private investors and other support activities through single window clearance process ➢ Promotion and facilitation of off-grid or decentralized renewable energy generation for electrification, cooking and other thermal energy requirement o Facilitating deployment of standalone off-grid solar power plants within 100 kW for fulfilling the power demand in dispersed locations under National Solar Mission with following target - a) Up to 2016-17 is 9 MW o Facilitating deployment of 500 No. Biogas plant (using cattle waste, household waste as well as water hyacinth) annually in 12th Plan period and setting up of bottling unit at community level to use the biogas in agro-based/rural industries across the state under the Government of India programme ➢ Promotion and facilitation of setting up of Solar Water Heater (SWH) systems in all government establishments under National Solar Mission. Declaration of targeted actions by the state government through policy mechanism. Project implementation in: o Public Health Centres - 86 o Hospitals - 22 o Govt. Higher Secondary Schools - 248 o University, College and Engineering Colleges – 26 ➢ Harnessing renewable energy potential scenario of the state for power generation through: o Assessment of biomass potential and availability for energy generation in the state and demarca-tion of biomass potential sites in the map o Assessment of solar irradiation, temperature, wind speed at district level across the state for solar mapping ➢ The state govt by amendment of building bye- laws suitable to state conditions will promote and man-date use of solar energy-based water heating and/or lighting in all commercial buildings and in private houses costs more than Rs. 20 lakhs or as may be decided by the competent authority o Amendment of building bye-laws considering state demographic profile o Enforcement of incentives/rebate on property tax for use of solar water heaters in buildings ➢ Strengthening of technical capability of existing renewable energy technology service providers and develop new service providers as per the international standard by introducing training course in all ITI's in the state	

Health

Table 19: Comparison of Health sector chapters/sections in IHR SAPCCs

IHR SAPCC	Key Thrust Areas	Examples of common elements and divergences
Jammu & Kashmir	Addressing the determinants of health Strengthening the surveillance with an integrated approach for management Closing the resource gaps Strengthening good governance of health systems Developing pro-poor health services ➢ Empowerment of communities and users of health services ➢ Control of major communicable diseases ➢ Improvement of the reproductive health ➢ Strengthening disaster preparedness for extreme events ➢ Monitoring air pollution and related respiratory tract diseases ➢ Enhancing capacity of the institutions to address climate change-related human health challenges ➢ Addressing knowledge gaps and investing in knowledge gaps ➢ Reducing diarrhoeal disease: food safety, drinking water, and sanitation ➢ Reducing the prevalence of cardiovascular and chronic respiratory diseases: major source of heat wave vulnerability ➢ Improving the control of vector species ➢ Securing supplies of freshwater to avert future shortage (health risks) and conflict ➢ Empowering women and children for improved health and nutrition ➢ Ensure that the human health risks of climate variability and change are addressed in emergency preparedness response plans ➢ Use a systems-based approach to develop adaptation options that increase resilience to the full range of drivers that affect health ➢ Effectively and efficiently address cross-border hazards (for example, vector surveillance and control) ➢ Develop and install early warning systems for flash floods and glacier lake floods (including the collection, analysis, and exchange of data) ➢ Improve disaster management and community preparedness and adaptation Capacity development and enhancement ➢ Strengthen and integrate national/state information management on climatologically, geo-hydrological, land-use changes, and disease statistics ➢ Facilitate understanding of the scientific evidence and interdependencies among climate variability and change, human livelihood, disasters, and disease vulnerability in J&K regions ➢ Build awareness amongst political and community leaders, including local and religious leaders of the projected health impacts of climate variability and change on populations in J&K ➢ Develop learning resource materials for local communities (particularly women and children), health and other relevant professionals, and the media on the potential health impacts of climate variability and change and on appropriate measures to address climate-sensitive health determinants and outcomes ➢ Develop materials for health education, health promotion, and behavioural change communication ➢ Develop school and university curriculum ➢ Ensure that school and media programmes are of sufficient length and frequency so that critical information is communicated ➢ Ensure that messages are communicated effectively, including translation into local languages ➢ Development of programmes on climate change and health such as exchange programmes and short courses ➢ Methods to determine the environmental burden of disease ➢ Methods for cost-effective analysis of environmental health interventions specific to climate change and health	• Common themes that recur in action areas included focus on research, data gathering and surveillance mechanisms and infrastructure/facilities, control and monitoring of vector and water borne diseases, emphasis on service delivery enhancements, emphasis on capacity development, as well as on preparedness and coordination between health and other authorities such as disaster management. • Less common themes were focus on assessing and improving resilience of health infrastructure, gender dimensions of health, early warning systems for heat/cold waves, need for health policies with reference to CC and impacts, emphasis on improving access (to health case facilities) logistics in remote areas, and focus on facilities for displaced migrants during extreme weather events.

