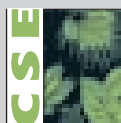


VOLUME II

COPING WITH CLIMATE CHANGE

**AN ANALYSIS OF INDIA'S
STATE ACTION PLANS ON
CLIMATE CHANGE**



Centre for Science and Environment



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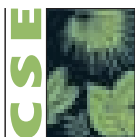
Research director: Chandra Bhushan

Author: Vineet Kumar

Editor: Arif Ayaz Parrey

Design and cover: Ajit Singh

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41, Tughlakabad Institutional Area

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Phone: 91-11-40616000

Fax: 91-11-29955879

E-mail: cse@cseindia.org

Website: www.cseindia.org

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1 Background

The effects of climate change are already being experienced across all continents and oceans of the world. Warming of the Earth's atmosphere is unequivocal. The average global temperature from January to September 2017 was approximately 1.1°C above that of the pre-industrial era. As a result of a powerful El Niño, 2016 was the warmest year on record. 2013–17 is set to be the warmest five-year period on record.¹

These rising temperatures are accompanied by high-impact events such as catastrophic hurricanes and floods, and debilitating heat waves and droughts. Long-term indicators of climate change, including increasing carbon dioxide concentrations, rising sea levels and acidification of the oceans, continue unabated. Arctic sea ice coverage remains below average and the extent of the previously stable Antarctic sea ice has dropped to a record low. Globally, the poorest bear maximum losses and damage as a result of climate impacts, even though they have contributed least to the cause of climate change.

Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the Earth's climate system, increasing the likelihood of severe, pervasive and irreversible impacts on people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.

Intergovernmental Panel on Climate Change's (IPCC) reports suggest that surface temperature is projected to rise over the 21st century under all assessed emission scenarios. Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development. Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of greenhouse gases are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases. Climate-related hazards affect poor people's lives directly through impacts on livelihoods, reductions in crop yields, or destruction of homes, and indirectly through, for example, increased food prices. The world, in many cases, is ill-prepared for risks from a changing climate. There are opportunities to respond to such risks, though the risks will be difficult to manage with high levels of warming.

The Paris Agreement, adopted in 2015, established the global goals on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal.

Article 7 of the Paris Agreement specifies that each country shall engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies or contributions. It further says that countries should strengthen their cooperation on enhancing action on adaptation. It make provisions of continuous and enhanced international support, comprising finance, technology and capacity-building, to be provided to developing countries. Currently, adaptation information is provided by countries to United Nations Framework Convention on Climate

Change (UNFCCC) through three distinct vehicles—nationally determined contributions (NDCs), national adaptation plans, and national communications.

The Paris Agreement specifies that adaptation efforts should be based on a country-driven approach, and emphasizes the importance of integrating adaptation into socio-economic development activities. The country-driven nature of the Paris Agreement with regard to adaptation aims to align adaptive responses to the unique needs of countries and gives them ownership and control over the articulation of these needs.²

UN Environment's Emissions Gap report 2017, released just ahead of COP23 held in Bonn in November 2017, reveals that national pledges (or NDCs) made by countries are sufficient to achieve only one-third of the reduction in emissions required by 2030 to meet climate targets (of staying well below 2°C increase in temperature from pre-industrial levels), with the private sector and sub-national action not increasing at a rate that would help close this worrying gap. Current mitigation pledges may lead towards a likely temperature increase of around 3°C by 2100.³

INDIA—VULNERABILITY AND ADAPTATION

India has been ranked as the sixth most climate change-vulnerable country in the world in terms of facing extreme weather events by the Germanwatch *Climate Risk Index 2018*.⁴ The report noted that in 2016, India had lost the maximum number of human lives (2,119) and over US \$21 billion worth of property to such events. It states that countries like India are repeatedly hit by extreme weather and have no time to fully recover.

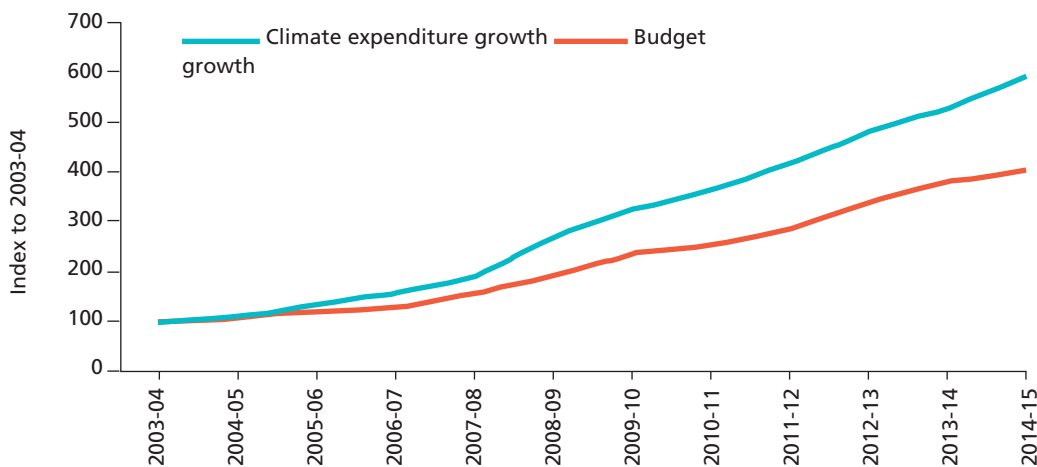
An analysis done by Centre for Science and Environment (CSE) on how India has warmed over the years—from 1901 till 2017—also shows significant rise in temperature. Annual mean temperature in India has increased by about 1.2°C since the beginning of the 20th century. Annual mean temperature in India has rapidly increased since 1995.⁵

Heavy dependence on agriculture, the Himalayan ecosystem, potentially reduced precipitation under a changing climate, long coastline, heavy investments in infrastructure and large population imply that nearly all major sectors will need to adapt. Therefore, Indian policy makers must anticipate and respond to climate change-induced challenges.⁶ More than half of India's population lives in rural areas and depends on climate-sensitive sectors like agriculture, fisheries and forestry for their livelihoods. Furthermore, the adaptive capacity of dryland farmers, forest dwellers, fisher folk and nomadic shepherds is very low. Climate change is likely to impact all natural ecosystems as well as socio-economic systems in India. In addition, poverty is a critical factor that limits the adaptive capacity of rural people in India.⁷

In the absence of extensive legislation on adaptation to date, the most widespread policy instruments currently are adaptation strategies, climate change action plans and climate-relevant provisions in sector policies and development planning. Adaptation strategies often outline mid- to long-term and cross-sectoral adaptation priorities.⁸

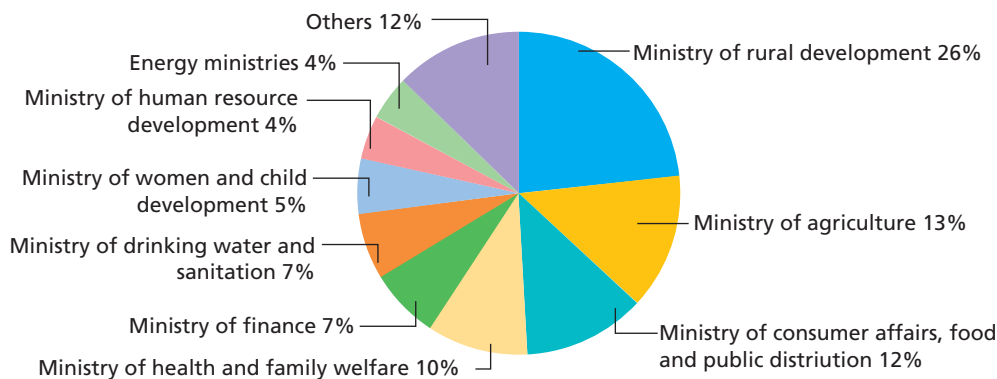
A study done by Indian Institute of Management (IIM), Ahmedabad and others shows that the overall budget outlay of India has increased by a factor of four (from 2003–04 to 2014–15), while as development and adaptation-related outlays have increased by a factor of five. This indicates that the rate of growth of government allocation to development and building adaptive capacity has been increasing at a faster rate than that of overall annual

Figure 1: Allocation to development activities that enhance adaptive capacity has been increasing over time



Source: Amit Garg, Vimal Mishra, Hem H. Dholakia, *Climate Change and India: Adaptation Gap (2015)*, W.P. No. 2015-11-01, November 2015

Figure 2: Distribution of public expenditure on climate change activities by ministry



Source: Amit Garg, Vimal Mishra, Hem H. Dholakia, *Climate Change and India: Adaptation Gap (2015)*, W.P. No. 2015-11-01, November 2015

budgets. Public spending on adaptation in 2014–15 was Rs 2,130 billion, i.e. 12 per cent of the budget for the year (~ 2 per cent of the GDP). Climate change adaptation spending in India through the Union budget has been on the rise, from 1.45 per cent of the GDP in 2000–01 to about 2.82 per cent of the GDP in 2009–10 (see *Figure 1: Allocation to development activities that enhance adaptive capacity has been increasing over time*).

The distribution of this development and adaptation-centric expenditure across different ministries has been provided in *Figure 2: Distribution of public expenditure on climate change activities by ministry*. Three ministries—rural development, agriculture and consumer affairs, and food and public distribution—together constitute roughly one half of the development and adaptation expenditure. Several policies such as Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), National Mission on Sustainable Agriculture, National Food Security Mission and National Initiative on Climate Resilient Agriculture have been put in place.⁹

EFFECTIVE CLIMATE ADAPTATION: PRINCIPLES AND MAINSTREAMING

Principles of effective adaptation

Throughout history, people and societies have adjusted to and coped with climate, climate variability, and extremes, with varying degrees of success. Universal definitions of adaptation are fraught with danger of generalization; countries interpret adaptation and adaptation needs based on their national and sub-national contexts. Adaptation can be framed more narrowly as risk management activities in response to climatic drivers, or more widely as ongoing development work that addresses or transforms the underlying socioeconomic drivers of vulnerability, adaptive capacity, and resilience.¹⁰ In practice, adaptation options adopted so far continue to emphasize incremental adjustments and co-benefits and are starting to emphasize flexibility and learning.

As per the IPCC's fifth assessment report of 2014, some key principles of effective adaptation as a means to build resilience and to adjust to climate change impacts can be understood as followings:

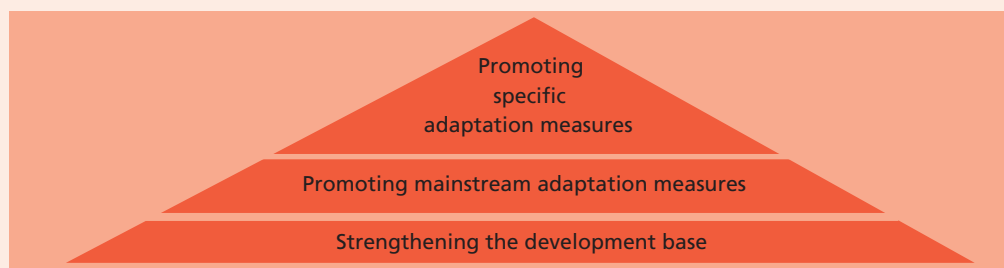
- **Adaptation is specific to place and context, there is no overarching appropriate approach for reducing risks across all settings.** Only when adaptation and risk reduction strategies consider the dynamics of vulnerability and exposure and their linkages with sustainable development, and climate change and socioeconomic processes do they achieve a measure of success.
- **Reducing vulnerability and exposure to present climate variability is the key in the efforts to adapt to future climate change. Strategies include actions with co-benefits for other objectives.** Strategies with co-benefits which can help improve human health, livelihoods, social and economic well-being, and environmental quality while increasing resilience across a range of possible future climates will be critical.
- **Adaptation planning and implementation at all levels of governance are contingent on societal values, objectives, and risk perceptions. Recognition of diverse interests, circumstances, social-cultural contexts, and expectations can benefit decision-making processes.** Indigenous, local, and traditional knowledge systems and practices, including indigenous peoples' holistic view of community and environment, are a major resource for adapting to climate change, but these have not been used consistently in existing adaptation efforts. Integrating such forms of knowledge with existing practices increases the effectiveness of adaptation.
- **Planning and implementation can be impeded by bunching of constraints.** Inadequate financial and human resources; lack of integration or coordination of governance, uncertain projected impacts, varying perceptions of risk, competing values, dearth of adaptation leaders and advocates, absence of tools to monitor adaptation effectiveness, insufficient research, monitoring, and observation and the finance to maintain them are some common constraints.
- **Adaptation planning and implementation can be enhanced through complementary actions across levels, from individuals to governments.** National governments can coordinate adaptation efforts of local and sub-national governments, for example by protecting vulnerable groups, by supporting economic diversification, and by providing information, policy and legal frameworks, and financial support.
- **Poor planning, overemphasizing short-term outcomes, or failing to sufficiently anticipate consequences can result in maladaptation.** Maladaptation can increase the vulnerability of the target group in the future, or the vulnerability of other people, places, or sectors.

Mainstreaming climate adaptation into development planning

Countries have started mainstreaming climate change adaptation efforts into their national and sub-national level development planning. However, such efforts of mainstreaming climate change adaptation into national development planning are still at a relatively early stage.

The United Nations Development Programme and United Nations Environment Programme (UNDP–UNEP) publication *Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners*, 2011 provides a framework for mainstreaming climate adaptation into development planning. This requires understanding the connections between climate change and national development priorities, as well as the governmental, institutional and political contexts and needs. Such efforts have to be based on country or region and local specific evidence, including impact, vulnerability and adaptation assessments, socio-economic analysis, and demonstration projects.

Figure 3: Three levels of intervention to mainstream climate change adaptation¹¹



Source: UNDP–UNEP 2011. *Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners*, UNDP–UNEP Poverty–Environment Initiative

The publication identifies mainstreaming climate change adaptation as the iterative process of integrating considerations of climate change adaptation into policy-making, budgeting, implementation and monitoring processes at national, sector and subnational levels. It is a multi-year, multi-stakeholder effort grounded in the contribution of climate change adaptation to human well-being, pro-poor economic growth, and achievement of development goals. It entails working with a range of government and non-governmental actors, and other actors in the development field.

