Climate-Smart District Disaster Management Plan as Effective Tool for Implementing State Action Plan on Climate Change :

Lessons from three states in India

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Abstract

Climate change is known to increase the frequency and intensity of disasters all over the World leading to massive destruction in terms of loss of human life, assets, environment and thereby the resources of the people. In the countries of Asia Pacific and more particularly in the South Asia, climate and disaster risks have sought a serious concern for the sustainability of infrastructure, ecosystem services, livelihood resources and local economies. As observed in the recent years, climate change has increased the magnitude and occurrence of precipitation related hazard events like floods, droughts, landslides, typhoons and cyclones. Incidences like heat-wave, forest fire, pest and disease outbreak have also caused serious challenges leading to disastrous impacts. Adaptation to the impact of climate change across all aspects of disaster risk management is critical to ensure our journey to sustainability and safety together. It calls for the adoption of an integrated approach that can address both the challenges together. The State Action Plan on Climate Change (SAPCC) and District Disaster Management Plan (DDMP) are the actions taken up at sub-national and district levels, respectively, to deal with environmental and disaster risks. This study is an attempt to examine and demonstrate the effectiveness of Climate Smart DDMP in implementing the proposed actions of SAPCC. A "Qualitative Coding System (QCS)" has been generated to demonstrate the link between the lowest administrative level actions to deal with climate change and disasters and the proposed state level actions, plans and programmes. The SAPCCs of three Indian states of Uttarakhand (Hilly, Multi-hazard), Odisha (Coastal, Multi-hazard) and Uttar Pradesh (Riverine, Flood, Multi-Hazard) were selected with the expectation that all of them will be varying in terms of their strategic approach and content. Aim and objectives of these SAPCCs were analysed to assess how they have balanced their actions between adaptation and mitigation. How the components related to disasters and disaster management are addressed in these three SAPCCs, have been examined. Finally, the challenges of implementation of SAPCC were studied. Detailed analysis of a Climate Smart DDMP of coastal district Puri in Odisha has been done to know the comprehensiveness of a DDMP and its effectiveness as a tool for implementation of SAPCC. The study analysed how each section of DDMP addresses the particular stages or aspects of disaster risk management. Key actions, projects and programmes from each section of DDMP were identified and linked with the proposed actions in SAPCC with the help of "Qualitative Coding System (QCS)". The sub-national plans are somewhere between the national policy and the ground level implementation of proposed actions and programmes at lowest administrative levels, be it district level or village level. The implementation of SAPCCs at local level requires clarity on institutional, financial and monitoring mechanisms. With the help of QCS, the study demonstrated that Climate Smart DDMPs like that of Puri district can act as effective tools to implement various actions proposed by SAPCC. It is recommended that collective efforts of government at central, sub-national and local level, stakeholders and communities will be required to address the challenges posed by disasters and climate risks. The governments at sub-national level have a key role to play in implementation of missions under NAPCC. However, a major constraint to implementation at sub-national level is the lack of relevant resources and ground level operational framework which are needed to build capacities for the implementation process. If a bottom up approach for implementation of SAPCC will be undertaken starting from the disaster management planning through DDMPs, then the capacities and internal coordination between the state and local governments can be effectively augumented, operationalised & monitored effectively.

Key Words : Climate Change, Disaster, SAPCC, DDMP

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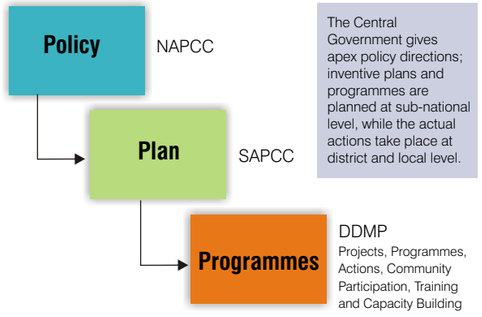
Introduction

India has witnessed major devastations as result of disasters either natural or climate induced. It is the unique eco-geo-climatic, socio-economic conditions and development implications in India which makes it altogether more vulnerable to floods, droughts, cyclones, earthquakes, landslides, avalanches and forest fires. November 2015 floods in Chennai known to kill more than 370 people and caused crop damage worth US$ 190 million (World Vision, 2015, cited in Bahadur et al., 2016). Thane Cyclone, El Nino events, Uttarakhand Cloud Burst and Flash flood of 2013, recurrent Bihar floods; All these have raised serious concerns related to preparedness and response at local levels. Around 90 lakh farmers were affected by the major drought in Maharashtra in 2015 (Times of India, 2015). Such disastrous events now occurring almost regularly not only bring miseries to numerous people more frequently, but also result in outbreak of disease epidemics, especially malaria, dengue, chikngunya and cholera, besides causing serious ecological and economic challenges (Gupta et al., 2014a).

In the face of changing climate and recurring disasters, it is very important to adopt an integrated approach which can address both the challenges together. State Action Plan on Climate Change (SAPCC) and the District Disaster Management Plan (DDMP) are the actions taken up at sub-national and district levels, respectively, to deal with the environmental and disaster risks from preventive cum- remediation and response perspectives. The Disaster Management Act, 2005 is a legal framework which directs the States and Districts to come up with their State Disaster Management Plans (SDMP) and District Disaster Management Plan to deal with natural hazards and other human induced disasters. In the case of DDMP, it is the duty of District Disaster Management Authority (DDMA) to adopt a continuous and integrated process of planning, organizing, coordinating and implementing measures, which are necessary and expedient for prevention as well as mitigation of disasters. These processes are to be incorporated in the developmental plans of the different departments and preparedness to meet the disaster and relief, rescue and rehabilitation thereafter, so as to minimize the loss to be suffered by the communities and are to be documented so that it is handy and accessible to the general public (NDMA, 2005).

It has been found that most of the climate-induced disaster prone areas are multi-hazard landscapes where the poor and marginal people are the most vulnerable. Besides this, the damage and disruption of infrastructure and ecological services cause serious setback to civil governance and people's living. Keeping in mind the context of multi-hazard vulnerability to climate change and disasters, three Indian States were selected for this study: Uttarakhand (Hilly and multi-hazard), Odisha (Coastal and multi-hazard) and Uttar Pradesh (Riverine, Flood & Multi-Hazard). Mainstreaming climate change adaptation (CCA) and disaster risk reduction (DRR) into developmental planning is a multi-level process (figure 1) which starts with the existing policies at national level and then scales down to the community level with the help of plans like the DDMP. As the primary responsibility for dealing with disasters lies with State Governments, this study caters to the process of CCA-DRR integration and mainstreaming it into development programmes, plans and projects at State level.

Figure 1 : The flow of Policy to Programmes in CCA-DRR



The study demonstrates a unique methodology of “Qualitative Coding” to link the lowest administrative level activities to deal with climate change and disasters to the proposed state level actions, plans and programmes. With the help of QCS, we have established that the provisions and activities in various sections of a Climate Smart DDMP are precursors to various proposed plans/actions/programmes in SAPCC. The study also demonstrates how different activities of adaptation and mitigation in DDMP actually cater to various sectoral needs of SAPCC. The overall objective of this study is to show how the efforts done at lowest administrative levels can be used and scaled up for Climate Smart and Risk Informed Development at State Level.

Approach

We selected the three states with the expectation that all of them vary in terms of their strategic approach and content. All of the selected states have different geographical spread, different donor organisations are involved and the complete report can be found out on Ministry of Environment, Forest and Climate Change (MoEF&CC) website. Firstly, we analysed the aim and objectives of these SAPCCs and assessed how they balanced their actions between adaptation (addressing risk and impacts) and mitigation (climate change mitigation, GHG reduction). This was done by looking into the sectoral aspects of SAPCC and a detailed analysis of selected sector specific actions.