IHR SAPCC	Key Thrust Areas	Examples of common elements and divergences
Uttara-khand	➢ Build and improve scientific knowledge and evidence base and understanding of climate change and its impacts on human health ➢ Collect, compile and analyze relevant data and information in terms of the perceptions of affected people and communities ➢ Review the State Health Policy to incorporate climate change concerns ➢ Undertake augmented measures to manage vector-borne and waterborne diseases ➢ Develop better approaches to deal with heat wave conditions and protocols for dealing with the physical and psychological impacts after extreme weather events ➢ Develop strategies for dealing with malnutrition and food security issues arising due to increased temperatures and other extreme events ➢ Undertake reviews of the state's health infrastructure and potential climate change-related vulnerabilities and risks (and where such infrastructure is found to be at high risk, retrofitting to make these more climate resilient) ➢ Make it mandatory for construction of green buildings for all future government hospitals and offices and examining options for retrofitting existing buildings to 'green' these ➢ Undertake a range of capacity building measures including: o Creating awareness among people about health hazards from climatic change o Information, education and communication efforts o Behavioural change communication interventions in relation to the impacts of climate change o Training and sensitization sessions for department personnel ➢ Explore the scope for and piloting a tele-medicine services network in the light of the fact that the state has a hilly and inhospitable terrain and there is a serious scarcity of medical experts in the state ➢ Developing and strengthening disaster management teams in every district hospital specifically to respond to the effects of extreme climate changes and to increase co-ordination between the health sector agencies in the state and the disaster management department ➢ Mount an extensive health surveillance and analysis exercise integrated with monitoring of the climate and other environmental conditions that facilitate the outbreak of diseases ➢ Initiate dialogues with counterpart departments in other states of the region to exchange information, experiences and best practices, as well as to examine the possibility of inter-state exchanges and capacity building initiatives ➢ Develop a gender perspective and methods, including gender-disaggregated data, etc. ➢ Strengthen the already significant role played by the private sector in the health sector of the state by leveraging their strengths in responding to adverse impacts of CC on health	
Himachal Pradesh	➢ Develop and implement a State Action Plan on Climate Change and Health that includes: o Research on climate change impacts on physical and mental health and identify key vulnerabilities o Identifying the capacity of the public health system and hospital systems to plan for and respond to these vulnerabilities including links to emergency services and health disaster management policies o Incorporating the potential for climate change impacts on health into community and public health education programmes ➢ Develop and implement heat/cold wave warning and response systems ➢ To carry out research activities with a focus on research on climate change and health ➢ To assess and develop strategies to address the impact of climate change on water-borne diseases	
Sikkim	NA	