The framework for mainstreaming climate adaptation consists of following three components, each of which involves a set of activities or modules for which a range of tactics, methodologies and tools can be used:

- **Finding entry points and making a case** for setting the stage for mainstreaming. It involves understanding the linkages between climate change and national development priorities and understanding the governmental, institutional and political contexts that inform efforts to define pro-poor adaptation outcomes, find entry points into development planning, and make a case for adaptation mainstreaming.
- **Mainstreaming adaptation into policy processes** focuses on integrating climate change adaptation issues into an ongoing policy process, such as a national development plan or sector strategy, based on country-specific evidence (i.e., impact, vulnerability and adaptation assessments, socio-economic analysis and demonstration projects).
- **Meeting the implementation challenge** aims at ensuring mainstreaming of climate change adaptation into budgeting and financing, implementation and monitoring, and the establishment of mainstreaming as standard practice.

Stakeholder engagement occurs throughout, from inception through policy development, implementation and monitoring.

Mainstreaming climate change adaptation requires three levels of intervention as can be seen from following *Figure 3: Three levels of intervention to mainstream climate change adaptation*.

- **The first level** consists of making development efforts consciously aimed at reducing vulnerability (not necessarily to climate change) while avoiding maladaptation. This can be seen as strengthening the base for adaptation by addressing the adaptation deficit and increasing the overall resilience of the country and population.
- **The second level** is about ensuring that climate change is considered in the decision making of relevant government agencies so that (mainstream) policy measures catering to climate change are developed. This means not only climate-proofing policies but also addressing emerging needs for adaptation in different sectors or geographical areas.
- **The third level** calls for specific adaptation policy measures targeting issues that the first two levels have not yet tackled (UNDP - UNEP, 2011).¹²

Adapted from *Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners*, UNDP–UNEP 2011 and *Climate Change: Impacts, adaptation and vulnerability*, IPCC 2014.

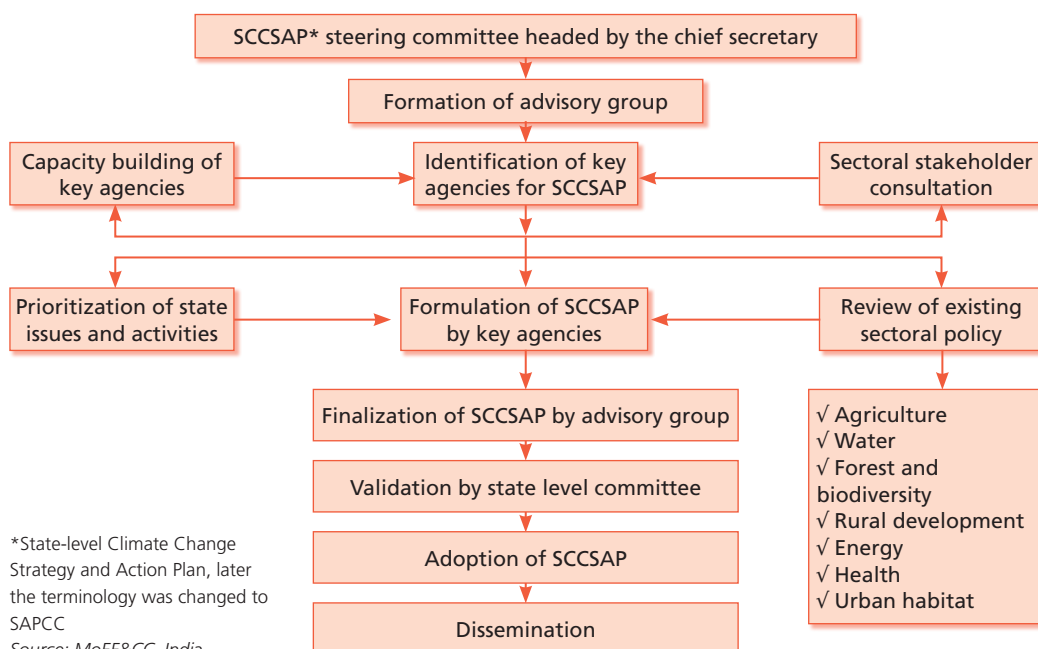
2 Sub-national climate change planning in India

The government of India formed the Prime Minister’s Council on Climate in 2007. Subsequently, the National Action Plan on Climate Change (NAPCC) was released on 30 June 2008 by the then Prime Minister. NAPCC recognized the role of state and local governments in implementation of the action plan as it was clear that climate change adaptation and mitigation challenges will only be addressed if state governments play an active role in the planning and implementing actions to achieve the objectives of NAPCC. Sub-national authorities at state level are expected to play a key role in actively incorporating climate change considerations into day-to-day governance, adopting climate-friendly policies and programmes, regulations, and investment decisions.¹³ Therefore, a process for preparation of State Action Plans on Climate Change (SAPCCs) was initiated following the announcement made by then Prime Minister in the conference of state environment ministers held on 18 August 2009. The erstwhile Ministry of Environment and Forest (MoEF) approached all state governments and union territories (UTs) to formulate SAPCCs.

FORMULATION PROCESS

SAPCC is the first sub-national exercise for climate change planning in India. After a national consultation workshop held on 19 August 2010 in New Delhi, it was decided by MoEF that a common framework with sufficient flexibility will be provided to all state and UT governments to prepare their respective SAPCCs.¹⁴ See *Figure 4: Step-wise process for SAPCC formulation* for a detailed depiction of the process.

Figure 4: Step-wise process of SAPCC formulation



In order to make the process participative, a state steering committee under the chairmanship of chief secretary and comprising representatives from relevant government departments was envisaged. The guiding principle of the common framework for SAPCCs provided to states included prioritizing the options suggested on the basis of a cost–benefit analysis and ease of implementation, incorporating community-based participation and ensuring broader stakeholder participation. The main content of SAPCCs as per the common framework document was suggested as follows:

1. **Climate profile of the state:** Regional development issues vis-à-vis national priorities in NAPCC, baseline assessments, expected future assessments and knowledge gaps.
2. **Assessment of vulnerability to climate change:** Assessment of current and future vulnerability temporally and spatially.
3. **GHG emissions and energy needs:** Sectoral emissions and future energy needs of different sectors.
4. **Climate change strategy:** Identification of entry points in existing programmes or schemes and cost–benefit analysis of proposed actions.
5. **Climate change action plans:** Identification of existing sources of funding for the plans, additional finances required, monitoring and evaluations.

This common framework document titled *Strategy for evolution of a framework towards preparation of state-level climate change and action plan or towards evolution of a framework for the preparation of state-level climate change strategy and action plan* was circulated to all states as a reference document for preparing SAPCCs.

As per the common framework, it was expected that an SAPCC will include climate profile of the state, a strategy of intended actions, and outline of specific implementation activities. It should be based on an assessment of the vulnerability to and impact of climate change and associated risks in the state. Necessary adaptation and mitigation measures to reduce the state's vulnerability in the short-, medium- and long-term should be identified accordingly in the SAPCC. Further the budget and incremental costs of carrying out the activities aimed at capacity building, technical assistance, demonstration projects (where needed), and the incremental costs for implementation of various activities in different sectors as prioritized, should be indicated in the SAPCC.¹⁵ SAPCCs were expected to build on the existing policies of the state governments by taking into consideration ongoing developmental programmes and schemes being implemented at the state level as well as the NAPCC.

DEVELOPMENT STATUS OF SAPCCs IN STATES AND UTs

All states and UTs of India have either developed or are in the process of developing SAPCCs. As per information available on Ministry of Environment, Forest and Climate Change (MoEF&CC) website, the National Steering Committee on Climate Change has endorsed SAPCCs of 32 states and UTs. MoEF&CC invited development agencies—Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), United Nations Development Programme (UNDP), UK Department for International Development (DFID), and World Bank—to provide technical assistance to selected states in the development of these plans. Daman and Diu, Dadra and Nagar Haveli, Goa and Delhi have yet to finalize their SAPCCs.¹⁶

The formulation of SAPCCs can be considered an important milestone in developing decentralized domestic policies on climate change in India. It involves most development departments, the key being agriculture, water, habitat, forestry, health, and disaster management.

In general, states and UTs have tried to stay as close to the eight missions identified under NAPCC as possible, with only a few going beyond to achieve the required focus on health, urban development etc. There has also been an effort to adopt the co-benefit approach—promoting development objectives while yielding additional benefits for climate change. Since SAPCCs are adaptation-centric and try to focus on good development, most interventions have been proposed to be implemented through ongoing sectoral programmes and schemes.

CONSTRAINTS IN THE PREPARATION OF SAPCCs

An ideal enabling environment for an effective climate change action plan has many components, including institutional capacity, awareness and understanding, evidence and research, stakeholder participation and finance. Some of the major issues in the preparation of SAPCCs are as follows.

Lack of dedicated and knowledgeable officials: One of the main obstacles for government departments in addressing climate change concerns is lack of dedicated personnel. Climate change action is a new and fairly technical field. Officials need to be highly skilled and trained. Qualities like empathy and effective communication skills are a big plus. It was observed that if the officer primarily responsible for preparation of an SAPCC was knowledgeable, responsible, proactive and powerful, the quality of the SAPCC developed improved considerably.¹⁷

Lack of coordination between states and the Centre: There is lack of transparency between states and the Centre on various issues like specific expectations from SAPCCs, funding and technical arrangements. A good example of this is the inclusion of GHG emissions and energy needs in SAPCCs. NAPCC has both mitigation and adaptation components, but the Central government wanted the SAPCCs to focus on adaptation, in line with India's position at UNFCCC. Therefore, even though the common framework for SAPCCs mentioned GHG emissions and energy needs (part of the mitigation strategy), some states were unofficially requested not to include GHG emission inventory in their SAPCCs. This created confusion among states, resulting in some states mentioning GHG emission inventories, while others not mentioning them. States which stressed on GHG mitigation activities did so because of their local priorities.¹⁸

Limited time and resources: Limited availability of time and resources was also highlighted as a significant issue by interviewed officials. SAPCCs of some states themselves mention issues like lack of time and resource as a challenge.

Climate change not a priority for state line departments: Every line department of some states have a nominated nodal officer responsible for climate change-related activities, but climate change might not be a priority for these officers. Some officials feel that they have many other responsibilities and climate-related work is just an extra load for them.

No blueprint for conducting vulnerability assessments and climate projections: Interviewed officials said that they lack clarity on how to proceed further for requirements like conducting vulnerability assessments. They feel that to conduct vulnerability assessment studies and state-specific climate projections, they need support on technical matters like the criteria for selecting consultancy firms, standard protocol, and scope, which has not been provided to them.

3 Scope and methodology

SCOPE OF THE STUDY

We have selected eight out of 32 approved SAPCCs for this study. These states have been randomly selected to incorporate India's major agro-climatic zones and varying population sizes. The agro-climatic zone classification used is the one developed by the erstwhile Planning Commission. It is illustrated in *Map 1: Agro-climatic zones in India*.¹⁹

The following states' climate change plans have been analyzed:

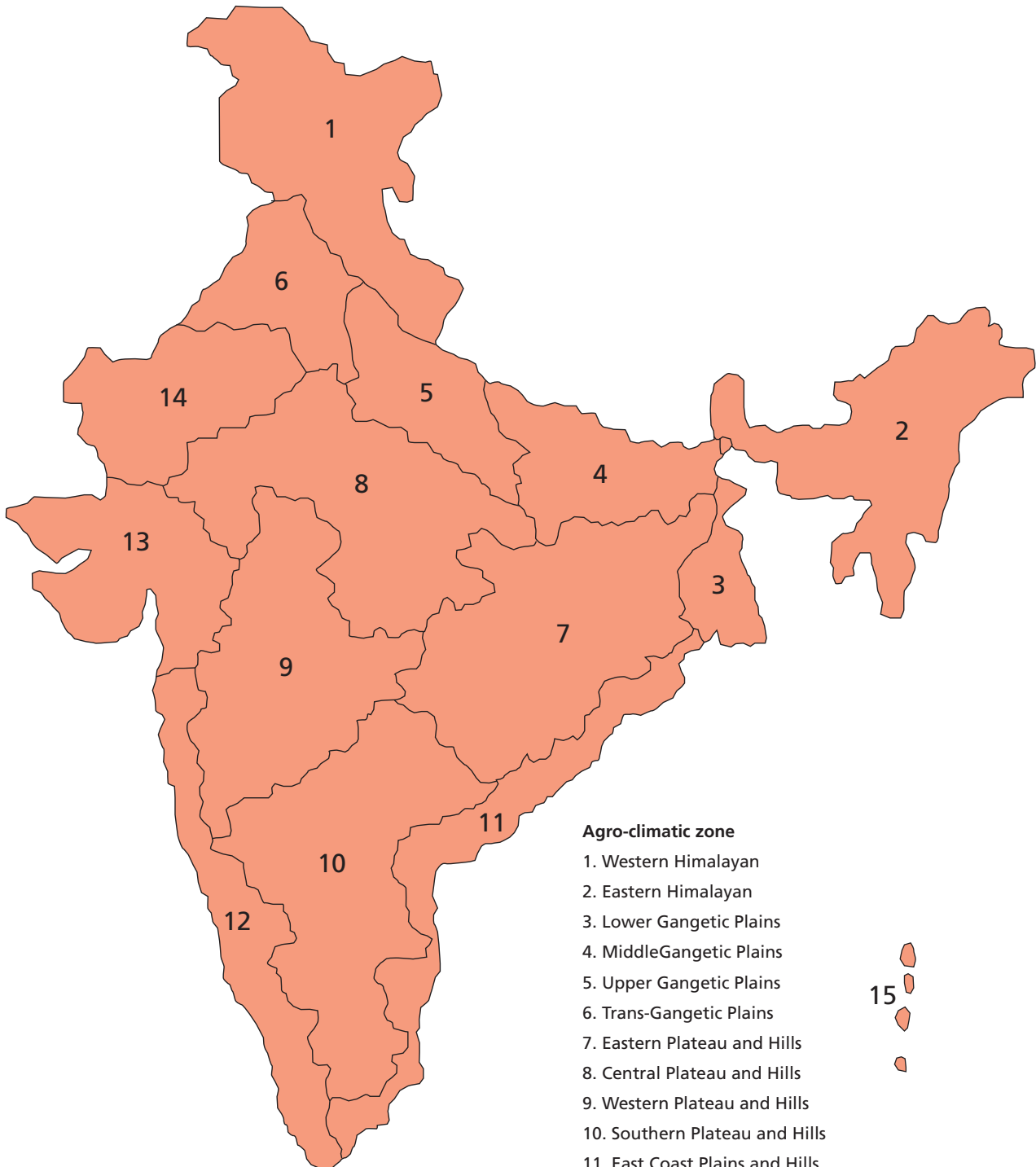
1. Gujarat (Gujarat Plains and Hills; 62.7 million population; SAPCC budget requirement Rs 24,775 crore)
2. Madhya Pradesh (Central Plateau and Hills; 73 million population; SAPCC budget requirement Rs 4,700 crore)
3. Mizoram (Eastern Himalayas; 1.1 million population; SAPCC budget requirement Rs 3,675 crore)
4. Odisha (Eastern Plateau and Hills and East Coast Plains and Hills; 43.7 million population; SAPCC budget requirement Rs 17,000 crore)
5. Punjab (Trans-Gangetic Plains; 28 million population; SAPCC budget requirement Rs 64,731 crore as per the 13th Five Year Plan)
6. Tamil Nadu (Southern Plateau and Hills and East Coast Plains and Hills; 77 million population; SAPCC budget requirement Rs 4,11,335 crore as per the 13th Five Year Plan)
7. Uttar Pradesh (Upper and Trans-Gangetic Plains; 204.2 million population; SAPCC budget requirement Rs 46,946 crore)
8. Uttarakhand (Middle Gangetic Plains; 10 million population; SAPCC budget requirement Rs 8,833 crore)