Secondly, we analysed how the components related to disasters and disaster management (DM) are addressed in these three SAPCCs. For this, we comprehensively analysed the 'Vulnerability Assessment' section of a SAPCC and then looked for DM and DRR components in the sectoral analysis.

Then, we studied the potential challenges of implementation that these states face. For this we systematically analysed the Institutional, Financial and Monitoring and Evaluation (M and E) Mechanism. Finally, with a thorough analysis of all sections of Climate Smart DDMP we developed a methodology to show the effectiveness of DDMP in implementation of SAPCC addressing the above three points.

A detailed analysis of Climate Smart DDMP of a coastal district of Puri in Odisha was done to know the comprehensiveness of a DDMP and its effectiveness as a tool for implementation of SAPCC. The study analysed on how each section of DDMP addresses the different stages and aspects of disaster risk management reflecting in the implementation of SAPCC in context of district and local level planning and actions. Key actions, projects and programmes from each section of the DDMP were identified and linked with the proposed actions in SAPCC with the help of a QCS.

The “Qualitative Coding System” (QCS) developed for this study gives unique codes to each section of SAPCC. The section specific actions identified from SAPCC, the key sectors identified in SAPCC and the key proposed actions in these sectors were all given unique codes. The following tables give the key to QCS generated through this study:

Table 1 : Key to Qualitative Coding System

SAPCC- Codes of Key Sectors	AG-Agriculture
	CD-Coasts & Disasters
	FO-Forest
	HE-Health
	WR-Water Resources
SAPCC Sectors- Categorisation of Actions	A:-Adaptation
	M :-Mitigation
SAPCC- Codes of Chapters	SV-Vulnerability Assessment
	SG- Greenhouse Gas Inventory
	SC- Climate Change Issues
	SS- Sectoral Issues
	SI- Institutional Arrangements
	SF- Financial Arrangements
	SM- Monitoring & Evaluation
DDMP Section Codes	II- District Profile
	III-HRVC
	IV- Institutional Arrangements
	V-Inventories & Evaluation of Resources
	VI- Preparedness & Capacity Building
	VII-Mitigation Plan
	VIII-Response
	IX-Damage Assessment, Reconstruction, Rehabilitation
	X-Standard Operating Procedure
	XI- Financial Arrangements
	A1:B25 XII-Monitoring & Evaluation.

Table 2 : Key to Qualitative Coding System

SAPCC CHAPTER- Vulnerability Analysis , CODE SV	
Actions	Action Code
Multi-hazard mapping for each district	SV1
Sectoral segmentation of vulnerability	SV2
Socio-Economic Vulnerability Assessment	SV3
SAPCC CHAPTER- Greenhouse Gas Inventorisation, CODE SG	
GHG Emissions Calculation	SG1
Mitigation from conservation measures	SG2
SAPCC CHAPTER- CODE SC	
Understanding Adaptation	SC1
Understanding Mitigation	SC2
SAPCC CHAPTER- Institutional Arrangements, CODE SI	
Formation of working groups for sectors	SI1
Formation of Orissa Climate Change Agency for inter-sectoral and inter-departmental coordination	SI2
SAPCC CHAPTER-Financial Arrangements, CODE SF	
Budget allocation for each sector	SF1
SAPCC CHAPTER- Monitoring & Evaluation Framework, CODE SM	
The monitoring of impacts of climate change and of progress in achieving key targets	SM1
The evaluation of programs undertaken to mitigate climate change as well as to adapt to its consequences	SM2
Sector Specific M & E	SM3
-Key Impacts to Monitor	
-Targets to Monitor	
-Key Programmes to Evaluate	

To link up different sections of DDMP and SAPCC, sections of DDMP were also given specific codes. Finally, the QCS was used in developing matrices in a tabular format to show how different sections of DDMP are catering to other sections of the same DDMP and on how the activities/actions/arrangements in different sections of DDMP are precursors to the proposed actions/programmes in SAPCC.
Our analysis and recommendations demonstrated that a comprehensive DDMP which addresses DRR and CCA issues can be used as an effective tool for implementation of SAPCC. A comprehensive DDMP is expected to be drawn with a holistic framework of disaster prevention-risk mitigation, preparedness and operational framework in context of detailed vulnerability analysis as defined in the national disaster management law and policies and experimented in certain districts/states (Gupta et al., 2014a, 2016).

Role of sub-national action plan on climate change

Global warming and climate change are the reality of today's world challenging the development of almost all the nations .Continuous efforts are being done at national level and international level to reduce the Greenhouse Gas (GHG) emissions to mitigate climate change and site specific adaptation measures are being implemented. In this process of climate change mitigation and adaptation, the sub-national governments and authorities have a significant role to play. The much needed low carbon economy plans and technologies, new policies and programmes to combat global warming and climate change; all actually need the involvement and coordination of sub-national governments. Sub-national action plans on climate change indicate the adaptation and mitigation needs of a state, identify the critical actions required in key sectors of an economy and then propose sector specific plans and programmes whose implementation can reduce the vulnerability to climate change to a greater extent. The good practices and lessons learnt by the implementation of these plans can act as model frameworks, which can influence climate policies and various other cross-sectoral policies at national and international level.

Role of Sub-national Governments

For effective implementation of a national policy on climate change it is required that the policy scales down to all levels of governance and streams through the programmes and projects of all relevant Ministries/Departments and stakeholder's actions. An issue like climate change which has cross-sectoral implications requires policy initiatives at multiple-levels in a harmonised and consistent manner. According to the constitution of India, the key sectors like Agriculture, Water and Fisheries, on which the impacts of climate change are directly being felt, come under the jurisdiction of “State” (sub-national government). On the other hand, several issues related to climate policy, international trade agreements, conventions, oil resources, atomic power and minerals which also directly impact climate change and are themselves impacted by climate change, come under the jurisdiction of the Union government. By such kind of division of responsibilities it becomes quite clear that the State also have a very important role to play in climate policy and environmental decision making. It is also the duty of the State to implement the policies made at national level. It is very important to recognise the States as innovators and initiators rather than just executors (Jorgenson, 2011, cited in Mishra et al., 2011). The role of State is very important for a diverse country like India which encompasses a vast variety of socio-economic, climatic, agricultural and geographic features. The policies which are formed at sub-national level have a close connection with ground realities and need to have a two way feedback mechanism. The programmes and actions in these policies are according to the socio-economic conditions and local needs, and that is why they are more effective in mitigation and adaptation to climate change.