IHR SAPCC	Key Thrust Areas	Examples of common elements and divergences
Assam	Research and technology development: ➢ Assess vulnerability hotspots (spatially and temporally) with respect to changes in the climate to identify regions and populations at risk of climate-sensitive diseases in the state ➢ Mapping changes in vector ecology relative to a changing climate ➢ Conduct studies to assess links between climate change and malnutrition through changes in nutritional content of crops ➢ Use remote sensing techniques to assess linkages between climatic variables, vegetation cover and malaria incidence ➢ Procure and customize health impact models for climate and health impact assessments in the state ➢ Conduct predictive modelling using high resolution meteorological data (observed and projections) for the region and establish the links with epidemiological parameters ➢ Develop and maintain a digital health database at fine spatial and temporal scales particularly for mortality and morbidity related to climate sensitive vector-borne diseases, water-borne diseases, and those related to higher temperatures and rainfall extremes Policy measures: ➢ Budget support for public health emergency preparedness in case of climatic extremes ➢ Strengthen anticipatory efforts such as vaccination, distribution of mosquito repellants, bed-nets and antibiotics in areas prone to malaria Institutions and governance: ➢ Bringing greater convergence amongst programmes in the health and non-health sectors to buttress primary healthcare ➢ Improve the quality of data Capacity Building: ➢ Upgradation of rural healthcare infrastructure to deal with emergencies during climatic extremes, especially in remote districts/areas (e.g. chars) ➢ Generation of awareness among the rural masses about the water quality issues and the problems related to water-borne diseases	
Meghalaya	NA	
Manipur	➢ Outbreak investigation and response (early warning signals of impending outbreaks of epidemic prone diseases and help initiate an effective response in timely manner) ➢ Integrated Diseases Surveillance Programme (IDSP), nutrient survey for base line nutritional status and subsequent impact and its mitigation ➢ Control of malaria and other climate variability related vector-borne diseases including sentinel surveillance of Dengue, Japanese Encephalitis, Chicken Guinea, Scrub Typhus, Rabies, host agents, water-borne diseases, and air-borne diseases ➢ Diarrhoea Diseases Control Programme ➢ Setting up of state-level high tech Entomological Research Laboratory, operational research on geographical areas based on epidemiological data, extent of vulnerability to adverse impacts of climate change, high resolution health impact model, etc. ➢ Develop climate-friendly State Health Policy	
Nagaland	➢ Addressing Enhanced Disease Burden o Enhancing the scope of existing programmes o Enhancing infrastructure support ➢ Managing emergence of new diseases and spread to new areas o Improved surveillance and monitoring o Development of an Integrated Early Warning System o Establishment of an Investigative Research Centre with Bio Safety III laboratory ➢ Ameliorating impacts of extreme events – Disaster Risk Reduction Plan ➢ Capacity building and public education	

IHR SAPCC	Key Thrust Areas	Examples of common elements and divergences
Mizoram	➢ Identify extrinsic and intrinsic drivers of malaria and identifying immunity intervention measures towards control of incidence of malaria ➢ Assessment of impact of heat stress on human health and framing adaptation strategy ➢ Identification, documentation and awareness creation on temperature-related morbidity ➢ Evidence-based assessment of biophysical determinants of malaria and development of framework for adaptation measures for malaria control ➢ Carrying out adaptation study ➢ Research initiatives to identify change in pattern of diseases by regions due to climate change/weather variation ➢ Study and documentation of diseases caused by water (water-borne) and development of institutional mechanism to reduce the incidence/outbreaks of such diseases along with awareness generation ➢ Development of institutional framework and infrastructural facilities for early detection of vector-borne diseases, including managing outbreaks ➢ Establishment of pathological laboratory with state-of-art technology for diseases identification ➢ Public health system infrastructure development for extreme climate risk management and managing outbreaks of major diseases ➢ Capacity building and training for health workers for sensitization of climate variation and health impacts ➢ Research study on malnutrition of vulnerable group due to food security caused mainly due to climatic variation	
Arunachal Pradesh	➢ Ecological study on air pollutants and pollen (as triggers of Asthma and respiratory diseases) and how they are affected by CC ➢ Studies on response of disease vectors to climate changes ➢ Enhanced provision of primary, secondary and tertiary healthcare facilities and implementation of public health measures, including vector control, sanitation and clean drinking water supply ➢ Providing high-resolution weather and climate data to study the regional pattern of diseases ➢ Development of a high resolution health impact models at the state level ➢ GIS mapping of access routes to health facilities ➢ Prioritization of geographic areas based on epidemiological data and the extent of vulnerability to adverse impacts of CC ➢ Enhanced public health care services ➢ Assessment of increased burden of diseases due to climate change ➢ Controlling vector-borne diseases – enhance the scope of NVBDCP	
West Bengal	Climate change concerns already included as part of the State Health Policy. Strategies to strengthen the health policy relating to climate include: ➢ Strengthening the surveillance with an integrated approach for management of o Vector-borne diseases (in different agro-meteorological zones) o Water-borne diseases (coastal and inland) ➢ Dealing with population displacements during extreme events ➢ Strengthening surveillance and management of malnutrition and addressing food security issues along with the Social Welfare Department ➢ Strengthening disaster preparedness for cyclones, floods and droughts including the management of psychological impacts ➢ Monitoring air pollution and related respiratory tract diseases ➢ Initiating research to study the interplay of climate change and its impact on health ➢ Enhancing capacity of the institutions to address climate change related human health challenges ➢ Addressing knowledge gaps	