Table 1: Departments and agencies which have prepared SAPCCs in the selected states

S. No.	State	SAPCC prepared by	SAPCC supported by	Year
1	Gujarat	Department of Climate Change, Government of Gujarat	TERI and GiZ	2014
2	Madhya Pradesh	Department of Housing and Environment, Government of Madhya Pradesh	UNDP	2014
3	Mizoram	Directorate of Science and Technology, Government of Mizoram	GiZ and CTRAN Consulting Ltd	For 2012-17
4	Odisha	Department of Forest and Environment, Government of Odisha	CTRAN Consulting Ltd, DFID and World Bank	For 2010-15
5	Punjab	Punjab State Council for Science & Technology, Government of Punjab	GiZ	2014
6	Tamil Nadu	Department of Environment, Government of Tamil Nadu	GiZ	2014
7	Uttar Pradesh	Department of Environment, Government of Uttar Pradesh	CTRAN Consulting Ltd and GiZ	2014
8	Uttarakhand	Department of Forest, Uttarakhand	UNDP	----

Source: State action plans on climate change

Map 1: Agro-climatic zones in India



Agro-climatic zone

1. Western Himalayan
2. Eastern Himalayan
3. Lower Gangetic Plains
4. Middle Gangetic Plains
5. Upper Gangetic Plains
6. Trans-Gangetic Plains
7. Eastern Plateau and Hills
8. Central Plateau and Hills
9. Western Plateau and Hills
10. Southern Plateau and Hills
11. East Coast Plains and Hills
12. West Coast Plains and Hills
13. Gujarat Plains and Hills
14. Western Dry Region
15. Islands

Source: Planning Commission, Government of India

METHODOLOGY: ASSESSING CLIMATE ADAPTATION ACTIVITIES

Assessment of adaptation activities examines what countries are doing to increase adaptive capacity and resilience, and decrease vulnerability at national, sub-national and local level. As per the methodologies suggested in UNEP Adaptation Gap Report 2017, these assessments can broadly be descriptive and evaluative in nature.

Descriptive assessment

Descriptive assessments of adaptation ask non-judgmental questions such as:

- What are a country's key vulnerabilities or areas of adaptive capacity and resilience (e.g., impact and vulnerability assessments and global risk maps)?
- What are a country's national goals and targets on adaptation (e.g. visions, goals and targets set out in adaptation planning documents)?
- How is a country making decisions on adaptation (e.g. national or subnational working groups, ministerial or departmental leadership, and integration of considerations of equity and justice into decision-making processes)?
- What is a country doing to increase adaptive capacity and resilience, and decrease vulnerability?
- What is a country doing to address climate change risk?
- Are governance structures in place to support adaptation?
- Are equity and participatory considerations are being taken into account during planning processes?
- Are stakeholders creating positive conditions and strong institutions to enable adaptation?

Evaluative assessment

- Are countries responding to the right risks, and in ways that do not create long-term maladaptation? For example, do national impact and vulnerability assessments reflect scientific consensus?
- Do goals and targets reflect key areas of adaptive capacity, resilience, and vulnerability? For example, are goals and targets sufficiently ambitious to address key risks?
- Do countries have robust decision-making processes? For example, do governments demonstrate decision-making processes that represent the spirit of the Paris Agreement (gender-responsive, participatory, transparent etc.)?
- Are countries making sufficient effort to meet goals and targets? For example, are countries doing enough to adapt to current and future risk?

Evaluative assessments of adaptation activities require multiple perspectives to be heard, and recognize that adaptation is not simply a technocratic exercise, but a political process in which there are winners and losers.²⁰ These assessments can be reproduced at the sub-national, regional and local levels.

In order to get a sense of the state of climate action in India so far, the SAPCCs of the selected eight states were analyzed for their usefulness and status of implementation with the help of secondary research and interviews with relevant stakeholders.

4 Key observations

LACK OF COMPREHENSIVE CLIMATE IMPACT AND VULNERABILITY ASSESSMENT AT LOCAL, REGIONAL AND STATE LEVELS

Assessing a state's vulnerability to climate change is the first step in devising a climate change action plan. Understanding regional and local dimensions of vulnerability is necessary to develop appropriate and targeted adaptation efforts. Vulnerability and impact assessments must also take into consideration the combination of multiple stresses that contribute to climate change impacts. This assessment helps to enhance understanding of current vulnerability, identify factors that increase vulnerability for certain districts or areas, and inform and facilitate the decision making process.²¹

Exposure and vulnerability are dynamic, varying across temporal and spatial scales, and depend on economic, social, geographic, demographic, cultural, institutional, governance, and environmental factors. Individuals and communities are differentially exposed and vulnerable based on inequalities expressed through levels of wealth and education, disability, and health status, as well as gender, age, class, and other social and cultural characteristics. Understanding the multi-faceted nature of both exposure and vulnerability is a prerequisite for determining how weather and climate events contribute to the occurrence of disasters, and for designing and implementing effective adaptation and disaster risk management strategies.²²

Therefore, availability of local, regional or state and sector-specific detailed current and future climate impact and vulnerabilities assessment is very crucial for decision making at the local or regional level.

The common framework document for SAPCCs circulated by MoEF&CC requires states to have “assessment of the physical and economic impact of and vulnerability to climate change on the most vulnerable sectors and on vulnerable groups.”

However, we observed lack of local, regional or state and sector-specific detailed vulnerability assessment and related climate change research in most states (see *Map 2: State-wise status of climate change impact and vulnerability assessment*). Climate vulnerability assessments have been carried out in some states, but they are very broad and general and operate at a macro-level. They are not comprehensive and risk overlooking specific local issues. Some states have used available random sector- or region-specific studies, which are of limited use and may not be suited to other sectors and regions within the state. Therefore, states are now proposing studies of comprehensive region- and sector-specific vulnerability assessments in their respective SAPCCs.

Map 2: State-wise status of climate change impact and vulnerability assessment

Case 5: Punjab

- Sector-wise broad climate vulnerability has been identified in the SAPCC in terms of current concerns only.
- Future climate vulnerability of different sectors due to climate change is not available at different spatial scales.

Case 2: Madhya Pradesh

- The SAPCC mentions that detailed assessment of climate change-induced vulnerabilities of the state was carried out, taking into account socio-economic and environmental indicators.
- However, the SAPCC goes on to state that the methodology for formally assessing the vulnerability in individual districts is in a nascent stage, but the plan has included use of a composite index based on multi-variate analysis of climate change-vulnerable indicators—social and economic indicators to determine socio-economic vulnerability and agriculture, water resource, forest and climate indicators to identify environmental vulnerability.
- Impact assessments have been conducted specifically for forest ecosystems and water resources in Madhya Pradesh based on the IPCC SRES A1B climate change scenario.

Case 1: Gujarat

- A comprehensive climate vulnerability assessment at regional and local levels on the vulnerability and impact of climate change at a scale that is relevant for anticipatory decision making has not been carried out.
- As per the SAPCC, comprehensive studies related to impact of climate change on sector like agriculture, forests and biodiversity are not available. It has proposed integrated vulnerability assessments of key crops, ecological resources, and socio-economic systems at the community level, among other measures.
- Vulnerability assessment from the perspective of vulnerable groups like women and children has also been proposed.

Case 6: Tamil Nadu

- A detailed comprehensive climate vulnerability assessment has not been carried out. In fact, no vulnerability assessment is mentioned in the report.
- However, some vulnerability assessment has been borrowed from external reports for sectors like forest and coastal areas etc.

Case 8: Uttarakhand

- No detailed assessment of vulnerability of sectors to climate change exists.
- The SAPCC says that there is a clear need for detailed vulnerability assessments of the state. Studies covering different sectors and the state in general have been proposed.

Case 7: Uttar Pradesh

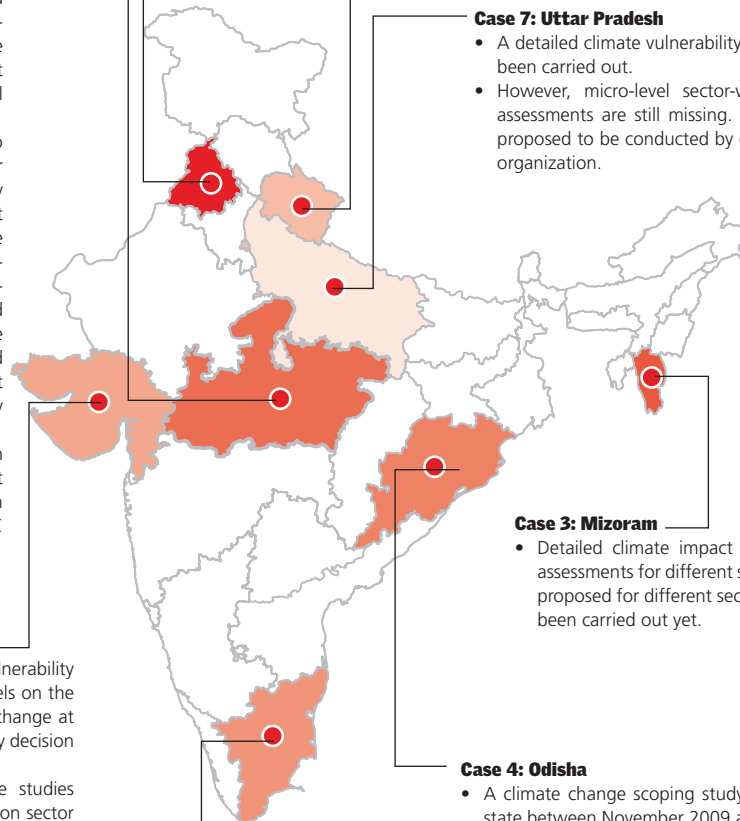
- A detailed climate vulnerability assessment have been carried out.
- However, micro-level sector-wise vulnerability assessments are still missing. These have been proposed to be conducted by external technical organization.

Case 3: Mizoram

- Detailed climate impact and vulnerability assessments for different sectors have been proposed for different sectors but have not been carried out yet.

Case 4: Odisha

- A climate change scoping study was carried out in the state between November 2009 and February 2010.
- Even though multi-hazard vulnerability mapping was done, a comprehensive sector-wise climate impact and vulnerability analysis is still missing from the SAPCC.
- It is not clear if the vulnerability mapping given in SAPCC also considers future climate projections or is simply based on current or historical vulnerabilities. No historical or projected timeframe is provided nor is vulnerability defined on specific parameters.



Source: State Action Plans on Climate Change

Map 3: State-wise status of future climate projections

Case 5: Punjab

- Climate projections available at 50 km x 50 km resolution are useful only for a particular developmental paradigm (IPCC A1B scenario) and are available for two time slices (2021–50 and 2071–98) only.
- Stakeholders expressed a need to have more sets of climate scenarios to understand the range of climate impacts that Punjab might face in the future. Projections need to be available for every 10 years.
- Many a time, climate change impact is highly local in nature, therefore, projections at higher resolutions are required for certain aspects of planning.

Case 2: Madhya Pradesh

- Regional climate models were not run specifically for MP. Instead, mid-century and end-century data projections presented in the draft SAPCC were based on secondary data collected from various sources.

Case 1: Gujarat

- The SAPCC clearly mentions that there is a need for state-specific projections and also that there is a need to have required infrastructural and institutional capacity in the state to make use of such strategic knowledge. It is very important to take into account the existing gaps in this regard.
- The SAPCC says that the available studies on climate modelling and impact projections have a degree of uncertainty associated with them due to factors such as nonlinearity, regional-scale variations and limited understanding of the climate system.

Case 6: Tamil Nadu

- District-wise climate change projections (the different scenarios of temperature, rainfall, cyclone and sea level rise) for the state have been made for the time periods 2010–40, 2040–70, 2070–2100.

Case 8: Uttarakhand

- Climate projections have been taken from 4 x 4 assessment. Climate projections have been taken from an independent study as well.
- No state-specific climate projections have been made at the micro level.

Case 7: Uttar Pradesh

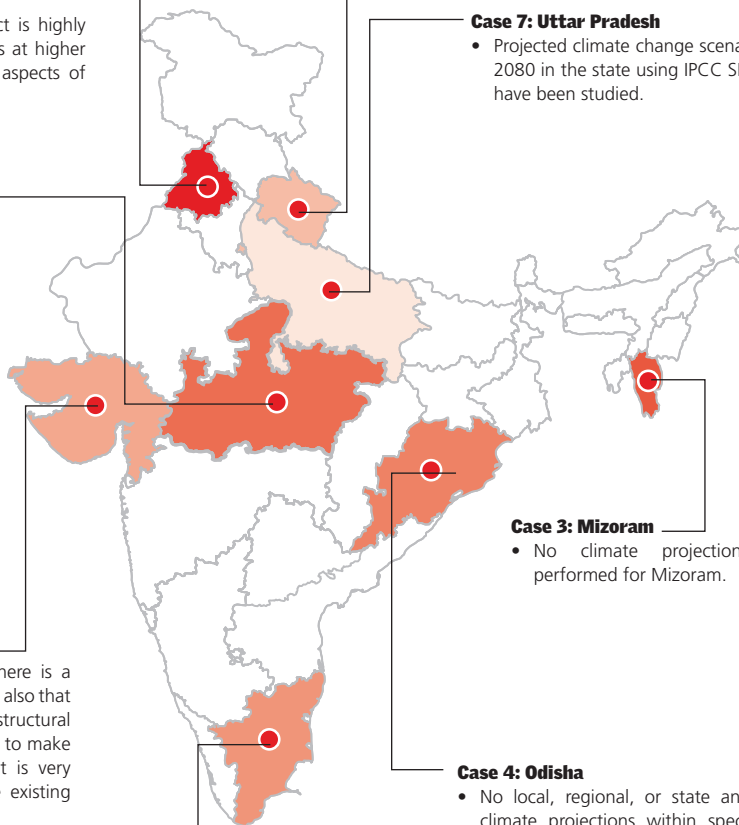
- Projected climate change scenarios in 2030 and 2080 in the state using IPCC SRES A1B scenario have been studied.