National Action Plan on Climate Change and State Action Plans

The National Action Plan on Climate Change (NAPCC, 2008) was released on 30th June 2008 as a strategy to deal with climate change. The action plan identifies measures to promote sustainable development of India along with co-benefits of addressing climate change. The core of this plan, the Eight National Missions is providing a multi-pronged approach to achieve key goals whilst addressing climate change. It primarily put focus on understanding of climate change, adaptation, mitigation, energy efficiency and natural resource conservation. Following are the Eight National Missions under NAPCC, 2008 :

Table 3 : National Action Plan on Climate Change and Eight Nattional Mission

National Action Plan on Climate Change	
National Solar Mission	The main aim of the mission is to promote the development and use of solar energy for power generation and other uses. It also aims at creating solar power solar power of at least 10, 000 MW and to create a solar research centre.
National Mission for Enhanced Energy Efficiency	It aims to save 10,000 MW of electricity by implementing certain initiatives like energy incentives, reducing energy consumption through certain demand side management programmes, trading of energy saving certificates etc.
National Mission on Sustainable Habitat	This mission aims to promote energy efficiency in urban planning through measures like urban waste management and recycling, strengthening the enforcement of automotive fuel economy standards, using pricing measures to encourage the purchase of fuel-efficient vehicles, and providing incentives for people to make greater use of public transportation.
National Water Mission	It aims to increase the water use efficiency by 20% with the help of pricing and regulatory measures, recycling of waste water, increasing the irrigation efficiency, providing incentives to promote water neutral, water-positive technologies and promoting groundwater recharge
National Mission on Sustaining the Himalayan Ecosystem	This mission aims to promote conservation of biodiversity, forest cover, and other ecological values in the Himalayan region to help stop the retreat of glaciers, as they constitute a major source of India’s water supply.
National Mission for a Green India	It aims to expand the forest cover by 10% in India with the help of afforestation of 6 million hectares of degraded forest land.
National Mission for Sustainable Agriculture	It fosters adaptation in agriculture sector. The mission supports development of climate-resilient crops and expansion of weather insurance mechanism.
National Mission on Strategic Knowledge for Climate Change	The mission promotes a better understanding of climate change impacts, climate science and challenges of climate change. It urges for the establishment of Climate Science Research Fund, improved climate modelling, and increased international collaboration.

There are “Other Initiatives” envisaged in the NAPCC, 2008 apart from the Eight National Missions. Some of them are as following: Research and development in the area of ultra-super critical boilers in coal-based thermal plants; Small and large scale hydro power generation, enhancements in the regulatory/tariff regimes to help mainstream renewable-based sources in the national power system; and renewable energy technologies for transportation and industrial fuels.

In 2009, the Indian National Government urged the State governments to come up with their own SAPCC in line with the Eight Missions in NAPCC (PIB, 2009). The purpose was to decentralise the actions beyond the Eight Missions and to develop adaptation interventions for state subjects like agriculture and water. MoEF&CC which was then Ministry of Environment and Forest (MoEF) provided a common framework document for the preparation of SAPCC with the help of donor agencies. The common framework document envisaged that the preparation process will be participatory in approach and will also build capacity to do vulnerability assessment (MoEF 2010a).

Table 4 : Structure of SAPCC as suggested by MoEF

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

Source : *Compiled from Subramanian, 2016*

SAPCC is a plan document based on the process which identifies the vulnerability of the states to climate change. It showcases the efforts of the sub-national governments to mitigate and adapt to climate change impacts. MoEF provided a common framework for preparation of SAPCC. During the process of formulation of SAPCC, many development partners provided technical support. The plan gives the details of current and future vulnerabilities to climate change and accords the states with the use of scientific knowledge and information. Generally, the SAPCCs in India put focus on adaptation to climate change impacts. Very few states mention on how the State is contributing to climate change. Greenhouse gas inventorization provides the details of GHG produced within the state. The preparation process was initiated with the involvement of State government, generally Forest and Environment department. A high level steering committee was formed to oversee the process of SAPCC preparation and senior level experts/officials were assigned the duties to draft chapters for their respective sectors (1: Indian SAPCC, Action on Climate Today, 2015).

Various sectoral needs are identified and actions and programmes are proposed by the respective line departments. Financial allocation, institutional arrangements and M&E framework is provided within the SAPCC. Once a State submits its SAPCC to the MoEF, a National Level Expert Committee on Climate Change review it and give their suggestions. After incorporating the recommendations, the SAPCC is endorsed by National Steering Committee (NSC) on Climate Change (1: ibid). Individual SAPCCs mention the sector-specific and cross-sectoral priority actions. The financial, institutional and monitoring & evaluation framework necessary for the implementation are also discussed in details.

A proper institutional mechanism is required for the implementation of SAPCC. At national level, MoEF is the nodal ministry responsible for implementation of NAPCC whereas at the State level there is a diversity of institutional arrangements. The nodal department is the Climate Change Cell and other departments of environment/forests of climate change in various States across India. State Steering Committee, State Advisory Group and Core Agency prepare the SAPCC by a participatory approach. Once a SAPCC is prepared, the NSC in the MoEF&CC takes the responsibility of the final approval. Preparation of SAPCC requires a lot of inter-departmental coordination to address various issues of climate change. Various line departments in states give their valuable inputs to the nodal department. The nodal department with the suggestions and inputs of line department and with the consultation of various technical experts finally develops a harmonised policy document (Mishra et al., 2011).

Analysis of SAPCCs - Odisha, Uttarakhand and Uttar Pradesh

1) Preparation, Planning and Objectives

Odisha : The SAPCC of Odisha was prepared before the common framework developed by MoEF&CC. It was prepared by the Forest & Environment Department, Government of Odisha. The plan was supported by the Chief Minister and two senior bureaucrats. The High Level Coordination Committee formed by the Chief Minister had inter-departmental representatives to ensure co-ordination among sectors. The plan intends to lead Odisha towards a carbon conscious and climate resilient development path. It put focus on the needs of 11 critical sectors and identifies their vulnerability to climate change. The objective of this plan as mentioned in the foreword is “to strengthen institutional capacities of different state agencies to integrate environment and climate change issues in development planning, policies and sectoral programmes.” It has been formulated by an inter-departmental team with inputs from the civil society, non-governmental organisations, political parties and academic institutions. Through a series of stakeholder consultation, key priorities were decided in line with NAPCC (Odisha SAPCC).

Uttarakhand : The plan was prepared by the Uttarakhand State Forest Department as the lead agency with close collaboration of various line departments. The preparation of the plan included several discussions and consultations. The departments and agencies were organised in 11 different sectors. The main aim behind the development of this SAPCC was to foster inclusive, sustainable and climate resilient growth and development of Uttarakhand. The planned actions to support the vision are stated properly. The overall approach was to accelerate inclusive economic growth, promote sustainable development, secure and diversify the livelihoods and safeguard ecosystem services. The plan identifies that there is a need to integrate climate

change strategy into regular developmental planning process. The implementation of SAPCC under various sectors is governed by a common implementation framework given in the document.

Uttar Pradesh : The plan was prepared by State Environment Department with seven sectoral missions. The High Level Committee formed during the planning and preparation of the plan oversees the process of coordination between various departments, academic institutions and civil society. Overall, 93 priorities are there under seven different missions. The overall objective of the plan is very clearly defined as "to align state priorities along the national action plan on climate change as well as to identify state specific vulnerability and key priorities related to adaptation and mitigation."

2) Vulnerability Analysis and Linkages with Climate Science

The sections on vulnerability analysis were reviewed to see whether they are general narratives of state's vulnerability or they provide definite evidences or trends to show the impacts of climate change. It was analysed whether future climate change projections are given or not. Overall, this analysis was done to understand the missing points in the vulnerability analysis and to interpret where the vulnerability analysis of a Climate Smart DDMP can help to make it more comprehensive. This will be demonstrated in another section.

Odisha : This chapter gives information of Odisha's general vulnerability to climate change. The analysis of trends is not given, nor does it give any measure to calculate the vulnerability of the state as a whole and the sectoral vulnerability. The analysis of future climate trends is also missing from the section. However, the multi-hazard map given by Odisha State Disaster Management Authority gives a district-wise ranking of five extreme weather events.

Uttarakhand : The plan identifies that there is a limited availability of information on vulnerability related to climate change and its impacts on state, economy, community and various sectors. This section on vulnerability analysis covers common climatic information about historic rainfall and temperature. Some additional data includes snow cover data trends, glacier changes and drought incidents. Future climate change projections predicted on the basis of 4X4 Report are used to show the vulnerability of the Himalayan region. This section identifies the need of detailed vulnerability analysis. To make the vulnerability assessment more comprehensive some additional information is there from different reports like the Interim report of Uttarakhand Centre on Climate Change (UCCC), Kumaon University. The plan also analyses the sectoral vulnerabilities of focus sectors, but not much use of climate science can be seen in these sections. The plan envisages the development of district and sector specific detailed climate vulnerability and risk analysis.