IHR SAPCC	Key Thrust Areas	Examples of common elements and divergences
Tripura	Formulating adaptation strategies to reduce the impact of climate change issues affecting human health ➢ Upgradation of state health policy through incorporation of health impacts due to climate change ➢ Research initiatives for changed patterns of diseases by region and by climate parameters Health impacts due to drinking water contamination and temperature variation ➢ Identification of vector-borne diseases like malaria, kala-azar, dengue, filarial, encephalitis, etc. ➢ Establishment/upgradation of pathological laboratories for disease identification caused due to climate variations Human health infrastructure development and capacity building for climate change adaptation ➢ Capacity building and training for mental and physical health treatment during and after emergency preparedness during extreme climate events and capacity building and training for health workers for sensitization of climate variation and health impacts: 1. State Technicians (2 batches of 20 each); 2. Health Workers (15 Batches of 40 each); 3. ASHA (100 Batches of 40 each) ➢ Public health infrastructure development (support and logistics for extreme climate risks) medicine, vaccines (Meningococcal Meninzitis), lab consumerable ➢ Mobility support 1. One-time expenditure for upgradation of Agartala Medical College Lab and South Tripura District Lab); 2. IEC materials Assessment of health impacts due to malnutrition- research study on malnutrition of vulnerable groups due to food insecurity caused by climatic variations	

LINKAGES IN IHR SAPCCS WITH THE NATIONAL MISSIONS

This section examines the linkages in SAPCCs to the eight National Missions under NAPCC. Since this report compares IHR SAPCCs, one of the National Missions – the NMSHE, which is the only Mission specific to IHR is chosen for comparison of details of mentions and articulation across SAPCCs.

Comparing the Linkages

Table 20 below summarizes articulation of linkages in IHR SAPCCs to the eight National Missions (Jawaharlal Nehru National Solar Mission (JNNSM), National Mission on Sustainable Habitat (NMSH), National Mission for a Green India (NMGI), National Mission for Sustaining the Himalayan Ecosystem (NMSHE), National Mission on Enhanced Energy Efficiency (NMEEE), National Water Mission (NWM), National Mission for Sustainable Agriculture (NMSA), and the National Mission on Strategic Knowledge on Climate Change (NMSKCC)) to contextualise subsequent analyses of the linkages to SAPCCs.

Articulation of linkages in IHR SAPCCs to the National Missions are classified into three categories: *Mention* – indicating that SAPCC had mentioned the National Mission at least once; *Explicit Articulation* – indicating that SAPCC had specifically articulated a link to a National Mission under its action agenda for the corresponding sector; and *Implicit Articulation* – meaning that SAPCC had articulated action agendas that matched the imperatives of a corresponding National Mission, but had not *specifically* indicated this.

Photo © Simon Allen/IHCAP

Sustainability of the Himalayan ecosystem is crucial for the livelihood of about 1.3 billion people in Asia.