Case 3: Mizoram

- No climate projections have been performed for Mizoram.

Case 4: Odisha

- No local, regional, or state and sector-specific future climate projections within specific time periods have been performed in the SAPCC.
- Future projections on precipitation, temperature, or extreme events are also absent from the SAPCC.



Source: State Action Plans on Climate Change



NIDHI JAMMAL / CSE

Climate projections will become increasingly important to deal with the vagaries of climate change

LACK OF LOCAL, REGIONAL OR STATE AND SECTOR-SPECIFIC RELIABLE FUTURE CLIMATE PROJECTIONS WITH SPECIFIC TIME PERIODS

Confidence in projecting changes in the direction and magnitude of climate extremes depends on many factors, including the type of extreme weather event, the region and season, the amount and quality of observational data, the level of understanding of the underlying processes, and the reliability of their simulation in models.²³

Global climate models have their limitations to simulate the finer regional features and changes in the climate arising over sub-seasonal and smaller spatial scales. This is more relevant in the case of India due to its unique climate system dominated by the monsoon and the major physiographic features that drive this monsoon.²⁴

The common framework of SAPCC circulated by MoEF&CC expects all states to have a climate change scenario, i.e., projection of possible climate changes at relevant spatial and temporal scales.

However, we found that local, regional or state and sector-specific future climate projections with specific time periods are not available for various states (see *Map 3: State-wise status of future climate projections*). Some states have imported climate scenarios and have done modellings based on IPCC PRECIS or UK models for their states but these have limitations and challenges in terms of lack of data, area resolution etc. IPCC's fifth assessment report came out at the end of 2013 and its content has not been reflected in the plans of many states, instead states are still using IPCC 2007 projections.

EXTENT OF STAKEHOLDER CONSULTATION TO FORMULATE SAPCCs

Stakeholders are individuals or groups who have current and past experience of coping with, and adapting to, climate variability and extremes. The principal resource for responding to climate change impacts is people themselves, and their knowledge and expertise. Through an ongoing process of negotiation, they can assess the viability of adaptive measures. Together, the research community and stakeholders can develop adaptive strategies by combining scientific or factual information with local knowledge and experience of change and responses over time. Stakeholders, at different levels and stages, are crucial to the success of an adaptation project. Stakeholder participation in planning, through priority-setting and voicing preferences, as well as in implementation, accords with people's right to participate in decisions that affect their lives. However, the process must be carefully designed and implemented, as stakeholder participation does not in itself guarantee equity, fairness or eventual buy-in.²⁵

The SAPCC common framework document circulated by MoEF&CC mentions “building broader stakeholder engagement to maximize the perspectives and to increase robustness of analysis” under the guiding principles of an SAPCC. It identifies the importance of a participatory approach to enhance broad ownership of the process and “ensure its quality, consistency, relevance, pertinence and transparency”. This includes involvement of multiple stakeholders through workshops, public hearings, consultative meetings and inputs from expert and experienced individuals and organizations.

However, a proper methodology or guideline regarding stakeholder consultation has not been provided to states by MoEF&CC. The intensity of stakeholder consultations varies between states, only a few states have conducted detailed consultations, most have held negligible consultations, especially with affected communities and civil society. See *Map 4: State-wise status of stakeholder consultation*.



CHAITANYA CHANDAN / CSE

Stakeholder consultations are crucial to the success of climate adaptation

Map 4: State-wise status of stakeholder consultation

Case 5: Punjab

- The SAPCC mentions only one stakeholder consultation. It states that inputs or comments from all stakeholders including departments, industry associations, NGOs and the general public were invited.
- No sectoral stakeholder consultation were carried out. Further, climate-vulnerable communities were not involved in the stakeholder consultation.
- The SAPCC was put on website for further comments.

Case 2: Madhya Pradesh

- The SAPCC states that a bottom-up approach was adopted in its development, whereby a series of consultation workshops were organized with identified climate-sensitive line departments (sectoral) and across the state in all the 11 agro-climatic zones. In all, 27 such consultations were conducted.
- Departmental, sectoral and agro-climatic zone consultation workshops (13 workshops in 11 agro-climatic zones, with more than 1,700 participants) were also organized. Percentage-wise stakeholder participation was tabulated in charts in the SAPCC.
- Stakeholders include government and departmental officers, civil society members, farmers, media professionals, groups of experts and specialists and non-governmental organizations. Through consultation workshops (e.g. a project launch workshop, a research institution networking workshop, and sectoral and agro-climatic zone stakeholder consultation workshops), participants shared concerns and helped the state identify sectoral and regional implications of climate change.

Case 1: Gujarat

- The SAPCC mentions that its drafting involved extensive consultations with experts, practitioners and policy makers.
- The SAPCC does not detail stakeholder consultation with vulnerable community groups, people's representatives and local communities. It's not clear if any inputs have been sought from farmers, pastoralists, fisher folk, forest dwellers, and other disadvantaged communities who are directly dependent on climate sensitive sectors.
- Very limited or no consultation was done at taluka, district or agro-climatic zone level.

Case 6: Tamil Nadu

- The SAPCC mentions just one stakeholder consultation workshop. Therefore, it seems that very limited stakeholder consultation was carried out.

Case 8: Uttarakhand

- The SAPCC mentions that many stakeholder consultations were held with government line department, experts, members of civil society, academics etc.
- The SAPCC was also put on a website for further inputs.

Case 7: Uttar Pradesh

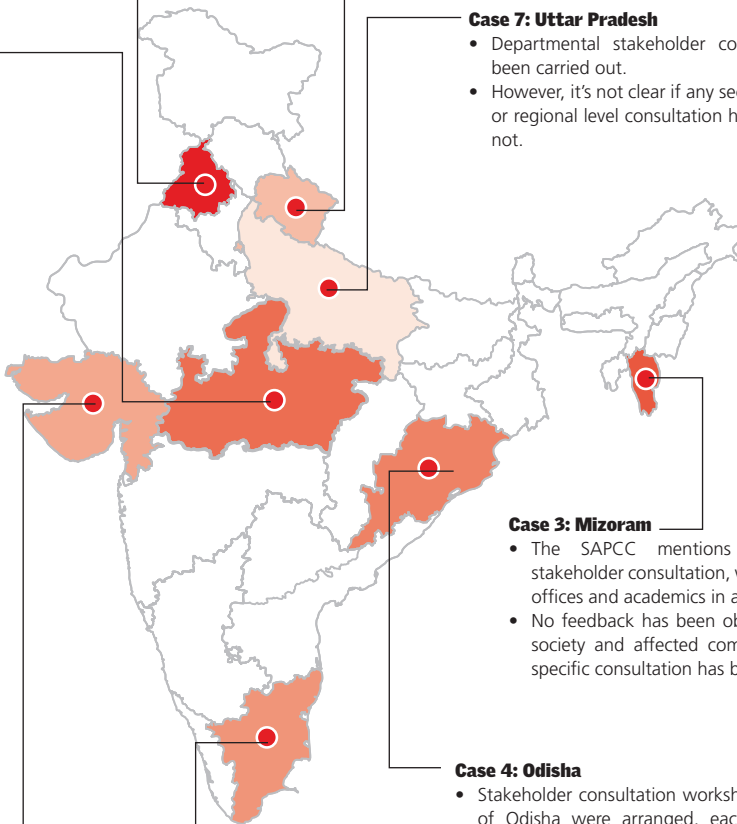
- Departmental stakeholder consultations have been carried out.
- However, it's not clear if any sectoral and district or regional level consultation have been held or not.

Case 3: Mizoram

- The SAPCC mentions just one generic stakeholder consultation, with only government offices and academics in attendance.
- No feedback has been obtained from the civil society and affected communities. No sector-specific consultation has been carried out.

Case 4: Odisha

- Stakeholder consultation workshops in different regions of Odisha were arranged, each discussing a specific sector in detail.
- These stakeholder consultations concluded with a synthesis stakeholder workshop that covered all 11 sectors.
- The extent of involvement of local vulnerable communities in the stakeholder consultations is not clear.



Source: State Action Plans on Climate Change

Table 2: Budget requirement under SAPCCs

S. no.	State	Budget requirement under SAPCC (in Rs crore)	Timelines, if mentioned
1	Gujarat	24,775	2014–19
2	Madhya Pradesh	4,700	-
3	Punjab	58,796	12th Five Year Plan (2012–17)
		64,731	13th Five Year Plan
4	Uttar Pradesh	46,946	2014–18
5	Uttarakhand	8,833	For five years
6	Odisha	17,000	2010–15
7	Mizoram	3,675	2012–17
8	Tamil Nadu	4,04,455	12th Five Year Plan (2012–17)
		4,11,335	13th Five Year Plan

Source: State action plans on climate change

LACK OF CLARITY ON CLIMATE FINANCE

It seems that states were under the impression that the Central government or international climate change finance will provide money for implementation of the projects under SAPCC and this was a motivating factor for many states to prepare SAPCCs. Interviewed officials indicated that some parts of SAPCCs appeared to have been made out of greed and not for specific need. The activities proposed in the SAPCCs were not always central to the problem, but were sometimes means to obtain money from the Centre. This resulted in arbitrary financial demands by the states, not always in sync with their requirement or the action they were planning to take. For example, Madhya Pradesh demanded Rs 5,000 crore, while Tamil Nadu demanded Rs 400,000 crore, even though the later has slightly less population.

This resulted into huge variations in budget requirement by states (see *Table 2: Budget requirement under SAPCCs*). Budget given in SAPCCs are indicative and just a rough estimate.

BOTTOM-UP APPROACH AND COMMUNITY PARTICIPATION MISSING

Dealing with current vulnerabilities and projected climate change impacts will require innovative thinking and participatory planning and action. A serious stakeholder engagement, especially with vulnerable communities, will be required throughout, from inception through policy development, implementation and monitoring. Participation of stakeholders and the involvement of vulnerable communities is missing from most SAPCCs.

The traditional knowledge of communities (including their holistic approach towards community and environment) and successful models run by communities and NGOs have not been identified or considered for mainstreaming under most SAPCCs. This is a classic example of poor utilization of knowledge and resources. It seems that most vulnerable section of community based on socio-economic conditions, geography, gender etc. have not been identified, which should be prioritized for adaptation actions.

A top-down approach has been followed in planning and implementation, but research suggests that to get effective results at the ground level, top-down approach must be integrated with bottom-up approach.

No standard reference document or framework was provided to the states by the Centre for bottom-up planning. Madhya Pradesh claims it has tried to adopt a bottom-up approach to develop its SAPCC, whereby a series of consultation workshops were organized with identified climate-sensitive line departments (sectoral) and across the state in all the 11 agro-climatic zones. However, other states like Mizoram, Odisha, Gujarat, Punjab, Uttar Pradesh and Tamil Nadu have not done any bottom-up planning, even though the SAPCCs of some states state that it should be done. A balanced integration of top-down planning with bottom-up planning is the key to true success of any adaptation efforts at the local level. Climate change action has to take place at the local level but taluka, district and local level planning is missing in all the states—even though some states like Kerala say that they are planning to make adaptation plans at taluka and district level.

ADDITIONALITY OF CLIMATE ACTIONS NOT IDENTIFIED

Climate change is not a standalone subject, it needs to be factored into decision making process for larger development. Mainstreaming climate adaptation within development planning processes is not a simple linear technical or bureaucratic process. Mainstreaming adaptation requires considering current and future climate risks at every stages in the decision making process. For mainstreaming to take place, it is essential to build capacity at various levels including the policy level, scientific and technical levels and at the grassroots implementation level. Most states have not taken even the first step required to mainstream adaptation.

Most states have not conducted a detailed comprehensive vulnerability assessment so far, even though it has been proposed in their SAPCCs. It is very difficult to identify entry points to set the stage for mainstreaming adaptation into development planning and policies under such circumstances. SAPCCs have simply mentioned the adaptation strategies for various sectors without giving any details about how they intend to mainstream them.

States have not been able to distinguish between business-as-usual development activities and additional actions required for climate change in their SAPCCs. In the absence of identification of additional action needed for climate change, there is no specific priority for implementation of such action.

Further, sector-wise key priorities have been identified by many states like Gujarat, Madhya Pradesh, Mizoram, Odisha and Tamil Nadu. In states like Punjab, very broad activities have been mentioned in the SAPCCs, but such activities have neither been linked with existing policies and programmes, nor has any new policy or programme been proposed in connection with them. Therefore, there is no clarity on how states are planning to implement such activities.

NO EFFECTIVE INSTITUTIONAL FRAMEWORK FOR MONITORING AND EVALUATION

States have proposed a variety of institutional frameworks to oversee the implementation and monitoring of SAPCCs. States have also established climate change departments and cells as a focal point for all the processes related to their SAPCCs. Different departments like environment, forest, science and technology etc. have been made nodal departments in different states. In most cases, a state-level steering committee chaired by the Chief Secretary or Chief Minister has been formed. Uttar Pradesh government has even announced a state climate change authority, becoming the first state in India to do so.

DESPITE HAVING LONGEST COASTLINE, GUJARAT NEGLECTS ITS COASTAL AREAS IN ITS SAPCC

Gujarat has the longest coastline (1,663 km) among Indian states, approximately 22 per cent of the total coastline of India. This coastline is highly vivid and distinct from others in terms of geomorphology, natural resources and human activities, making it extremely climate sensitive. The coastal areas extend from Rann of Kutch through the little Rann of Kutch and low-lying delta region of Bhadar, Bhogavo, Sabarmati, Mahi Dhadar, Narmada and Tapi rivers.

With almost 37 per cent population living along the coast and being an economically active zone, the coastal regions of Gujarat are highly vulnerable to the impacts of climate change. The coastline supports large sections of poor vulnerable population. The economy of Gujarat is linked to the coastal region very significantly and depends upon coastal resources. Rising sea levels pose a threat to the coastal infrastructure as they can lead to inundations, flood and storm damage in case of cyclones, erosion, saltwater intrusion and wetland loss.