Uttar Pradesh : A vulnerability framework is developed to cover climatic, bio-physical and socio-economic dimensions of vulnerability. IMD data has been used to show precipitation and temperature trends. Future climate projections are analysed for the state on the basis of IPCC SRES A1B scenario. It has been identified that changes in temperature and precipitation will affect the key sectors but the sectoral impacts are not discussed here. Socio-economic factors of vulnerability are analysed with the help of GIS maps showing exposure, sensitivity, adaptive capacity and overall climatic vulnerability of all the districts of this state. Overall, the section on vulnerability analysis makes good use of climate science and GIS. The sectoral vulnerabilities to climate change are discussed separately in sectoral missions making good use of climate science by analysing past trends and predicting future impacts of climate change on the respective sectors.

3) Balance between adaptation and mitigation measures

Ideally, the states should have a balance of adaptation and mitigation actions as the direct consequences are to be borne by states. NAPCC, the guiding document of the SAPCC also includes missions focussing on both adaptation and mitigation (NAPCC, 2008). The common framework document by MoEF (MoEF 2010a), also clearly states that the SAPCCs should include a section on GHG inventories which is ultimately linked to mitigation measures.

Odisha : The analysis of Odisha's SAPCC shows that the state government has maintained a balance between the proposed actions of adaptation and mitigation. It mentions some of the measures from a few key sectors. Some of the sector specific proposed actions are already a part of the existing government activities and programmes. The sectoral programmes and actions are more or less in line with the Eight National Missions given in NAPCC. The plan identifies that for Odisha, adaptation is of much greater importance.

Uttarakhand : Adaptation is identified as the primary concern for this state while giving some edge to mitigation also. Both "Hard" and "Soft" adaptation approaches are given equal importance. "Hard" adaptation options are related to infrastructural and engineering measures while "Soft" adaptation measures include skill development, policies and programmes. The sectoral actions and programmes are consistent with the principles and guidelines of NAPCC.

Uttar Pradesh : The seven missions in this plan are planned to be an extension of National Missions in NAPCC. The budget estimation clearly indicates that the plan is envisioned to put equal focus on adaptation and mitigation measures.

4) Disasters and Disaster Management in NAPCC and SAPCC

NAPCC envisages "Effective Disaster Management" in the "Other Initiatives" apart from Eight National Missions. It is clearly identified in NAPCC that with changing climate the frequency and intensity of disasters like cyclones, floods and droughts are going to increase. It also talks about a new approach to disaster management in India-From Response and Relief to Prevention and Mitigation Centric approach. The plan identifies the importance of mainstreaming disaster risk reduction into infrastructural project designs and strengthening communication networks and disaster management facilities at all levels. Some key relevant points for this study from NAPCC, 2008 are as follows:

- Disaster specific vulnerability assessments and sectoral impacts assessments at the state and district level for preparing contingency plans.
- Maintenance of critical facilities like health care services and water supply
- Capacity Building among design engineers, project planners and financial institutions on incorporating elements of disaster management
- Upgrading forecasting, Tracking and Early Warning System for cyclones, floods, storms and tsunami.
- Monitoring river flows and mapping flood zones
- Zoning of vulnerable urban areas
- Generation of regional scenarios based on single or multi-hazard mapping
- Disaster Response Training at community level to build infrastructure and human resources for medical preparedness and emergency medical response to manage mass casualities during disasters.

The overall national responsibility for climate change adaptation and mitigation lies with MoEF&CC, while the responsibility of managing disasters either natural or climate-induced is given to Union Ministry of Home Affairs in India. There are Departments of Revenue and Relief and Disaster Management at state level to look after the issues of disaster management. The broad structure of preparing SAPCC by MoEF&CC suggests that apart from the eight national missions, there should be some specific actions addressing DRR issues of states. However, it has been observed that most of the SAPCCs identify only strategic interventions to address climate change alone, put emphasis on GHG reductions for mitigation measures and usually lack provisions to deal with environmental vulnerabilities because of climate change impacts. "Adaptation and DRR has seldom been addressed within primary concern in a SAPCC document, despite great overlap among these and also with the issues of natural resources management, environmental health along other developmental facets" (Gupta et al., 2011).

We have done this analysis on the basis of key provisions of Disaster Management (DM) in the NAPCC. The SAPCCs which should follow the ideology of NAPCC should have the key provision of DM within their frameworks. On that basis we have selected three key sections of SAPCC to analyse how they have addressed the component of Disaster Management in them. The five key sectors analysed were: Agriculture, Forest, Health, Coast and Disasters and Water.

Odisha : The vulnerability assessment of this SAPCC includes multi-hazard mapping for all the thirty districts of Odisha done by Odisha Disaster Management Authority. It also gives an account of natural disasters in Odisha for a 20 year time frame. Sectoral segmentation of vulnerability is also given but the disaster specific impacts are not there. A specific sector on coasts and disasters is part of sectoral analysis. Various priority actions in line with NAPCC guidelines for DRR are given in this section. For example: Flood mapping, flood forecasting and use of downscaled climate models are key priority needs where the models will be used to strengthen the preparedness against floods. It is not specifically mentioned whether these actions will cater to disaster risk reduction or disaster management. According to the principles of NAPCC we identified the following actions.

Table 5 : DM and DRR in SAPCC

State	Aim & Objectives	Disaster Specific vulnerability assessment (State & District level)	Sectoral Issues: Sectors or Sector Specific Key Actions directly/indirectly catering to DRR as per NAPCC's guidance:
Odisha	Not mentioned	Yes; Multi- hazard mapping for districts,	Yes,
			Agriculture: Undertaking capacity building, Conducting climate-linked research studies.
			Forestry: - Assessing fire management strategies, Obtaining access to updated knowledge on climate change science and policy developments, Capacity building of Panchayati Raj institutions/communities/JFM institutions to adapt to climate change.
			Health: - Capacity Building of the health sector on climate change, Strengthening approaches to deal with the physical and psychological impacts due to extreme weather conditions caused by climate change, Integrating climate change considerations in the State Health policy.
			Water:- Development of flood forecasting models, Constructing and protecting water harvesting structures, Raising awareness raising with Pani Panchayat through Farmers' Training Programme and creating agro-climatic stations, Integrated Water Resources Management
			Specific Sector: Coasts and Disasters
Uttar Pradesh	Not Mentioned	Yes; Indirectly- Exposure and Sensitivity related vulnerability mapping. Impact of extreme events on water resources	Yes,
			Agriculture :- Identification of Vulnerable areas and assessing
			Vulnerability, Climate responsive research programmes, Establishment of Climate Field Schools (CFS) (One in each block), Establishment of climate change and agriculture cell.
			Forest: - Plantation (Afforestation and Reforestation) by Forest
			Department, Road side/canal side plantation, Management of dense forests, protected areas and wetlands
			Water:- Enhancement of Observational Infrastructure and Flood Management, Enhancing Preparedness for Drought Monitoring, Drought Mitigation and Development of Early Warning System, Research and development, Training and Capacity Building, Integrated water resource management in over exploited areas including basin management plan, Assessment of impact of climate change on water resources of Uttar Pradesh.
			Strategic Knowledge for Climate Change :- Various actions under this mission like Flood mapping, flood forecasting and downscaled climate change projections modelling, Hazard risk mapping and climate modelling.
Uttarakhand	Yes; key importance is given to adaptation options along with Disaster Risk Reduction	No, but gives importance to the study UCCC Kumaon University report which includes vulnerability due to hazards and disasters.	**Agriculture** :- Investments in infrastructure for water management and soil conservation, Improved information, knowledge base and dissemination of information on climate changes and options to adapt to them
		The CDKN supported project titled "Vulnerability and Risk Assessment to Strengthen Uttarakhand SAPCC" has completed the District and Block level analysis of VRAs.	**Water**: - Incorporation of DRR methods, Capacity development, education and awareness at all levels as high-priority agendas, Steps to foster integrated water resources development and management planning, and seeking convergence among various water resources programmes and organizations.
			Health: - Developing and strengthening disaster management teams in every district hospital specifically to respond to the effects of extreme climate changes and to increase co-ordination between the health sector agencies in the state and the disaster management department. Build and improve scientific knowledge and evidence base and understanding of climate change and its impacts on human health, Review the State Health Policy to incorporate climate change concerns, Develop better approaches to deal with heat wave conditions and protocols for dealing with the physical and psychological impacts after extreme weather events, Undertake a range of capacity building measures including awareness about various health hazards, and training of medical personnel etc.
			Forest: - Management of forest fires, Development of appropriate silvicultural techniques with climate change considerations, Increasing the existing area under forests and trees and improving the quality and density of the degraded forests.
			Specific Sector: Disaster