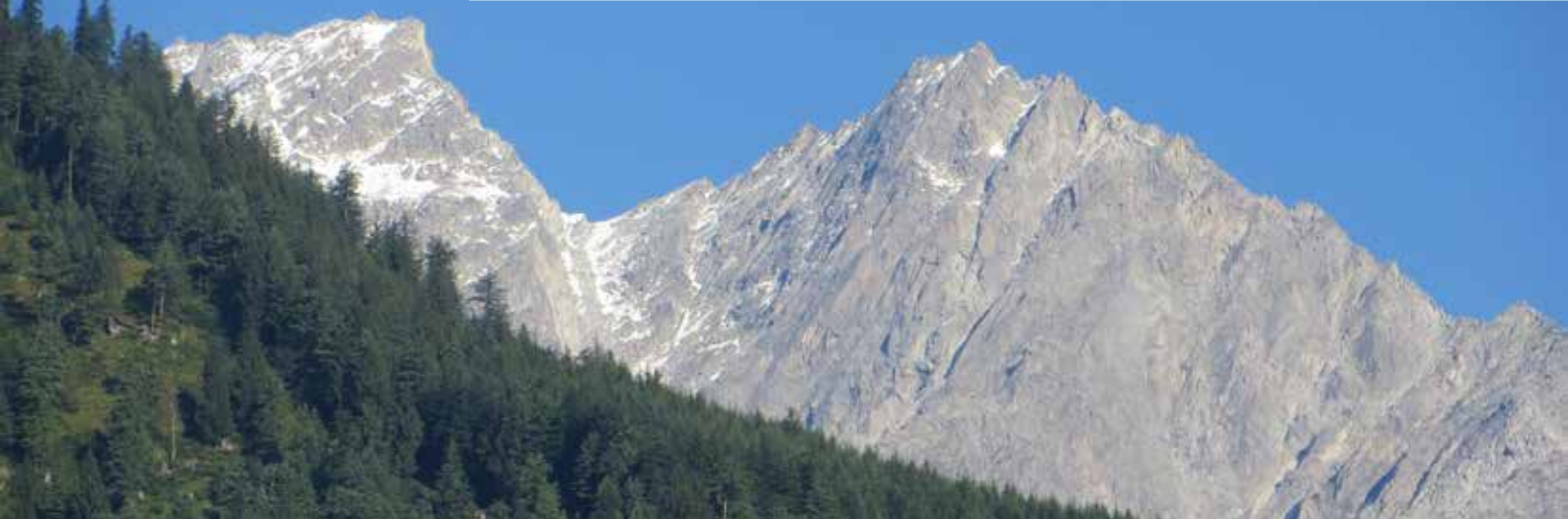


Table 20: Articulation of Linkages in IHR SAPCCs to the National Missions

National Mission	J&K	UK	HP	Skm	Asm	Meg	Man	Nag	Miz	ArP	WB	Tri
JNNSM	●	●	●	◣	◣	●	●	●	●	●	●	●
NMSH	●	●	●	◣	◣	●	●	◣	●	●		●
NMGI	●	●	●	◣	◣	●	●	●	●	●	●	●
NMSHE	●	●	●	◣	◣	●	●	◣	◣	◣	◣	●
NMEEE	●	●	●	◣	◣	●	●	●	◣	●	●	●
NWM	●	●	●	◣	◣	●	●	●	●	●	◣	●
NMSA	◣	◣	●	◣	◣	●	●	◣	●	●	◣	●
NMSKCC	◣	◣	●	◣	◣	●	●	◣	◣	●	◣	●

Key: Explicit articulation = ●

Implicit articulation = ◣

Examination of linkages in IHR SAPCCs to the National Missions under NAPCC yielded interesting results. While All IHR SAPPCs *mentioned* all the National Missions, there was wide variation in terms of articulation of linkages to the Missions, and many linkages were more implicit than explicit.

The table shows that JNNSM and NMGI had the most number of explicit articulations (10) followed by NMEEE and NWM (9). This was followed by NMSHE and NMSA with six IHR SAPCCs articulating explicit linkages to both – the second lowest numbers, whereas NMSKCC had the least number of explicit articulations. The picture for implicit articulations is almost the exact opposite – with NMSKCC with the highest number followed by NMSHE and NMSA, and with JNNSM having the least number of implicit articulations. Only one National Mission – NMSH had no articulation in one case (West Bengal, where sustainable habitat was not a focus sector).

Comparing NMSHE Linkages across SAPCCs

An integral part of NAPCC and the only Mission with a specific geographical focus – the IHR, NMSHE aims to a) understand scientifically the complex processes affecting this ecosystem, b) evolve suitable management and policy measures for sustaining and safeguarding the Himalayan ecosystem including Himalayan glaciers, and c) work with the states in the Indian Himalayan Region in the implementation of scientifically-derived policy measures. Recognizing the scientific and technological inputs required for sustaining the fragile Himalayan ecosystem, DST

has been charged with the responsibility of implementing this mission.

The mission aims to evolve management measures for sustaining and safeguarding the Himalayan glaciers and mountain ecosystem by:

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

» Establishing observational and monitoring network to assess ecosystem health including freshwater systems

» Promoting community-based management through development of mechanisms for incentives for protection and enhancement of forested lands

» Strengthening regional cooperation through established mechanisms for exchanging information with countries sharing the Himalayan ecology

NMSHE, towards achieving the above, proposes to involve various institutions already engaged in the research, conservation and management of natural resources in IHR. The Mission would effectively network with institutions with common and shared objectives, co-sharing of resources and co-generation of processes leading to ecologically sustainable development. Indicative categories of institutions in NMSHE include (i) Government institutions dealing with research and development, (ii) NGOs with local, national and international mandate, and (iii) community-based organizations.