Despite being such an important sector for the state, a comprehensive action plan regarding overall coastal zone management in the context of climate change is not adequately featured in the SAPCC. Existing coastal zone development plans fail to take into account rising sea levels. This will put people, industries and basic infrastructure at risk.

Gujarat government's claim of 25,000 ha of mangrove forest being added in the coastal areas of Gujarat is also being rejected by environmental activists and member of Coastal Zone Management Authority. Activists say that a well-planned bio-shield along the coastline is the immediate need of the hour, and it is not clear from the SAPCC if there has been adequate focus on the bio-shield in the SAPCC. They allege that stakeholder consultation has not been done appropriately and community has not been involved in the planning process.

A conceptual monitoring and evaluation (M&E) framework has been proposed by the states in their respective SAPCCs. However, in practice, M&E for the activities mentioned under SAPCCs have been almost non-existent.

Usually, governments do not effectively monitor and evaluate their development policies, plans and programmes. Generally, they only measure expenditures and adherence to processes rather than results, as this risks exposing poor performance.²⁶ Under such circumstances, we don't know, how much we can depend on any specific development plan for achieving climate adaptation objectives to build resilience and fight climate change.

As such, currently, it is very difficult to understand the actual implementation of any ongoing activities linked to the SAPCCs. Interviewed officials are of the view that existing ongoing developmental schemes, as mentioned in SAPCCs, are being implemented by respective state governments in a business-as-usual manner. This state of affairs makes it very difficult to monitor climate change components of general developmental activities.

5 Assessing SAPCCs

We have analyzed the selected SAPCCs on two indicators. One, by comparing the estimated sectoral budgetary allocations with vulnerabilities. Two, by examining the very vulnerable agriculture sector, with more than half on the country's population dependent on it, in terms of climate impacts and vulnerabilities vs proposed adaptation strategies.

INDICATOR 1: FINANCIAL ALLOCATION VS VULNERABILITIES

Finance is a crucial requirement for formulating and implementing climate adaptation strategies. Budgetary allocation demanded for a specific sector is an important indicator to understand the perceived climate vulnerability and challenges faced by that specific sector within states. Further, it helps to understand the priorities given to different sectors by a state. Therefore, it is very important to understand the estimated budget allocation to each sector within states. We have broken down and analyzed the sector-wise budget estimation for the eight selected states.

The priority given to different sectors varies greatly—an overview of the SAPCC budgetary preoccupations of the states under consideration is presented in the following pages.

WILL SAPCCs INCREASE FARMERS' ADAPTIVE CAPACITY TO CHANGING CLIMATE?

Agriculture is the main source of livelihood for almost 60 per cent of the country's population. Any impact of climate change on agriculture will, therefore, be severely felt. It has been projected that under the increasing temperature scenario, the productivity of many crops like wheat, rice and maize etc. will decrease significantly. Unpredictable weather will also play a gamble with farmer's lives. Extreme weather events like floods, droughts, hailstorms, cyclones, and sudden excessive rainfall have caused widespread crop devastations in different parts of the country in recent years. Farming is one of the most risky professions and the farming community is one of the most vulnerable due to climate change. Our country is already passing through an agrarian crisis—economical, ecological and existential.

Other than these challenges, Indian farmers are also facing serious challenges related to fair and remunerative crop pricing. Every other day, farmers are protesting in one or another part of country—mostly because of non-realization of fair prices for their farm produce. This is pushing the farmers into a never-ending debt cycle and some studies have linked Indian farmer suicides with climate change as well.²⁷

Under the changing climate scenario, the agriculture sector will require prioritization in following areas, especially because a majority of Indian farmers fall under the small and marginal category.

- Promotion of agro-ecological and other sustainable farming practices and less dependency on market for farming inputs
- Extension services for sustainable agriculture technologies and cropping patterns
- Farmer income protection strategies, state procurement support, MSP programmes and guarantees of fair prices
- Financial safety nets in the form of crop insurance, relief and compensation to farmers
- Credit support to marginal, small and medium farmers
- Specific weather-based usable agro-advisories to farmers
- Promotion of climate-resistant indigenous seed varieties and soil and soil health management
- Need for effective institutional mechanism for implementation

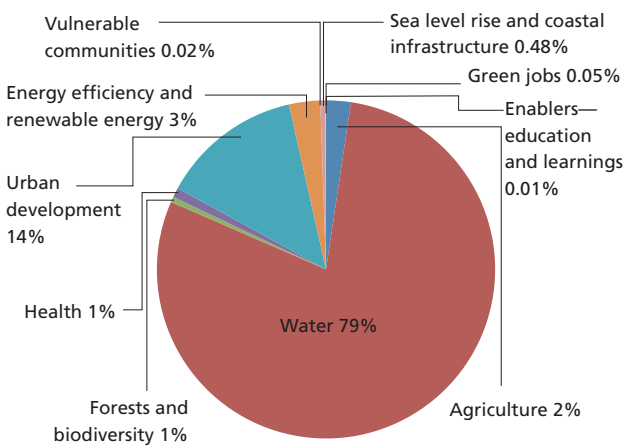
However, climate change adaptation strategies proposed for the agriculture sector in most states focus only on some of the general strategies and lacks a comprehensive approach. For example, almost all states completely ignore or do not pay adequate attention to the income security of farmers, thereby reducing their adaptive capacity. Pertinently, the estimated budgetary allocation for the agriculture sector in most SAPCCs is relatively small.



Gujarat

Observations: Gujarat has provisioned close to 80 per cent of the estimated budgetary allocations to the water sector alone. Second priority has been given to urban development. Despite agriculture providing livelihood to more than half of Gujarat’s workforce and contributing 18.3 per cent of the state’s GDP, it has obtained a mealy 2 per cent of the estimated allocations. Similarly, forests and biodiversity sector has been allocated a mere 1 per cent, despite the fact that this climate-vulnerable sector constitutes 11.04 per cent of the total geographical area of the state. Further, Gujarat has an over 1,600 km-long coastline and close to six million people live in the coastal region, which is vulnerable to potential sea level rise, flooding, cyclones and damage to infrastructure. Despite this, only 0.4 per cent of the estimated budgetary allocations have been provisioned for the coastal region.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Agriculture	585	2
2	Water	19,616	79
3	Forests and biodiversity	129	1
4	Health	226	1
5	Urban development	3,348	14
6	Energy efficiency and renewable energy	736	3
7	Vulnerable communities	4.2	0.02
8	Sea-level rise and coastal infrastructure	118	0.48
9	Green jobs	12	0.05
10	Enablers—education and learnings	1.36	0.01
	Total	24,775	



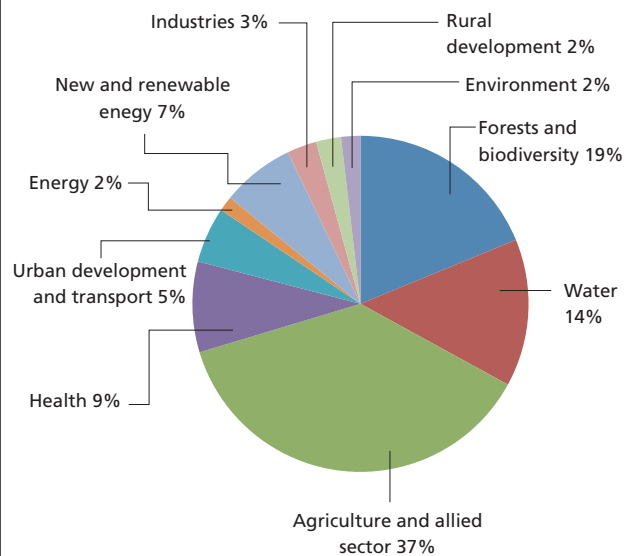
Source: State action plan on climate change



Madhya Pradesh

Observations: Madhya Pradesh has given importance to agriculture, forest and water sectors. This is in line with the fact that more than 70 per cent of the population lives in rural area and relies on primary sectors like agriculture and forestry for livelihood. These natural resources-based livelihood sources are expected to be impacted more by climate change as compared to other sectors. There seems to be a relatively better distribution of financial requirements among different sectors. However, energy sector has been neglected by merely providing 1 per cent of the estimated budgetary allocation.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Forests and biodiversity	883	19
2	Water	667	14
3	Agriculture and allied sectors	1,756	37
4	Health	410	9
5	Urban development and transport	252	5
6	Energy	68	1
7	New and renewable energy	330	7
8	Industries	134	3
9	Rural development	113	2
10	Environment	87	2
	Total	4,700	



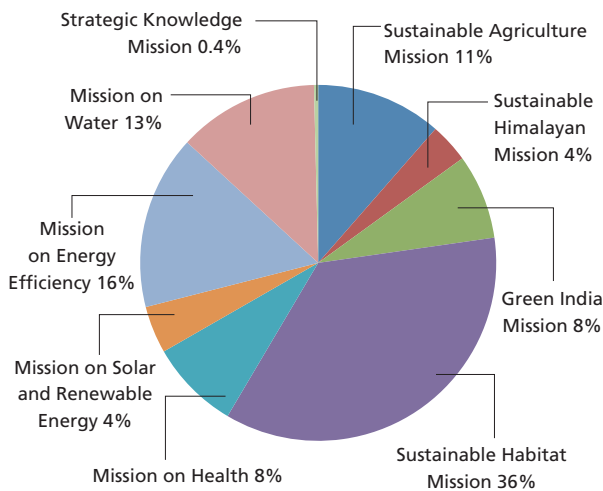
Source: State action plan on climate change



Mizoram

Observations: Mizoram has focused primarily on sustainable habitat sector. The state's economy is predominantly agrarian, with more than 60 per cent of the work force engaged either directly or indirectly in the sector. The SAPCC is aware of a likely increase in the frequency and number of extreme weather events like heavy rainfall but, if the paltry allocations to the water and agriculture sectors are any indication, it fails to meet this challenge. Further, despite being a part of the vulnerable Indian Himalayan region, Mizoram has an estimated allocation of only 4 per cent to the Sustainable Himalayan Mission. The forest cover in the state is around 91.27 per cent of its geographical area—highest in the country. The state is facing major issues like higher deforestation rate and almost two-thirds of the forest area has already been degraded. Despite this, the Green India mission has been allocated only 8 per cent of the total estimated budgetary allocations.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Sustainable Agriculture Mission	421	11
2	Sustainable Himalayan Mission	131	4
3	Green India Mission	284	8
4	Sustainable Habitat Mission	1,315	36
5	Mission on health	302	8
6	Mission on solar and renewable energy	158	4
7	Mission on energy efficiency	582	16
8	Mission on water	470	13
9	Strategic Knowledge Mission	14	0.4
	Total	3,675	



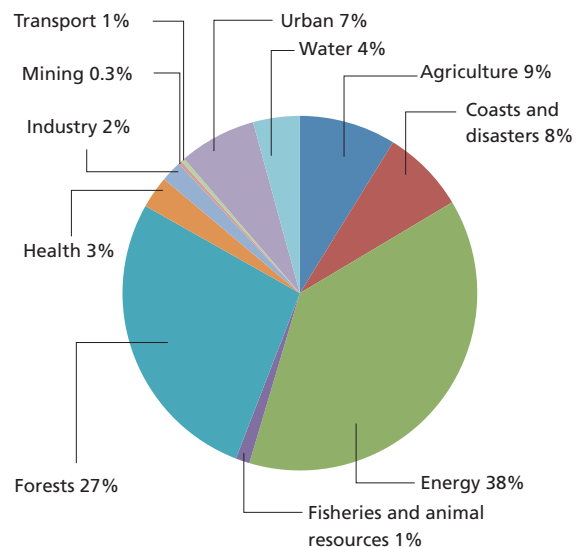
Source: State action plan on climate change



Odisha

Observations: Odisha has given main importance to the energy and forest sectors, with 38 per cent and 27 per cent estimated allocations respectively. With a 480 km-long coastline, the state is prone to climate-mediated cyclones and coastal erosion, and water resources are dependent on monsoons. More than 80 per cent of the state's population is prone to one or more forms of natural disasters—mostly in the coastal belt, floodplains and drought-prone regions. About 80–85 per cent of the state's population is rural and virtually dependent on agriculture. Livestock and crop losses due to climate change are, therefore, a major issues. Yet, the respective estimated budgetary allocations to the agriculture, coast and disasters, and water sectors are 9, 8 and 4 per cent.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Agriculture	1,500	9
2	Coasts and disasters	1,300	8
3	Energy	6,500	38
4	Fisheries and animal resources	217	1
5	Forests	4,650	27
6	Health	500	3
7	Industry	325	2
8	Mining	55	0.3
9	Transport	60	0.4
10	Urban	1,200	7
11	Water	725	4
	Total	17,032	



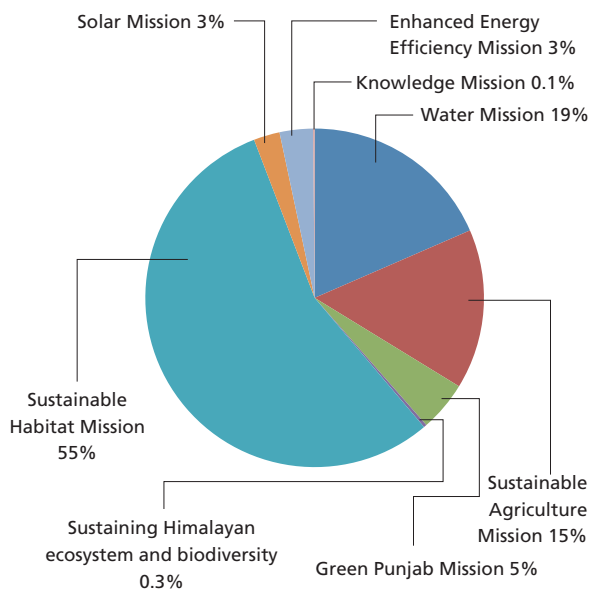
Source: State action plan on climate change