Uttarakhand : Keeping in mind the fragility of the Himalayan state, the plan identifies that along with adaptation interventions, the measures related to Disaster Risk Reduction are equally important. There are various sector specific actions in key sectors which are directly or indirectly catering to DRR. For example incorporation of DRR methods in the water sector is a key sectoral priority. The vulnerability assessment of this SAPCC lacks Hazard Mapping of the state and districts but gives reference for other study which has done the same. The plan also seeks to develop and strengthen the institutional capacity for climate-related disaster risk reduction and management.

Uttar Pradesh : The component of disasters is not directly mentioned in the vulnerability analysis but GIS maps showing exposure and sensitivity related vulnerability to disasters like extreme climate events drought, cyclone and warm year is given. In the water resources sector, floods & droughts are identified as extreme climatic events which can seriously impact the water resources.

5) Assessment of implementation strategies of SAPCC

Indian SAPCCs are the primary steps of sub-national governments to deal with climate change. The implementation planning and discussion is very limited in these SAPCCs. Since no plans give exclusive framework for implementation of actions, we examined the extent of preparedness of the states for implementation by looking into sectoral and section wise provisions catering to the above mentioned points. The necessary pre-requisites for the sub-national governments to implement these plans are- Institutional Structure to implement the present and future actions, Financial Mechanism and Capacity and Resources to facilitate Research, Scientific Assessment, Data generation, management and sharing and Monitoring and Evaluation. "The actions of key priorities are expected to be implemented by using the annual budget of line departments. The Central Government's National Adaptation Funding may also be used to provide additional support" (1: ibid).

Table 6 : Comparative Analysis of State/District Disaster Management Plans (SDMP/DDMP) and State Action Plans on Climate Change (SAPCC) at State Level in India

	SDMP/DDMP	SAPCC
Authority	Multitier institutional framework National Disaster Management Authority, State Disaster Management Authority, District Disaster Management Authority, local authority	Advisory council on Climate change
Chaired by	Prime Minister, Chief Minister, District Collector, Local authority	Prime Minister, Chief Minister
Statutory/legal provision	The Disaster Management Act, 2005	No legal provisions
Nodal ministry	Ministry of Home Affairs	Ministry of Environment, Forest & Climate Change
Objectives	Comprehensive Disaster Management Plan addressing all natural and human induced hazards and disasters	Identifies measures that promote development objectives while also yielding co-benefits for address-ing climate change effectively. It outlines a number of steps to simultaneously advance India's develop-ment and climate change-related objectives of adap-tation and mitigation.
Departments	Disaster Management and Relief, Revenue	Forest and Environment department, Department of environment, science and technology.
Planning Approach	In line with the development plans of the State Five Year Plan	In line with the eight missions of the NAPCC
Point of integration	Emerging concerns of urban, environment, population etc. are included in the proposed guideline	Disaster management has been included as a key area in SAPCC
Financial arrangement	National Disaster Response Fund (NDRF) and State Disaster Response Fund (SDRF), Mitigation fund (flexi fund 25% of all sponsored schemes/project funds), State Disaster Response Fund, National Disaster Response Fund, Chief Minister's Relief Fund,13th finance commission allocations	No such dedicated funds for CCA but other ministries have fund under different missions

5.1 Data Generation and Management

For any climate action plan to be successfully implemented it is very important to have adequate and accurate data. In India, where there is a huge socio-economic and geographic diversity it is quite challenging to get good quality of data at local level. Therefore, it is very important for the sub-national actions to upgrade their existing approaches of data collection, management and sharing. In case of Odisha, the Climate Change Agency established by Department of Environment & Forests which will be responsible for data sharing. In case of Uttarakhand, the role of government as well as Public Private Partnership (PPP) is given equal importance in data generation and management. It recognises that the private sector has a great role to play when it comes to bring new innovative ideas on adaptation and mitigation measures. The plan also envisages the establishment of a Centre for Climate Change in the State Forest Department/ Environment Directorate for data generation and management connecting science, practice and policy. The Strategic Knowledge Mission under Uttar Pradesh's SAPCC is planned to cater to the need of data generation and management. Apart from the sectoral key priority actions, the plan also envisions the establishment of agencies/institutions to generate and manage data. For example, the mission on sustainable agriculture proposes the establishment of Climate Change & Agriculture Cell to collect and compile data and other information on climate change and agriculture to enhance the current understanding of the subject.

5.2 Research and Scientific Assessment.

The impacts of climate change which are assessed through scientific research and vulnerability assessment have a key role to play in the formation of specific policy actions. To better understand climate change, its uncertainties and to effectively implement SAPCC, it is extremely important that due consideration is given to scientific research and assessments. It has been observed that a very limited use of relevant scientific knowledge is there in the preparation of SAPCC due to lack of access to such kind of knowledge (Dubash & Jogesh, 2014). Most of the SAPCCs have chapters on climate trends and forecasts by making use of scientific information on climate trends and models from a regional perspective. This information is gathered from the report of Indian Network of Climate Change Assessment (INCCA), which provides trends for four climate sensitive regions and sectors in India (MoEF 2010b). For individual state level planning this regional information is actually inadequate. A more comprehensive knowledge of climate trends and future scenarios is required at local level to address the vulnerabilities. Here, the DDMP can be used as an effective tool which provides district wise knowledge on climate trends. The Hazard, Risk, Vulnerability Assessment (HRVA) of DDMP can overcome the shortcoming of lack of adequate local level information on climate predictions and adequate scientific capability.

Odisha Odisha SAPCC being an early bird in the process of formation of SAPCC without any guidelines took support from donor agencies and consultants and lacks science-based research on climate change (Jogesh & Dubash, 2014). The section on vulnerability analysis in Odisha SAPCC makes use of current climate trends to study the sectoral and regional climate sensitivity without any discussion on projected climate trends. Multi-hazard mapping of the districts is also based on past climate events. No future projections based on downscaled climatic models is given. A CCA-DRR centred DDMP contains district wise climate trends and future projections which can be used at State level to make SAPCC more comprehensive and informative. Overall, the importance of scientific research in climate action plan is identified for implementation but it is not much used in the plan.