While designing and implementing strategies and plans for achieving the goals of the Mission, focus will be to follow the following principles enshrined in NAPCC:

» Protecting vulnerable sections of society – this includes participatory resource management strategies and development of livelihood options

» Developing human resource, which includes skill development, particularly mountain-specific skill development to empower communities

» Enhancing ecological sustainability by examining causes and consequences of disturbance regimes, promoting conservation of native and endemic elements and understanding glacier and river system dynamics

» Deploying technologies for hazard mitigation and disaster management, development of suitable human habitats, and agriculture and forest

sector innovations

The task force set up by the Planning Commission of India on Mountain Ecosystems[1] had highlighted the need for coordination, networking and cohesiveness among institutions working on conservation and development in the mountains. Requirements of adequate manpower and funds, infrastructure, communication and incentives for enhancing the delivery systems and connecting the laboratory findings to the real field requirements had been identified. As such, NMSHE aims to undertake a range of actions to address these gaps.

Considering the above NMSHE was chosen to compare the degree of articulation of linkages with it in the SAPCCs. As can be seen from Table 20 above, despite its specific focus on the Indian Himalayan Region, NMSHE received the second-lowest number of explicit articulations in IHR SAPCCs, behind only NMSKCC (with which NMSHE is closely related).

Table 21 below summarizes the key areas of articulation in IHR SAPCCs relating to NMSHE.

Table 21: Comparing NMSHE linkages in IHR SAPCCs[2]

NMSHE	J&K	UK	HP	Skm	Asm	Meg	Man	Nag	Miz	ArP	WB	Tri
Primary Objectives												
Building Human and Knowledge Capacities at the National Level;	●	●	●	●	●	●	●	●	●	●	●	●
Building Institutional Capacities;	●	●	●	●	●	◔	●	●	●	●	●	●
Building Evidence Based Policy Implementation Capacities	●	●	◔	◔	◔	◔	◔	●	◔	◔	◔	●
Building capacities for continuous learning & pro-active designing of development strategies	●	●	●	◔	●	●	NA	●	●	●	●	●
Scientific assessment of the vulnerability of the Himalayan ecosystem	●	●	●	●	●	●	●	●	●	●	●	●
Research for framing evidence-based policy measures to protect fragile ecosystems	●	●	●	●	●	◔	●	●	●	●	●	●
Time bound action programmes at state level	●	●	●	●	●	●	●	●	●	●	●	●

1 Report of the Task Force on Mountain Ecosystems (Environment and Forest Sectors) for the Eleventh Five Year Plan, Planning Commission, GoI, November 2006

2 Where the NMSHE mentions objectives at the National level, articulated counterpart actions in the SAPCCs are taken to be at the State level, or where relevant, across IHR States In most cases though, articulation is more implicit than explicit.

NMSHE	J&K	UK	HP	Skm	Asm	Meg	Man	Nag	Miz	ArP	WB	Tri
Secondary Objectives												
Network knowledge institutions in Himalayan Ecosystems	●	●	●	◣	●	●	●	●	NA	NA	●	●
Develop bio-geo data base for Himalayan Ecosystems	●	●	●	●	●	●	●	●	●	●	●	●
Detect & decouple natural & anthropogenic induced signals	◣	◣	◣	◣	◣	◣	◣	◣	◣	◣	◣	●
Assessment of the socio-economic and ecological consequences of global environmental change	●	●	●	◣	●	◣	◣	●	●	●	●	●
Studying of traditional knowledge systems for community participation in adaptation, mitigation and coping mechanisms	●	●	●	●	●	NA	●	●	●	●	●	●
Evaluation of policy alternatives for regional development plans for key sectors	◣	◣	◣	◣	◣	◣	◣	◣	◣	◣	◣	◣
Creation of awareness amongst stakeholders	●	●	●	●	●	●	◣	●	●	●	●	●
Development of regional cooperation with neighbouring countries	●	●	●	NA	NA	●	◣	●	NA	NA	●	●

Key: Explicit articulation = ●

Implicit articulation = ◣

It can be seen from the table above that there are considerable linkages between IHR SAPCCs and NMSHE's objectives and action/application areas, despite the fact that in most cases, articulation of the linkages are more implicit than explicit.

KEY DISCUSSION POINTS/QUESTIONS

There are major variations among SAPCCs in selection of focus sectors. Some sectors were common across SAPCCs while others were less so, or clubbed with or subsumed under other focus sectors. The comparison showed that the sectors most common (or featured in all SAPCCs) were agriculture (and allied sectors such as horticulture, animal husbandry, etc.) and forests and biodiversity (though nomenclature may vary). Other most common sectors included water, energy and sustainable habitat. These were common to all SAPCCs except a single state exclusion in each. In addition, some states had included focus sectors such as industries, mining and bio-resources, though these were the least included sectors. Disaster management – a key sector in IHR was common to only four states (all Western Himalayan, plus Assam) though some of the other states included articulation of DRR mechanisms in their SAPCCs.