Punjab

Observations: Punjab has given maximum importance to the Sustainable Habitat Mission—with 55 per cent of budgetary allocations. Sustainable Habitat Mission’s focus is on urban areas and, thus, rural areas have been neglected. About 75 per cent of the state’s population is dependent on agriculture and the state, known as the granary of India, produces about 19 per cent of India’s wheat and 11 per cent of its rice. It has consistently contributed 25–50 per cent of the rice and 38–75 of the wheat to the Central pool of food grains over the last four decades. Yet, the agriculture sector has been neglected in the budgetary allocations. Similarly, even though the state is facing a huge water crisis, the water sector does not get a sufficiently large chunk of the budgetary allocations.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Water Mission	10,866	18
2	Sustainable Agriculture Mission	8,979	15
3	Green Punjab Mission	2,811	5
4	Sustaining Himalayan ecosystem and biodiversity	169.5	0.3
5	Sustainable Habitat Mission	32,547	55
6	Solar Mission	1,465.00	2
7	Enhanced Energy Efficiency Mission	1,877.25	3
8	Knowledge Mission	82	0.1
	Total	58,796	



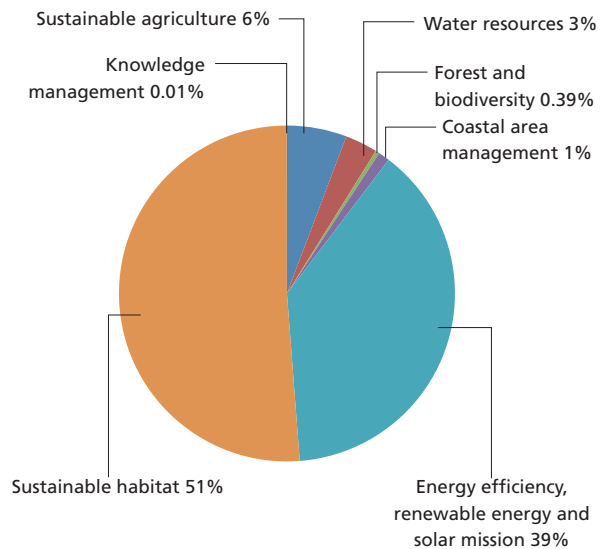
Source: State action plan on climate change



Tamil Nadu

Observations: Tamil Nadu’s estimated SAPCC budget is to the tune of Rs 4 lakh crore, betraying a lack of proper understanding of the principles and objectives behind SAPCC formulation. SAPCCs are supposed to provide the details of fund requirements only for incremental action for climate change. The state has not been able to distinguish the additionality for climate action from business-as-usual development scenario, resulting in a huge demand of funds by the state from the Centre in the name of climate change. Budgetary allocations among different sector in Tamil Nadu also show the misplaced priority imbalance, as sustainable habitat sector has gained significantly more importance compared to other relatively more climate-vulnerable sectors like coastal area management, agriculture and water. Even though the contribution of the agriculture sector to the GDP has decreased to 8 per cent, it still provides livelihood to 45 per cent people of the state and could do with more money.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Sustainable agriculture	23,251	6
2	Water resources	12,626	3
3	Forest and biodiversity	1,567	0.39
4	Coastal area management	4,420	1
5	Energy efficiency, renewable energy and Solar Mission	155,438	38
6	Sustainable Habitat Mission	207,104	51
7	Knowledge management	49	0.01
	Total	404,456	



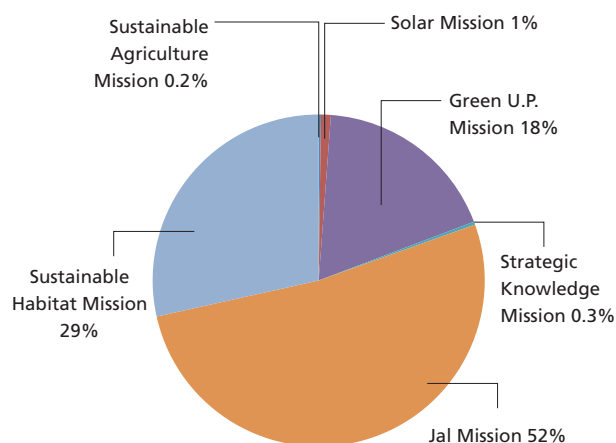
Source: State action plan on climate change



Uttar Pradesh

Observations: Maximum priority has been given to the water sector, and Sustainable Habitat and Green U.P. Missions. The water sector is highly vulnerable to climate stress and has obtained significant fund allocations. However, it is quite surprising to see that merely 0.2 per cent of the estimated budgetary allocations have been made for the agriculture sector, even though around 70 per cent population of the state is dependent on agriculture and the state's farming community is already the worst affected because of climate change. Farmers in the state have suffered huge crop losses in recent years because of extreme weather events like drought, flood, hailstorms etc. Despite this, important concerns like increasing adaptive capacity of vulnerable farming communities etc. have been completely ignored. Sustainable Habitat Mission, with 28 per cent of the budgetary allocations, has skewed the rural-urban balance in the SAPCC because the Mission mostly works in the urban areas.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Sustainable Agriculture Mission	103	0.2
2	Solar Mission	450	1
3	Energy Efficiency Mission		
4	Green U.P. Mission	8,481	18
5	Strategic Knowledge Mission	136	0.3
6	Jal Mission	24,401	52
7	Sustainable Habitat Mission	13,376	28
	Total	46,946	



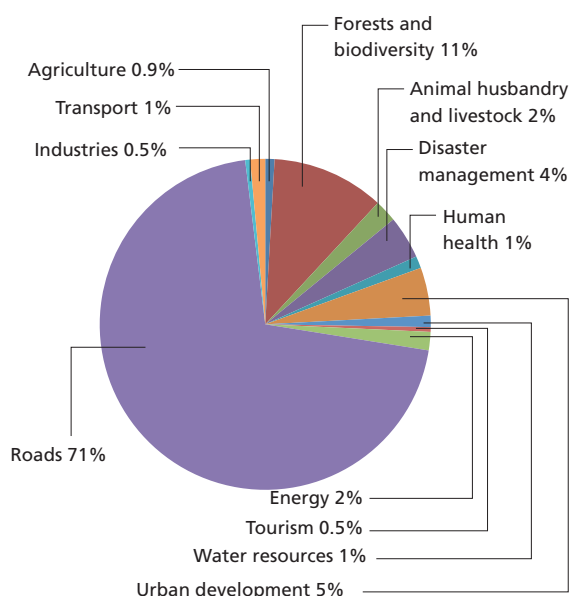
Source: State action plan on climate change



Uttarakhand

Observations: Uttarakhand has given maximum importance to roads as more than 70 per cent of the budgetary allocations are provisioned for this sector, at the cost of climate-vulnerable sectors like disaster management, agriculture and water sectors. This despite the fact that the livelihood of the majority of the people in the state is almost entirely dependent on natural resources like water, forest, agriculture etc. Three-fourths of the state's population is rural and virtually dependent on agriculture, yet the sector has been allocated merely 0.9 per cent of total budgetary. Further, the SAPCC clearly lists the major disaster risks in the state like receding glaciers, flash floods due to glacial melting, and erratic rainfall etc., but adequate attention in terms of fund allocation has not been paid to them.

S. no.	Sector	Sector-wise estimated allocation (in Rs crore)	Percentage of total budget
1	Agriculture	80	0.9
2	Forests and biodiversity	971	11
3	Animal husbandry and livestock	193	2
4	Disaster management	371	4
5	Human health	104	1
6	Urban development	415	5
7	Water resources	98	1
8	Tourism	41	0.5
9	Energy	158	2
10	Roads	6,230	71
11	Industries	43	0.5
12	Transport	129	1
	Total	8,833	



Source: State action plan on climate change

Table 3: Comparison of agriculture budgets of different states

State	Estimated agriculture budgetary allocation in the SAPCC (in Rs crore)	Share of agriculture in total estimated budgetary allocation (in per cent)
Gujarat	585	2
Madhya Pradesh	1,756	37
Mizoram	421	11
Odisha	1,500	9
Punjab	8,979	15
Tamil Nadu	23,251	6
Uttar Pradesh	103	0.2
Uttarakhand	80	0.9

Source: State Action Plan on Climate Change

INDICATOR 2: IMPACTS AND VULNERABILITIES VS ADAPTATION STRATEGIES IN THE AGRICULTURE SECTOR

Agriculture sector in India still accounts for a substantial part of GDP (16 per cent) and employment (49 per cent). Agriculture sector is one of the most climate-vulnerable sector in India. Economic survey of 2018 says that climate change could reduce annual agricultural incomes in the range of 15 per cent to 18 per cent on average, and up to 20 per cent to 25 per cent for unirrigated areas. This will result in reduced adaptive capacity for more than half of the population of the country and present a huge challenge to the food security.

Almost all the SAPCCs recognize importance of agriculture sector in the context of climate change. The estimated budgetary allocation for the agricultural sector varies widely between states. It is a reflection of the ground realities in a particular state, but also a result of the arbitrary factors mentioned in the previous chapter (see *Table 3: Comparison of agriculture budget of different states*). For example, a charismatic officer pleading on behalf of a particular department may manage to obtain a larger share in the budget, irrespective of concrete needs. Therefore, an attempt to draw a comparison between the “actual” requirements and those allocated under the budget would be instructive.

Ideally, estimated budgetary allocation for the agriculture sector should reflect its relative importance in the state and the work needed to counter effects of climate change. Flagship schemes like Pradhan Mantri Fasal Bima Yojana, Soil Health Cards etc. should also be reflected in updated SAPCCs.

GUJARAT

Impacts and vulnerabilities identified

Agriculture is the primary source of livelihood for more than half of the workforce of the state. No comprehensive climate change impacts and vulnerability assessment has been carried out for the state, but, broadly speaking, following are the key vulnerable areas identified in the SAPCC:

Drought because of erratic rainfall: Inconsistent and inadequate rainfall is a limiting factor for the growth of kharif crops in the state, as most of the kharif crops are rain-fed. The incidence and distribution of rainfall, particularly in Saurashtra and Kutch regions and in the northern part of the state, is highly erratic and the regions often face drought situations.

Salinity: Gujarat has a long coastline. With rising sea levels and others changes related to climate change, the ingress of salinity is becoming a problem for agriculture and animal husbandry. A gradual shift in cropping patterns, decline in the area under horticulture and reduction in the yield of crops has been observed in almost all coastal districts. Lack of fodder and the health impacts on animals have affected the animal husbandry sector.

Additionally:

- ❖ Temperature has been identified as the main factor limiting the productivity of rabi crops like wheat and mustard.
- ❖ Irrigated rice and wheat yield will decline in the near future in many regions.
- ❖ Coastal areas are projected to lose up to 40 per cent coconut yield because of high summer temperatures.
- ❖ Standing crops in coastal regions are also more likely to be damaged due to cyclonic activity.

Proposed key adaptation strategies

- ❖ Establishing animal hostels in various districts of the state, improved animal husbandry activities through disease monitoring, and providing adequate care to animals.
- ❖ Soil and water conservation, improvement in depleting groundwater tables and increasing productivity.
- ❖ Soil health improvement through use of bio-fertilizers.
- ❖ Research on climate change implications on crop growth.

Observation: It is clear that key adaptation strategies proposed for agriculture sector in the state are not designed to respond adequately to the impacts and vulnerabilities identified in the SAPCC. Important issues like drought, salinity, and decreased crop yield have not been addressed appropriately. It seems that agriculture sector has been neglected as the SAPCC budgetary allocation for the agriculture is merely 2 per cent of the total.

MADHYA PRADESH

Impacts and vulnerabilities identified

About 70 per cent rural population of the state is engaged in the primary sector covering agriculture, horticulture, animal husbandry, fisheries and dairy development. A decline in wheat and soybean productivity by 14–20 per cent and 14–17 per cent respectively is predicted by 2030.

Climate change impact assessment for wheat and soybean have been done in four districts of the state.

Vulnerabilities identified in the agriculture sector are as follows:

- ❖ Extreme events like unprecedented frost, excess rain and high temperatures have resulted in huge losses in productivity. Shifting of rainfall patterns affects cropping patterns as well.
- ❖ Mono-cropping reduces crop diversity and adversely affects soil health.
- ❖ Horticultural crops are also sensitive towards changing climate.
- ❖ Lack of availability of water is a major constraint for horticultural crops, particularly in drought-like situations.
- ❖ Storms and hailstorms induce damage to horticultural crops during flowering and fruit-bearing stages.

- ❖ Rise in temperature can lead to the emergence of new pests against which plants do not have resistance. Many new diseases have been observed in fruit plants due to change in climatic parameters. There is a threat of extinction of coarse grains or millets.
- ❖ Heavy rains also impose physical damage on trees and fruit plants.
- ❖ Deteriorating soil health, lack of awareness about soil nutrition and irrigation management among farmers at large.
- ❖ Overdependence on groundwater for irrigation.
- ❖ Climate-induced shift in cropping patterns.
- ❖ Burning agri-residues in fields.
- ❖ Use of energy-intensive water pumps.
- ❖ Absence of real time data and information management systems.

Proposed key adaptation strategies

- ❖ Promoting use of soil and water conservation technologies. Planning cropping systems suitable for each agro-climatic condition.
- ❖ Capacity-building for sustainable agriculture.
- ❖ Management of climate risk for sustainable productivity.
- ❖ Enhancing dissemination of new and appropriate technologies developed by researchers and strengthening research further.
- ❖ Building institutional mechanisms for the climate change action plan.
- ❖ Creation of rural business hubs and accessibility to markets.

Observation: The proposed adaptation strategies in the state are relatively broad and have the potential to address major impacts and vulnerabilities mentioned in the SAPCC. The estimated budgetary allocation demanded for the agriculture sector is 37 per cent of the total allocations under the state's SAPCC.

MIZORAM

Impacts and vulnerabilities identified

As such, no comprehensive climate change impacts and vulnerability assessment has been carried out in Mizoram for the agriculture sector. However, the following broad issues and impacts have been identified:

Warm and humid summer and cold winters: Erratic precipitation and the consequent haphazard adjustments in the cropping seasons, heavy crop loss due to submergence or lack of timely precipitation.

Traditional *jhum* cultivation: Deforestation, reduction in carbon sinks, soil erosion and land degradation, and livelihoods affected.

Use of fertilizers: Reduction in carbon sinks.

Increase in vector borne diseases: High mortality of farm animals.