Uttarakhand : The need for research and scientific assessment is identified for a detailed vulnerability assessment. Need for establishing Climate Change Cells for these processes is also identified. The plan aims to improve the scientific evidence base and coordination between various scientific research and academic institutes to build a scientific database for the state. It seeks to implement a mechanism to stimulate coordination between scientific research pertaining to climate change and academic institutions. The plan identifies that the state has a huge potential to involve the private sector in technology transfer mechanisms and other scientific innovations to implement the plan.

Uttar Pradesh : In case of Uttar Pradesh an entire mission is dedicated towards scientific research and development to promote better understanding of climate science, impact and challenges. It also calls for a dedicated fund for improved climate modelling and national and international collaboration and cooperation. Research and scientific assessment is also a key priority under various sectoral actions.

5.3 Cross Sector Coordination

The implementation process at ground level is actually done by specific agencies and institutions which are assigned this responsibility. Since climate change is an issue which can't be dealt with in isolation, cross-sectoral issues will be there and that can be solved only by inter-agency and inter-departmental coordination.

Odisha : In case of Odisha, Climate Change Agency is responsible for this task of coordination between various departments of state, funding agencies and the central government. A Climate Change Cell formed under the department of Forest and Environment is given the responsibility to coordinate all the recommended actions and to mobilise the resources to implement different components of the action plan in a systematic and time bound manner.

Uttarakhand : In the state framework emphasis is given on strengthening the institutional decision making mechanism including monitoring and evaluation to make sure that there is cross-sectoral coordination to address the issues related to climate change. It proposes the formation of a climate change cell which will track all the on-going plans and activities.

Uttar Pradesh : Directorate of environment being the nodal agency to deal with climate related matters looks after the coordination between various departments and agencies. The mission on Strategic Knowledge on Climate Change is cross-cutting in nature and it serves to support coordination between other sectoral missions.

5.4 Capacity Building and Institutional Mechanism

To implement the proposed actions at ground level and to use the available resources efficiently, capacity building of implementing institutions, various stakeholders and the community is very important. With modernisation, new tools and techniques and technologies are coming up, so it is necessary to build the capacities both in terms of human capabilities to use that technology and technical capabilities to move further. The institutions which are created during the preparation of SAPCCs to a greater extent are also responsible for its implementation, monitoring and evaluation. But the existing capacities of these institutions are insufficient for effective implementation. There are also specific line departments for implementation and monitoring and evaluation process.

Odisha : The plan identifies the need for awareness and capacity building at institutional level. A list of departments and agencies responsible for implementation of sectoral needs is given. Odisha Climate Change Agency housed in the Department of Forest and Environment is the key institutional entity suggested in the draft to overlook M&E process of this plan. In 2011, The Odisha Gazette stated the formation of Climate Change Action Plan Cell to do the same duty (Jogesh & Dubash, 2014). Climate Change Cell, under the department of Forest and Environment, is given the task of implementation of different components of the plan. Awareness and capacity building programmes are common among the sectors. Government of Odisha has taken the responsibility to generate awareness among stakeholders about climate change issues as a part of implementation process. Specific departments are mentioned against key sector priorities in the appendix section

Uttarakhand : A separate section on “Overarching State Framework” is given for institutional and coordination mechanisms for implementation. The framework suggests the development of a management approach which includes regulatory, incentive-based and innovation-based avenues so that new adaptation and mitigation measures can come up. It also puts emphasis on developing institutional mechanism for disaster risk reduction and management and enhancing their capacity. The State Committee on Climate Change and State Forest Departments play important role to overlook all the aspects of implementation. The plan also envisages the setting up of Climate Change Cells in focus sector departments. Capacity building and awareness generation for monitoring and implementation process is given equally importance. It identifies the need of building capacities of all government line departments and agencies to properly analyze, monitor and implement the programmes addressing climate change. The plan identifies the need of awareness generation among government departments as well as in community, civil society and private sector. The role of PPP in capacity building initiatives is marked as very important.

Uttar Pradesh : The plan identifies the need for setting up a robust Institutional Framework to implement the proposed actions. It also proposes a scheme where a State Level Climate Change Authority is there to ensure effective planning, monitoring, reporting and coordination. Various other sectoral and regulatory institutes are

recognised to ensure effective implementation. Capacity building of government departments/agencies through training, workshops, seminars and field exposures is a part of key the priorities of mission Strategic Knowledge on Climate Change and other sectoral missions. Dissemination and capacity building activities are an important part of the mission Strategic Knowledge on Climate Change.

5.5 Financial Estimates

A very important part for implementation of SAPCC is to give budget estimations to the proposed actions and programmes. Odisha has given the estimation of total funds requirements along with financial requirements for each and every programme of key sectors. It identifies that along with the climate and environment friendly activities, additional financial requirements would be there for proposed adaptation and mitigation actions. Acquisition of global funds for adaptation and mitigation would be the responsibility of Climate Change Cell. In case of Uttarakhand, the total budget estimation over a period of five years is given devoting a major percentage to the "Roads". Sector specific budgets are also identified along with budget for each activity under the sector. The sector specific programmes and actions will be implemented by respected departments mentioned against each sector in the section "Action Plan and Budget". In case of Uttar Pradesh, a financial estimate for sectoral missions over a period of four years is given.

5.6 Sources of Finance

Without adequate financial sources ground level implementation cannot occur. Each SAPCC must identify a financial mechanism where proper funding agencies and budgetary allocations should be there for various sectoral needs. In the case of Odisha, sources of finance are identified properly for each action of key priority. These

Table 7 : Assessment of Strategies for Implementation of selected SAPCCs

Strategies for Implementation	Odisha	Uttarakhand	Uttar Pradesh
Institutional Mechanism	Yes: Orissa Climate Change Agency, Climate Change Action Plan Cell (2011)	Yes: State Committee on Climate Change and State Forest Department, Important role of PPP in implementation. The Climate Change Cell is now there in place with announcement of 1% departmental budget to be allocated to deal with climate change issues.	Yes: State Level Climate Change Authority
Financial Mechanism	Estimation –Yes: action wise financial requirements Sources :Yes: identified sources for every action and includes Central assistance, state government allocations, external funding, donor agencies etc.	Estimation:- Yes: total budget estimation is given along with sector specific budgets Sources: - Yes: civil society organisations, external agencies and international institutions	Estimation: - Yes, Total budget estimation is given with a break-up of sector wise budget.
Monitoring and Evaluation	Yes, sector specific M&E framework is given with key targets and programmes to monitor for each sector	Yes, M&E framework is articulated which is overseen by State Committee on Climate Change.	Yes, M&E framework is given. Directorate of Environment and State level climate change authority
Research and Capacity Building (Human Resource, Scientific Research, Training)	Research- Yes, emphasis on need for scientific assessments. Capacity building-Yes, integrated with the sectoral actions HR- Yes, Emphasis on requirement of policy makers, economists, engineers and scientists to solve problems related to climate change.	Research- Yes, Emphasis on the need of scientific research to build scientific data and evidence for the state. Capacity Building- Yes, emphasis on enhancing the capacities of government line departments for monitoring and implementation of the plan. Training- Yes, Incorporating climate change related modules into educational curriculum	Yes, Strategic Knowledge on Climate Change Mission
Knowledge Management (Data and Information generation and	Yes, Climate Change Agency for sharing data and information	Yes, identifies the role of civil society, other Himalayan states and international support in knowledge management	Yes, Strategic Knowledge on Climate Change Mission. Also integrated in sectoral key priority actions.

sources include: funds allocated by state government, assistance from central government, external funding and donor agencies. In the case of Uttarakhand, the role of PPP, external agencies and international organisations as financial institutions is very important. A major portion of budget is expected to come from Central Government and State Government Schemes. In the case of Uttar Pradesh it is the Directorate of Environment which looks after fund flows. The plan lacks the identification of sources of finance in the Budget Estimation Section.