Comparison of the agriculture sector chapters/sections in IHR SAPCCs showed significant variations in structure and key action areas. Most IHR SAPCCs subsumed various linked sub-sectors such as horticulture, animal husbandry/livestock and fisheries. Some themes/areas that were common included crop diversification, rainfed/dryland agriculture, soil and moisture conservation, development of more resilient varieties of crops, protection/promotion of traditional varieties, integrated pest management, strengthening institutional mechanisms and extension services, and awareness and capacity building. Less common themes/areas of action included policy reviews, gender concerns, *jhum* optimization, and protection and enhancement of aquatic ecosystems.

Comparison of the water sector chapters/sections in IHR SAPCCs also showed significant variations in structure and key actions areas. However, several action areas were commonly articulated in most. These include the need for a state water policy, acknowledgement of scientific gaps and the need to augment these as well as developing scientific modelling based projections of the impacts of climate change, emphasis on capacity building and awareness generation, need to adopt water use optimization mechanisms, need to incorporate DRR mechanisms into sector planning and programming, and augmented storage. Key action areas that were less common were conservation of aquatic ecosystems and appropriate technology adoption. Further, West Bengal, which has distinct geographical regions also included action areas specific to its hill districts that fall in IHR.

Likewise, while there were wide variations of structure and content as well as key thrust areas in the energy sector chapters/sections of IHR SAPCCs, several common action areas emerged. These included need for policy development for the sector, demand side management and efficiency improvements, technical improvements in transmission and distribution infrastructure and other non-technical measures to reduce technical and commercial losses, enhanced adoption of renewable energy and augmenting generation in general, capacity building, and the need for research and scientific studies to better understand the impacts of climate change on the sector. Less common action areas articulated were biomass substitution to reduce use of biomass fuels for cooking and heating and to reduce pressure on forests, promotion of cleaner fuels such as CNG and fuel conservation in transport.

As in the case of agriculture, water and energy sectors, there were wide variations in structure and action areas articulated in the health sector chapters/sections of IHR SAPCCs. Common themes that recurred in the action areas included focus on research, data gathering and surveillance mechanisms and infrastructure/facilities, control and monitoring of vector and water-borne diseases, emphasis on service delivery enhancements, emphasis

on capacity development, preparedness and coordination between health and other authorities such as disaster management. Less common themes were assessing and improving resilience of health infrastructure, gender dimensions of health, early warning systems for heat/cold waves, need for health policies with reference to climate change and impacts, emphasis on improving access (to health care facilities) logistics in remote areas, and focus on facilities for displaced migrants during extreme weather events.