Proposed key adaptation strategies

- ❖ Development of land (levelling, bundling etc.) for wetland rice cultivation (WRC) on available lands having upto 10 per cent slope and improvement of existing WRC.
- ❖ Developing databases 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-checkdams for irrigation.
- ❖ An assessment study and demonstration of systematic rice intensification (SRI) cultivation and capacity building to train farmers in latest rice cropping techniques, especially 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*.
- ❖ Construction of hill slope terraces for conservation of moisture and cultivation of food grains, 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 storage for perishable crops and promotion of winter cultivation practices.
- ❖ Promotion of organic farming through usage of compost and vermi-compost.
- ❖ Adoption of integrated pest management for improved crop yield, preparedness to tackle emerging scenarios of pests and capacity building of stakeholders.
- ❖ Research study on livestock diseases and establishment of an early warning system, and capacity building of stakeholders.
- ❖ Study of impact of climate change on indigenous fauna of aquatic ecosystems and open waters.
- ❖ Storage of water 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.
- ❖ Waterbody conservation for the fishery sector and establishment of fishery units in reservoirs and riverine areas.
- ❖ Greening devastated barren wasteland (7,000 hectares) for fodder cultivation.

Observation: The adaptation strategies proposed for agriculture sector are very broad but in the absence of a comprehensive climate change impacts and vulnerability assessments for agriculture sector, it is not clear if they will be sufficient to deal with climate impacts and vulnerabilities. Around 11 per cent of total SAPCC budget has been proposed for the agriculture sector.

ODISHA

Impacts and vulnerabilities identified

No comprehensive climate change impacts and vulnerability assessment has been carried out in the state for the agriculture sector, though the SAPCC has proposed it.

Proposed key adaptation strategies

- ❖ Rapid screening and strategy assessment of state agriculture policy.
- ❖ Establishing an effective institutional delivery mechanism to promote best practices on climate change.
- ❖ Undertaking capacity building.
- ❖ Continuing livelihood-focused, people-centric integrated watershed development in rain-fed areas.

- ❖ Increasing the area under perennial fruit plantation.
- ❖ Developing water use-efficient micro-irrigation methods and individual or community farm ponds.
- ❖ Improving monitoring and surveillance techniques.
- ❖ Developing sustainable soil, water and crop management practices.
- ❖ Breeding studies on major crops for tolerance or resistance.
- ❖ Conducting climate-linked research studies.

Observation: Due to lack of availability of comprehensive impacts and vulnerability assessments on agriculture sector, it is not clear if the proposed adaptation strategies in the state will be able to effectively address climate change. Proposed budgetary allocation for the agriculture sector is 9 per cent of the total budgetary allocation under SAPCC.

PUNJAB

Impacts and vulnerabilities identified

Studies carried out in the state indicate that productivity of rice is likely to decline by 0.16–9.6 per cent as the temperature rises by 0.5–2°C in the future. Yields of wheat are already declining and reduce by 4.6–32 per cent. The production of cotton is also going to suffer. Potato yield is likely to decrease by 7.2 per cent and horticulture crops in general show a decline in yields with rise in temperature. In the case of livestock too, temperature increase beyond a certain level affects them negatively.

Proposed key adaptation strategies

- ❖ Promote crop diversification as per the suitability of production in different agro-climatic zones and take advantage of efficiency of C3 vs C4 crops in the enhanced CO₂ environment.
- ❖ Sustainably manage crop residue to avoid ill-effects of farm burning of crop residue in Punjab and also benefit from management of the same.
- ❖ Promote resource conservation of soil, water and energy.
- ❖ Formulate agriculture market intelligence cells within the department of agriculture in order to adjust the production systems each year which have to be aligned according to the variable climate as well as to the demands of the markets after meeting the basic demand of food security of the state.
- ❖ Develop cultivars and enhance germplasm base that are (a) thermal resistant, (b) can withstand water stress, (c) can grow in waterlogged areas, (d) withstand emerging pests and diseases, and (e) withstand enhanced levels of CO₂.
- ❖ Diversify into value-addition activities to avoid waste of agriculture produce and increase storage capacity of grains to ensure farmer incomes in a changing climate scenario.
- ❖ Promote cooperative farming amongst marginal, small and medium farmland owners to reduce input costs, and maximize productivity and farm incomes, thus ensuring livelihood security and income for farmers.
- ❖ Manage climate risk through insurance and by assessing the socio-economic impacts of climate change on agriculture.

Observation: A comprehensive climate impacts and vulnerability assessment is lacking for the agriculture sector. Therefore, it is not clear if the proposed adaptation strategies will be sufficient to address the challenge. Proposed budgetary allocation for agriculture is 15 per cent of total budgetary allocations under SAPCC.

TAMIL NADU

Impacts and vulnerabilities identified

There is no systematic study to assess the direct and indirect effects of climate change on agriculture and allied sectors in the state. However, some of the impacts have been identified as follows:

- ❖ Continuous increase in ambient temperature.
- ❖ Increase in frequency and intensity of droughts.
- ❖ Increase in intensity of cyclones and floods.
- ❖ Increase in heavy precipitation events.
- ❖ Adverse impacts on yield of crops like rice, sorghum etc.

Proposed key adaptation strategies

- ❖ Research and development on crop seasons, water conservation, integrating water usage, effect of change in temperature and humidity, varietal development for rice and pulses that will tolerate weather changes and different soils.
- ❖ Climate profiling research mainly on agronomic practice and popularizing the same with extension strategies to mitigate extreme weather events.
- ❖ Countering sea water incursion.
- ❖ Soil conservation strategies.
- ❖ Water conservation strategies.
- ❖ Weather mitigation.
- ❖ Green cover for coastal calamities.
- ❖ Promotion of inland fishing.
- ❖ Promoting inland fisheries for effective utilization of water bodies.
- ❖ Brackish water aquaculture for utilizing saline areas for shrimp or fish production.
- ❖ Strategies for animal husbandry and dairy development sector.

Observation: Due to lack of availability of comprehensive climate change impacts and vulnerability assessments on agriculture sector, it is not clear if the proposed adaptation strategies will be able to effectively address the climate change. Proposed budgetary allocation for the agriculture sector is 9 per cent of the total budgetary allocations under the SAPCC.

UTTAR PRADESH

Impacts and vulnerabilities identified

- The state forms an important component of India's overall agricultural story as it contributes about 20 per cent food grains to the national food basket. The state is a major producer of wheat (34 per cent), rice (13 per cent), pulses (14 per cent), sugarcane (35 per cent), potato (37 per cent), vegetables (16 per cent) and milk (18 per cent) in the country.
- Available trends indicate that agricultural productivity will decline up to 25 per cent in irrigated areas which could be as much as 50 per cent in rain-fed areas.
- Dominance of small and marginal farmers (about 92 per cent) with small land holdings will make the state more vulnerable to climate change.
- Inconsistent and erratic monsoon and water scarcity has substantially affected the crop yields, cropped area and livestock in the Bundelkhand region in the last four–five years.
- Considering the increasing population and limited availability of natural resources, agricultural productivity needs to continuously increase to meet the growing demand for food despite the adverse impacts of changing climate.

Proposed key adaptation strategies

- ❖ Establishment of climate change and agriculture cells, and coordination and monitoring.
- ❖ Identification of vulnerable areas and assessing vulnerability.
- ❖ Establishment of climate field schools (CFS) at the block-level.
- ❖ Promotion of carbon sequestration agricultural practices.
- ❖ Pilot projects for use of organic manures (one village per block per year).
- ❖ Soil management practices (farm machineries in adopted villages).
- ❖ Farming system approach for diversifying incomes and livelihoods (10 farmers from each identified village).
- ❖ Diversification of cropping systems and promotion of biotic stress-tolerant crop varieties in identified villages.
- ❖ Popularization of aerobic rice cultivation methods in identified rice villages.
- ❖ Popularization of agro-forestry in identified villages.
- ❖ Climate responsive research programmes.

Observation: There seems to be lack of sincerity and commitment in dealing with the agriculture sector as only 0.2 per cent of the total proposed budgetary allocations under the SAPCC has been set aside for the agricultural sector. This despite the fact that the SAPCC itself states that Uttar Pradesh's agriculture sector contributes significantly not only to state but to the entire country. Again, comprehensive climate change impacts and vulnerability assessments on agriculture sector are completely missing.

UTTARAKHAND

Impacts and vulnerabilities identified

No detailed vulnerability and risk assessment of climate change on the agricultural sector in the state currently exists.

Proposed key adaptation strategies and observation

A broad range of adaptation strategies including improving scientific knowledge and evidence-based understanding of climate change have been proposed. Due to lack of availability of comprehensive climate change impacts and vulnerability assessments, it is not clear if the proposed adaptation strategies in the state will be able to effectively address the climate change. Proposed budgetary allocation for the agriculture sector is merely 0.9 per cent of total budgetary allocation under the SAPCC. Further, animal husbandry and livestock sector budget, which is also associated with agriculture sector, is 2 per cent of the proposed SAPCC budget.

We observed a mismatch between identified climate impacts, vulnerabilities for agriculture sector and the corresponding strategies proposed to address the same. Further, it was found that most of the selected states have still not conducted a comprehensive climate impacts and vulnerability assessment for the agriculture sector. Therefore, proposed adaptation strategies seem more like a generic wishlist than a clear plan of action to address the current and future climate vulnerabilities in the sector adequately.

6 Conclusions

SAPCCs—BABY STEP FACING HUGE CONSTRAINTS

In general, existing SAPCCs have proven as just the first step for the states to start the conversation about climate change in a comprehensive manner. There are many constraints and challenges in the preparation of SAPCCs. These include limited understanding of climate change by government officials, and lack of resources and time. Therefore, it is good that SAPCCs have been kept as dynamic documents, so that they can evolve as more sensitization, experience and expertise is achieved by government officials, new research is done, and breakthroughs achieved in climate change-related knowledge. This will also achieve a fine-tuning of the demand and utilization of funds over time.

CHANCE OF DIRECTIONAL SHIFT IN POLICY LOST

While some states have taken a proactive approach and put in a lot of effort in the preparation of their SAPCCs, by carrying out comprehensive stakeholder consultations and vulnerability assessments, most SAPCCs give a distinct impression of being prepared only to follow the MoEF&CC instructions. Most SAPCCs miss an appropriate methodology to deal with climate challenges.

NAPCC's call for a "directional shift in the development pathway" of India in response to climate change is not visible in the SAPCCs. The chance of transformative policy initiatives has been lost in the first round of SAPCC formulation. Many states have repeated existing development policies and schemes in their SAPCCs, without properly reviewing them from a climate perspective. Some of these policies might have already failed to make significant impact even in business-as-usual scenario development model. Further, implementing policies and programmes without looking at different perspectives at the local level can also result in maladaptation.

CONTRARY TO EXPECTATIONS, SAPCCs NOT A READY-TO-ACT PLAN YET

Contrary to expectation, SAPCCs are not a ready-to-act plan yet. Climate adaptation strategies given in SAPCCs are broad generalizations, giving the impression of a wish list. Specific, result-oriented action plans with clear-cut expected outcomes are missing. There is no demarcation between business-as-usual and additional activities. Monitoring and evaluation of implementation is poor.

LACK OF FINANCE—STATES LOSING INTEREST IN SAPCCs

The Centre has not allocated any fund to SAPCCs, instead telling states to arrange funds themselves, through Central government schemes like MGNREGA and NAPCC. This has resulted in waning interest in SAPCCs in the states.

Lack of clarity about available funding affects the scope and extent of proposed action under SAPCCs. The number of stakeholders who will benefit from proposed action and the consideration of the interests of marginalized communities on regional, class and gender basis depends heavily on the funds available.

States which are proactive and apply for specific projects fulfilling narrow eligibility criteria are likely to obtain funds from National Adaptation Fund, GCF etc. This may lead to a situation where states which are relatively more climate-vulnerable might not get climate finance if they do not have the right approach or advocacy skills.

Further, there is a capping of Rs 25 crore for obtaining funds from National Adaptation Fund (NAF), even though funds required by states are in thousands of crores. Lack of funds means, in practice, SAPCCs have merely remained documents of intent.

NEED TO REVAMP SAPCCs

In their current form, SAPCCs fall woefully short of dealing with the climate-related challenges India is facing, like increased frequency and intensity of extreme weather events including droughts, heatwaves, rising sea levels, floods, melting glaciers etc. For instance, rural areas in large parts of the country are under stress because agricultural incomes are at an all-time low. Farmer's suicides in India are being linked to climate change but there is no blueprint in the current SAPCCs to mitigate farmers' misery.

Moreover, globally, policy is evolving to not only deal with existing climate challenges but to prepare for future climate vulnerabilities projected by various models and scenarios. States in India must adopt proper scientific, systematic and methodological approaches in a comprehensive and holistic manner. Adjustments in our systems and policies have to be done in response to actual or expected climate stimuli or their effects.

Currently, some states are deliberating upon revising their SAPCCs, even though there is no formal instruction yet in the public domain from MoEF&CC to do so. Technical and funding agencies like GiZ, UNDP etc. are helping states initiate the process. This opportunity should not be missed and should be fully utilized for directional shift on the way development is being approached in these respective states. States are now in a better position to move forward because of their previous experience of formulating SAPCCs, new climate research availability and better understanding of expectations from a viable, useful SAPCCs.

Annexure

DETAILS OF CURRENT CLIMATE CHANGE PROJECTS BEING FUNDED THROUGH NAF, GCF AND AF

NATIONAL ADAPTATION FUND FOR CLIMATE CHANGE (NAFCC)

NAF was established by MOEF&CC to fund concrete action on climate change at the state level. The fund aims to mainstream adaptation into state level development plans and fund demonstration projects that can be scaled up at the state level. A detailed list of the projects funded under the NAF is listed in *Table 4: List of projects funded under National Adaptation Fund*.²⁸

Government of India had established the NAF on climate change with a budget provision of Rs 350 crore for the years 2015–16 and 2016–17, with an estimated requirement of Rs 181.5 crore for the financial year 2017–18. As of now, 27 projects have been approved by National Bank for Agriculture and Rural Development (NABARD). The objective of the Fund is to assist states and UTs which are particularly vulnerable to adverse effects of climate change to meet the cost of adaptation. The Adaptation Fund is meant to assist states that are particularly vulnerable, based on the needs and priorities identified under the SAPCC and the relevant missions under NAPCC.²⁹

CLIMATE CHANGE FUND REQUIREMENTS IN INDIA

The 2016 adaptation finance gap report found that the costs of adaptation in developing countries could range from US\$ 140 billion to US\$ 300 billion per year by 2030.