5.7 Monitoring and Evaluation (M&E)

The duty of sub-national government doesn't end with the allocation of funds, setting up institutions, sharing information and data for implementation of proposed action, M&E process is also their responsibility. An effective M & E Framework will help to achieve continuous improvement in implementation process.

Odisha : A complete section on M & E is given in Odisha's SAPCC with the main aim of monitoring the plan regularly and making corrections after receiving feedbacks. The SAPCC of Odisha has provided sector specific M and E framework which identifies Key impacts to monitor, Targets to Monitor and Key Programmes to evaluate with monitoring frequency are given but the specific departments who will take action are not mentioned.

Uttarakhand : The plan provides a M & E framework while giving various role and responsibilities at different levels. Line Departments are given sector specific roles. The overall M & E process is overseen by State Committee on Climate Change. The monitoring frequency is also given and it also envisages the development of a new Monitoring framework which includes specific methodologies, protocols and templates for monitoring and reporting.

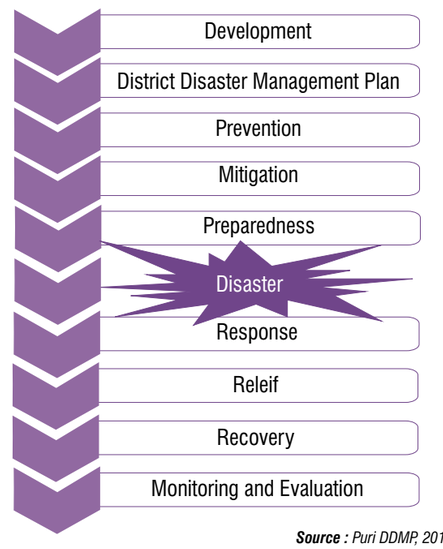
Uttar Pradesh : Directorate of Environment plays an important role in monitoring the climate related activities. M & E process is also supported by the mission Strategic Knowledge on Climate Change. State Level Climate Change Authority is also supposed to take lead in the task of Monitoring and Evaluation.

District Disaster Management Plan

As mandated by the Disaster Management Act, 2005, a multi-tiered Institutional System was created by Government of India containing National Disaster Management Authority (NDMA) headed by the Prime Minister, the State Disaster Management Authorities (SDMAs) headed by the respective Chief Ministers and the District Disaster Management Authorities (DDMAs) headed by the District Collector and co-chaired by Chairperson of the Elected Bodies (District Jila Panchayat). The primary function of these bodies is to facilitate paradigm shift from the hitherto relief-centric approach to a more proactive, holistic and integrated approach of strengthening disaster preparedness, mitigation, and emergency response (NDMP, 2016).

DDMPs are intended to mitigate the impacts of disasters like cyclones, droughts, floods and earthquake etc. Rural and marginal people are the most vulnerable, and are adversely affected by the impacts of these disasters. When the efforts to reduce the impacts of disasters start from the lowest administrative level like district level, then it brings about a huge and meaningful change. The efforts including relief, rehabilitation and preventive measures by District Administration have become a potential tool to mitigate disasters (Puri DDMP). Around 80% of the country's districts have created their DDMPs (Bahadur et al., 2016).

Figure 2 : DDMP Preparation Model Framework



Source : *Puri DDMP, 2016*

Need for a DDMP

It has been observed that the number of climate related disasters, people affected and economic losses have increased strikingly over the past decades (Gupta et al., 2009). A comprehensive DDMP with inclusion of lessons learnt from past geo-natural, climate change induced and other disasters strengthen the efforts of District Administration to deal with them. The multi-hazard approach and incorporation of various actions in DDMPs promote a culture of preparedness. The district is a very important administrative unit from the point of implementation of actions and programmes relating to mitigation and response of disasters. These plans are prepared with a participatory and coordinated approach (Gupta et al., 2014b).

Trigger mechanism given in a DDMP is an emergency quick response mechanism, which will spontaneously set in motion all disaster management activities for response and recovery without loss of critical time. The aim of the DDMP is - fool proof communication, authentic and accurate database, documented and rehearsed, to be activated in the shortest possible time with minimum simple orders and procedures ensuring active participation by Government, Community and volunteers at all levels, making optimal utilization of men, material and resources with no gaps or no overlaps to prevent loss to lives and minimize loss to property ensuring fastest restoration of the situation (Puri DDMP, p-8).

CCA-DRR in DDMP and District Developmental Planning

CCA and DRR approaches are integrated and their convergence have been well recognized to some extent at national level through India's commitment to Sendai Framework for Disaster Risk Reduction 2015-30 (SFDRR), the National Action Plan on Climate Change (NAPCC, 2008), and other ministerial level programmes. Aspects of Biodiversity Conservation, Wetland Restoration, Forests, Ganga Rejuvenation, Coastal regulation zone management, UN Convention on Desertification, and many programmes of MoEF&CC provided CCA-DRR convergence as implicit, Furthermore, an array of sectoral departments such as Water Supply, Irrigation, Health, Agriculture, Rural Development, Urban Development, Industry, Tourism, Housing, Public works, etc, undertake activities that influence climate and disaster resilience. However, when the overall implementation of such projects and schemes is observed at the state or district level, low horizontal and vertical coordination exists between and among departments, especially on integrating DRR and CCA concerns into their sectoral programmes. These gaps undermine the ability to translate concepts and DRR or CCA policies into action on the ground. Improving the capacity of the DDMAs towards integration of CCA and DRR concerns represents a potential point of entry for addressing the gaps. The DDMAs are district level organizations with a presence across India where all the departments converge. Hence, it offers a unique platform for integration of CCA and DRR approaches (Gupta et al., 2014a).

The policies which are aimed at reducing the risk of climate related disasters can provide entry point(s) for integrating adaptation options too (Lebel et al., 2012). When CCA and DRR are integral part of developmental planning and implementation process then the sustainability of human well-being, their environmental assets and economies can be ensured. The main objective of a DDMP addressing CCA-DRR is to minimise the adverse impacts on human lives, property and environment under current and future climatic settings (Gupta et al., 2014b).

A major achievement to mainstream disaster management and adaptation to climate change at sub-national level and to build the resilience of the most vulnerable is the CCA-DRR project “Scaling up sub national climate and disaster smart development in India” by GEAG and ISET-I funded by CDKN, lessons of which have been drawn and utilized by NIDM and brought in form of training manual and policy papers. This project is based on the learning derived from the phase I 'Gorakhpur DDMP Model'- A district level disaster and climate smart development plan. On the basis of review and evaluation of the existing planning and processes the DDMPs of Almora and Puri are updated with significant focus to climate change adaptation.

This newly formalised DDMP of Puri District in Odisha provides the technical support for strengthening the capacity of stakeholders including communities and institutions to fast-track implementation of the planning frameworks on DRR and CCA. The entire DDMP is divided into twelve broad chapters with Annexures. The five major sub-plans are: General plan, HR-V-C-A, Preparedness plan, Risk Reduction Plan and Response plan. Special focus is given to the four priorities of Sendai Framework for Disaster Risk Reduction in the Section of Mitigation of Climate Induced Disasters (Puri DDMP).