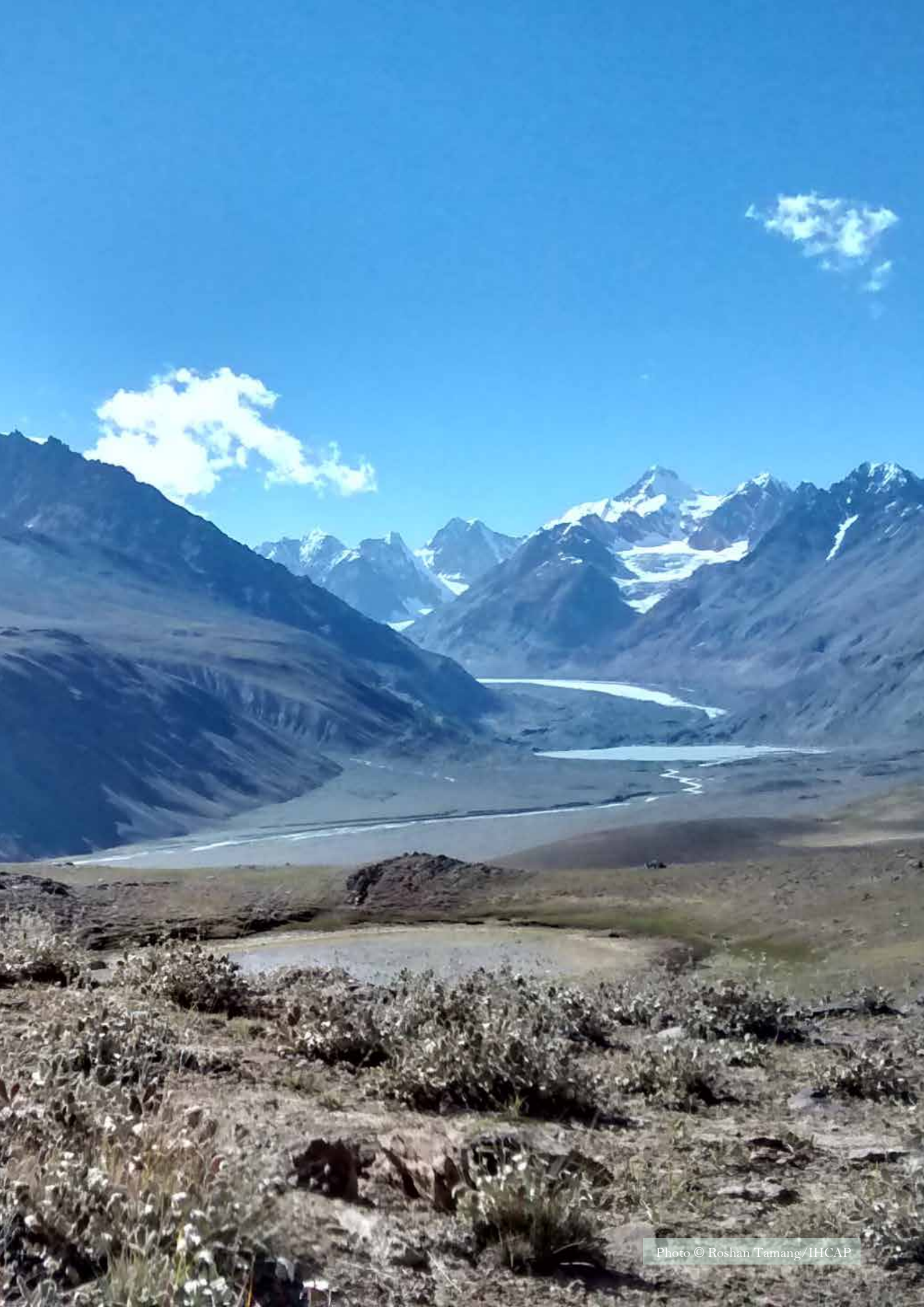
Examination of linkages in IHR SAPCCs to the National Missions under NAPCC yielded interesting results. While all IHR SAPPCs *mentioned* all the National Missions, there was wide variation in terms of articulation of linkages to the Missions, and many linkages were more implicit than explicit. Of the 11 IHR SAPCCs, nine had articulated explicit linkages to JNNSM and NMGI, eight articulated explicit linkages to NMEEE and NWM. This was followed by NMSHE and NMSA with five IHR SAPCCs articulating linkages to both – the second lowest numbers. NMSKCC has the least number – only five IHR SAPCCs had explicit linkages.

In contrast, the number of IHR SAPCCs that had only implicit articulation to National Missions was almost exactly the opposite of the numbers for explicit articulation, with JNNSM having the least implicit linkages (two IHR SAPCCs) and NMSKCC having the highest numbers (seven). This was closely followed by NMSHE and NMA, both of which had the second most implicit linkages. Only one National Mission – NMSH -- had no articulation in one case (West Bengal, where sustainable habitat was not a focus sector).

These findings are important, especially from the standpoint of the fact that NMSKCC and NMSHE (the latter with a specific IHR focus) – both missions of significant importance to IHR SAPCCs (and also closely related in terms of their scope and mandates), and both administered by DST find relatively lower explicit articulation across IHR SAPCCs. This assumes even greater significance in the light of the findings of the comparison of NMSHE linkages in SAPCCs.

Examination of IHR SAPCCs and their explicit or implicit articulated linkages to NMSHE, its objectives (primary and secondary) as well as its applications areas broken down by application segment under each showed significant explicit articulation of linkages to the primary objectives, and likewise strong articulated linkages to the secondary objectives (please see Table 21 above).

Given that NMSHE is especially focussed on IHR, it is clear from the findings above that there is scope for significant synergies between IHR SAPCCs and NMSHE (and also the closely-related NMSKCC).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