India also requires huge finance to undertake climate action. This can be understood from the following information compiled from various sources:

- As per an MoEF&CC estimate, a minimum of US \$2.5 trillion (at 2014–15 price) will be required for meeting India's climate change actions between 2015 and 2030.³⁰
- India would need around US \$206 billion between 2015 and 2030 for implementing adaptation actions in agriculture, forestry, fisheries infrastructure, water resources and ecosystems plus other cost.³¹
- Approximate adaptation cost for India in energy sector alone would roughly be about US \$7.7 billion in 2030s. Mitigation activities for moderate low carbon development in India would cost around US \$834 billion till 2030. Economic damage and losses in India from climate change to be around 1.8 per cent of its GDP annually by 2050.³²
- India is losing US \$9–10 billion every year to extreme weather events.³³
- India's expenditure on programmes with critical adaptation components has increased from 1.45 per cent of GDP in 2000–01 to 2.82 per cent during 2009–10. Expenditure on human capabilities and livelihoods, viz., poverty alleviation, health improvement and disease control and risk management, constitutes more than 80 per cent of the total expenditure on adaptation in India.
- Economic survey of India, 2018 says that climate change could reduce annual agricultural incomes in the range of 15–18 per cent on an average, and up to 20–25 per cent for unirrigated areas in India.³⁴

States have been asked by the Centre to arrange funds for their SAPCC activities either from their state budgets or from respective Central government schemes

Table 4: List of projects funded under the National Adaptation Fund

S. no.	Name of project	State	Executing entity	Project outlay (in Rs. crore)
1	Towards climate resilient livestock production system	Punjab	Punjab State Council for Science and Technology, Government of Punjab	17.40
2	Conserving water through the management of run-off in the river basin to reduce vulnerability and enhance resilience for traditional livelihood in Nuapada	Odisha	Department of Water Resources, Government of Odisha	20
3	Sustainable livelihoods of agriculture-dependent rural communities in drought prone districts through climate-smart solutions	Himachal Pradesh	Department of Environment, Science and Technology, Government of Himachal Pradesh	20
4	Model carbon-positive eco-village in Phayeng	Manipur	Directorate of Environment, Government of Manipur	10
5	Management and rehabilitation of coastal habitats and biodiversity for climate change adaptation and sustainable livelihood in Gulf of Mannar	Tamil Nadu	Department of Environment, Government of Tamil Nadu	24.74
6	Promotion of integrated farming system of Kaipad and Pokkali in coastal wetlands	Kerala	Agency for Development of Aquaculture (ADAK), Department of Fisheries, Government of Kerala	25
7	Sustainable agriculture development through expansion, enhancement and modelling	Mizoram	Department of Agriculture (Crop Husbandry), Government of Mizoram	10.38
8	Climate adaptation strategies in wetlands along the Mahanadi river catchment areas	Chhattisgarh	State Centre for Climate Change, Department of Forest, Government of Chhattisgarh	21.47
9	Climate resilient sustainable agriculture in rain-fed farming (kandi) areas	Jammu and Kashmir	Agriculture Production Department, Government of Jammu and Kashmir	22.52
10	Spring-shed development work for rejuvenation of springs for climate-resilient development in the water-stressed areas	Meghalaya	Directorate of Soil and Water Conservation, Government of Meghalaya	22.92
11	Resilient agricultural households through Aadaptation to climate change in Mahbubnagar district	Telangana	Environment Protection Training and Research Institute (EPTRI), Government of Telangana	24.00
12	Integrated surface water management through rejuvenation of 20 tanks and 32 village ponds for climate change adaptation	Puducherry	Department of Science and Technology, Government of Puducherry	16.76
13	Climate resilient interventions in the dairy sector in coastal and arid areas	Andhra Pradesh	Department of Animal Husbandry, Government of Andhra Pradesh	19.83
14	Conservation and management of indigenous varieties of livestock (cattle and sheep) in the wake of climate change	Karnataka	Department of Animal Husbandry and Veterinary Services, Government of Karnataka	24.22

15	Increasing adaptive capacity to climate change through development of climate-smart villages in select vulnerable districts	Madhya Pradesh	State Knowledge Management Centre on Climate Change (SKMCC), EPCO and Urban Development and Environment Department, Government of Madhya Pradesh	24.88
16	Scaling-up climate resilient agriculture practices towards climate smart villages*	Haryana	Department of Agriculture, Government of Haryana	22.1
17	Rainwater harvesting and sustainable water supply to the hilly areas in Darjeeling as an adaptive measure to potential climate change Impacts	West Bengal	Municipal Engineering Directorate, Department of Municipal Affairs, Government of West Bengal	23.12
18	Management of ecosystem of Kaziranga National Park by creating climat-resilient livelihood for vulnerable communities through organic farming and pond-based pisciculture	Assam	Kaziranga National Park (KNP) under Department of Environment and Forests (DoEF), Government of Assam	24.57
19	Efficient water management and agriculture technology adoption for climate adaptive and resilient farming systems in 51 villages of Nandurbar and Buldhana districts	Maharashtra	Department of Water Conservation, Government of Maharashtra through Vasundhara Watershed Development Agency (VWDA)	22.95
20	Climate change adaptation for natural resource-dependent communities in Kachchh	Gujarat	Gujarat Ecological Education and Research (GEER) Foundation	21.36
21	Addressing climate change vulnerability of the water sector at the gram panchayat-level in drought-prone areas	Sikkim	Rural Management and Development Department, Government of Sikkim	24.67
22	Mukhya Mantri Jal Swavlamban Abhiyaan for climate change adaptation and water harvesting in Arthuna, Anandpuri and Sajjangarh blocks of district Banswara	Rajasthan	Department of Watershed Development & Soil Conservation, Government of Rajasthan	24.97
23	Scaling climate-smart agriculture through mainstreaming climate-smart villages	Bihar	Department of Agriculture, Government of Bihar	23.06
24	Ecosystem services-based adaptation to climate change in the Bundelkhand region	Uttar Pradesh	Forest and Wildlife Department, Government of Uttar Pradesh	20.02
25	Enhancing climate-resilience of forests and its dependent communities in two landscapes	Jharkhand	Department of Forest, Government of Jharkhand	24.99
26	Gene pool conservation of indigenous rice varieties under traditional integrated rotational farming systems (<i>Jhum</i> optimization) for promoting livelihood and food security as a climate change adaptation strategy	Nagaland	Department of Agriculture, Government of Nagaland	24.80
27	Developing climate resilience in rural areas through crop residue management	Regional Project: Punjab, Haryana, Uttar Pradesh and Rajasthan	Department of Agriculture of the Respective State Government	100
	Total			660.72

*Details of this project are given on the next page

Source: NABARD³⁵

HARYANA: CASE OF CLIMATE-SMART AGRICULTURE UNDER NAFCC

There is no precise definition for climate-smart agriculture. Global Alliance for Climate-Smart Agriculture (GACSA) leaves it to its members to determine what climate-smart agriculture means to them.

Many climate smart agriculture practices are being piloted in different parts of the world. CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS) is working with a number of partners, including national governments and research institutions, to test a range of interventions in climate-smart villages (CSVs) across West Africa, East Africa, South Asia, Latin America, and Southeast Asia.³⁶

At the global scale, to promote climate-smart agriculture, the GACSA was launched at COP 21 in Paris in 2015. GACSA claims that it aspires to improve farmers' agricultural productivity and incomes in a sustainable way. It also hopes to build farmers' resilience to extreme weather and changing climate and reduce greenhouse gas emissions associated with agriculture.

As of September 2016, GACSA had 154 members, including governments, industries, institutions and non-profits. An analysis report by Genetic Research Action International (GRAIN), a non-profit organization, states that the founding membership and steering committee of GACSA also includes fertilizer companies, their front groups and partner organizations.³⁷ As of April 2016, about 60 per cent of its private sector members were from the fertilizer industry.

Of the Alliance's 29 non-governmental founding members, there are three fertilizer industry lobby groups, two of the world's largest fertilizer companies (Yara of Norway and Mosaic of the US), and a handful of organizations working directly with fertilizer companies on climate change programmes.

More than 350 organizations from all over the world—including Via Campesina (the world's largest peasant farmers' movement), Friends of the Earth, Slow Food and many others oppose climate-smart agriculture and GACSA. They critique the Alliance for ambiguity on what climate-smart agriculture means, and whether and how it includes social and environmental safeguards. They caution that climate-smart agriculture must not be confused with agro-ecology, which it threatens.

Civil society alleged that agribusiness corporations that promote synthetic fertilizers, industrial meat production and large-scale industrial agriculture—all of which are widely recognized as contributing to climate change and undermining the resilience of farming systems call themselves "climate smart". Civil society warns that climate-smart agriculture can take us in the wrong direction, falling short of ensuring food and nutrition security, and undermining the radical transformation of current food and agricultural systems that the world urgently needs to address climate change. Civil societies across the world fear that big multinationals corporations will push seeds, fertilizers and pesticides in the guise of climate-smart agriculture, making farmers dependent more on market forces, thereby increasing their financial vulnerability and reducing their adaptive capacity.

Climate-Smart Village project under National Adaptation Fund in India

In India, climate-smart pilots are being run in many states including Haryana, Punjab, Telangana, Bihar and Maharashtra by different institutions like International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and International Maize and Wheat Improvement Centre (CYMMIT), both members of the Consultative Group for International Agricultural Research (CGAIR).

Many states like Haryana, Bihar, Madhya Pradesh etc. have already earned approval for climate-smart village projects under NAFCC.

For the purpose of this study, we have examined climate-smart village pilots in Haryana.

Concerns in climate-smart villages in Haryana

Climate-smart village (CSV) projects have been piloted jointly by CIMMYT, Haryana's department of agriculture, National Innovations in Climate-Resilient Agriculture (NICRA) under Indian Council for Agricultural Research (ICAR), krishi vigyan kendras (KVKs), and farmers' cooperatives under the aegis of Climate Change, Agriculture and Food Security (CCAFS) in 27 villages of the Karnal district in, Haryana.

The detailed project report given under the national Adaptation Fund on Climate Change states that based on the successful implementation of CSV projects in 27 villages, the project will be up-scaled in 250 villages in 10 districts of the state.

Interviewed farmers, activists and district government officials in Karnal say that most of the proposed practices under CSV (e.g. subsidy for land levelers, zero tillage machines, information and communication technology services for weather advisories, crop diversification etc.) were in place through ongoing schemes even before the launch of CSV projects but they were not

implemented in the kind of focused manner they started to be implemented under pilot CSVs.

Farmers who are part of the pilot face serious problems in some of the practices promoted under climate-smart agriculture. These agriculture practices require farmers to purchase heavy farm machines and also increase dependence on harmful herbicides and weedicides. Some of these practices might increase the cost of cultivation significantly, thereby increasing financial vulnerability manifold. So much so that some of the farmers whose "success stories" were showcased by the CGIAR around the globe in the first year returned to the previous modes of agricultural practices in subsequently.

Take the example of direct seeding of rice. This practice promoted under climate-smart agriculture in Karnal has been marred by uncontrolled weed growth, reduced production in turn reducing farm income, and harmful chemical impacts on soil and human health.

Scientists are of the opinion that practices like zero tillage and direct seeding of rice are not possible without use of weedicides and herbicides. In fact, there is a belief among many that zero tillage practices were historically introduced to promote use of herbicides.

Farmers in Karnal are using herbicide promoted by Syngenta, Monsanto etc. A popular herbicide, Roundup (marketed by Monsanto) has been linked with interference with the functioning of the pituitary gland in a study by Indian Institute of Science, Bengaluru. Another study suggests that glyphosate, a primary constituent of the herbicide, could be carcinogenic, disrupt hormonal functioning and could also affect the development of foetus.³⁸ Some countries in Europe and California, US, are considering listing Roundup as a carcinogen.

Further, farmers were asked to cultivate maize under crop diversification, but because of low market prices of maize, suffered losses.

Therefore, governments must be careful about selection of practices to promote climate change adaptation. More comprehensive analysis should be done on the suitability and impact of a particular practice in a specific region and ecosystem. Civil society across the globe has been advocating that agro-ecological farming might be the best way to adapt to the changing climate.



VINEET KUMAR / CSE

A climate-smart village project in Karnal, Haryana

Table 5: List of projects funded under Adaptation Fund

Name of project	State	Project outlay (US \$)
Climate Smart Actions and Strategies in North Western Himalayan Region for sustainable livelihoods of agriculture-dependent hill communities	Uttarakhand	969,570 (2015–19)
Building Adaptive Capacities in Communities, Livelihoods and Ecological Security in the Kanha-Pench Corridor in Madhya Pradesh	Madhya Pradesh	2,556,093 (2016–21)
Building Adaptive Capacities of Small Inland Fishers for Climate Resilience and Livelihood Security in Madhya Pradesh	Madhya Pradesh	1,790,500 (2015–18)
Conservation and Management of Coastal Resources as a Potential Adaptation Strategy for Sea Level Rise	Andhra Pradesh	689,264 (2015–19)
Climate Proofing of Watershed Development Projects in the States of Rajasthan and Tamil Nadu	Tamil Nadu and Rajasthan	1,344,135 (2015–18)
Enhancing Adaptive Capacity and Increasing Resilience of Small and Marginal Farmers in Purulia and Bankura Districts of West Bengal	West Bengal	2,510,854 (2015–19)
TOTAL		9.8 million

Source: *Adaptation Fund*³⁹

GREEN CLIMATE FUND (GCF)

The Green Climate Fund was established by the UNFCCC to help developing countries fund mitigation and adaptation activities to counter climate change. The designated national authority to disperse the fund in India is NABARD.

Currently, there is a single project that is listed on the NABARD website that is slated to get approval under the GCF in its forthcoming funding process. The project aims to promote groundwater recharge and less water-intensive irrigation in Odisha. The total funding that would be available for this project is US \$34–36 million.

ADAPTATION FUND (AF)

This fund helps vulnerable communities around the world adapt to climate change by funding projects and programmes based on country specific needs and priorities. The projects funded by the AF in India are listed *Table 5: List of projects funded under Adaptation Fund in India*.⁴⁰

As mentioned in the table, the total funding sourced from the adaptation fund is close to US \$10 million. So far, the projects funded include adaptation action in the forest, agriculture, water and coastal management sectors.

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The National Action Plan on Climate Change (NAPCC) of India recognized the role of state and local governments in its implementation. It was clear that adaptation and mitigation challenges will only be addressed if state governments play an active role in the planning and implementation process.

This led to the conceptualization of State Action Plans on Climate Change (SAPCCs). A common framework document was produced under the aegis of the then Ministry of Environment and Forests to guide the process. Subsequently, almost all states and union territories formulated their SAPCCs.

This report examines the process of SAPCC formulation and, through eight case studies, provides a detailed exegesis on the highlights and shortcomings of the existing SAPCCs.



Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phone: 91-11-40616000 Fax: 91-11-29955879
E-mail: cse@cseindia.org
Website: www.cseindia.org