To know how the development at district level is affected by climate induced disasters, a Risk Reduction Plan is given which contains an on-going coping mechanisms to reduce the long-term disaster risk in long term with special focus on climate induced disasters. The first section of Risk Reduction Plan is the “Climate Change Action Plan”. It describes the impacts and various actions taken up by the key line departments to lessen the adverse impacts. The plan lists major developmental programs and schemes with relative DRR-CCA component. The chapters on HRVCA and Mitigation are further updated with insights from structured process of two rounds of consultations with key line departments (SLDs) on issues of mainstreaming DRR-CCA. Further, results from specific analysis on cyclones and extreme precipitations, and consultations with communities from select blocks/ villages/ urban areas contributed to the update. All of this fed into revising and categorising the mitigation actions of select climate-induced disasters into four priority areas of SFDRR (Puri DDMP).

DDMP as an effective tool for implementation of SAPCC

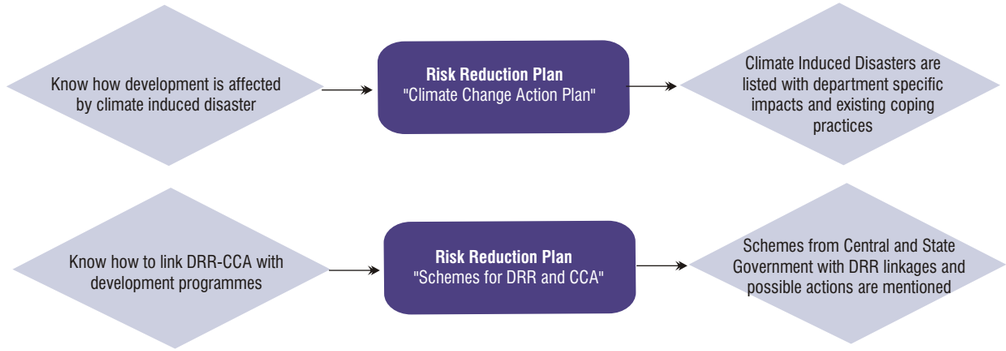
Within the structure of analysed SAPCCs, it is observed that the key priorities are identified according to the sectoral needs, but the importance of local level (District or Village) implementation is not identified. For a plan to be effective at ground level, the vulnerability assessment should include the local vulnerabilities to climate change. The specific policy actions should be based on these local vulnerabilities and needs of people at the lowest administrative level. This bottom-up approach can be scaled up to state level for effective and successful implementation of proposed actions and plans in SAPCC. The shortcomings in the implementation approach of a SAPCC can be ruled out by various provisions of DDMP. For this purpose, a thorough understanding of a DDMP from CCA-DRR

Uttarakhand : Almora (Hills, Multi-hazard- Flash floods, Landslides, water scarcity, hail storm, forest fires etc.)

Shared Learning Dialogues in Almora, Uttarakhand

Uttarakhand which is situated in the Indian Himalayan region is one of the multi-disaster prone states of the country due to its geo-climatic, ecological and socio-economic settings. In the year 2013, the region suffered its greatest disaster in living memory with huge loss of lives and wide spread destruction (Satendra et al., 2014). Almora is one of the districts in Uttarakhand which is affected by natural hazards like earthquake, LLOFs, GLOFs, avalanches, landslides, cloudburst etc. Human activities like hydropower generation, road and building constructions, river bed mining have also added and increased the vulnerability of the region. An effort was made to develop a climate resilient DDMP in the district with the support of CDKN and ISET-I. The objective of the plan is to reduce the disaster risks along with overall development of the region. Micro-risk analysis of the region was done and DRR-CCA component was integrated into major development programs and schemes.

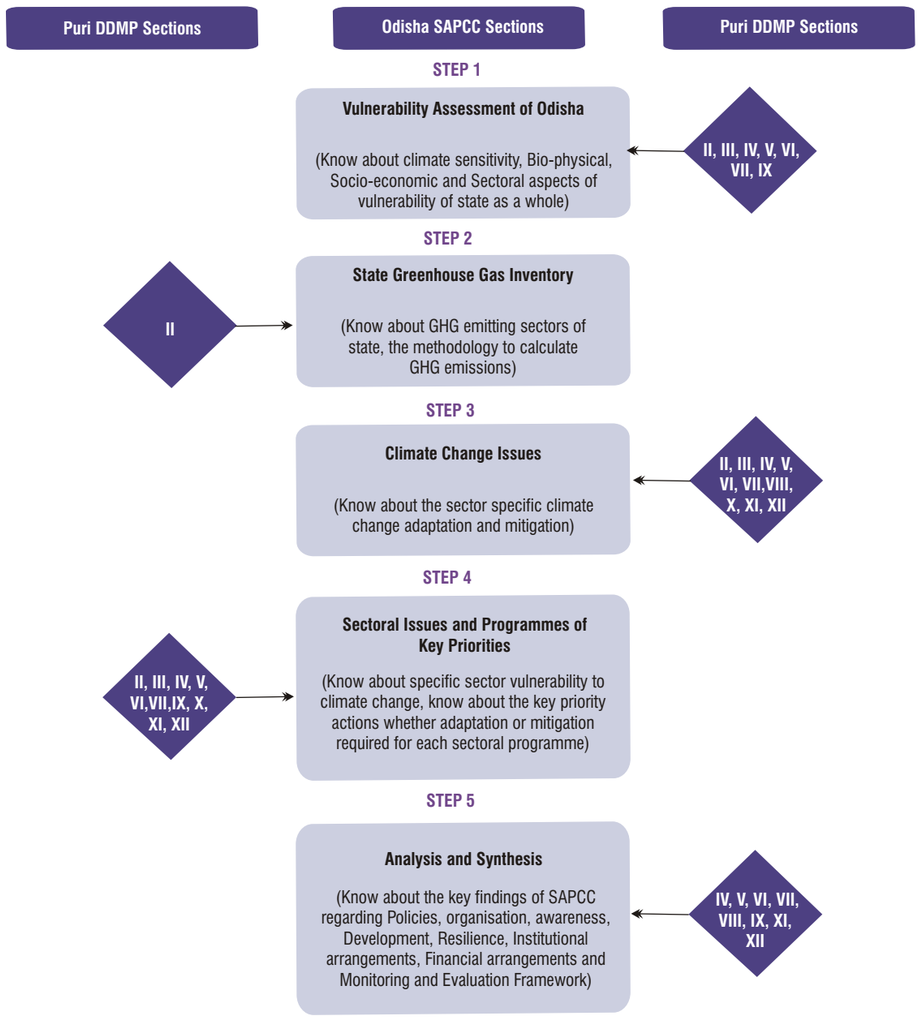
Figure 3 : CCA-DRR in Puri DDMP



perspective and knowledge of various provisions in different sections is required. With such understanding, it becomes evident that the provisions of DDMP can act as precursors to actions in a SAPCC.

By the introduction of DDMPs like Puri, Almora and Gorakhpur which have integrated climate change concerns and related adaptation components within their structure, the exposure and sensitivity can be reduced and the adaptive capacity of humans and environment can be increased to climate change and associated disaster risks. A comprehensive DDMP like that of Puri ensures - effective communication between communities and governments, mobilises funds, human and material resources and coordination between various sectors. All these help to achieve effective and quick response to climate related hazards. On the basis of our analysis of DDMP of Puri and SAPCC of Odisha, we have come up with the following figure. It shows the linkages between different sections of SAPCC and DDMP. For example in the Step 1 of vulnerability assessment in SAPCC, the provisions in sections II, III, IV, V, VI, VII and IX of DDMP will help or will act as precursors to the actions in vulnerability assessment of SAPCC. The detailed analysis to demonstrate the usefulness of DDMP as a tool for implementation of SAPCC is given in the following sections.

Figure 4 : Odisha SAPCC in a Nutshell-how DDMP actions/programmes/projects as a tool for implementation of SAPCC



Implementation of Sectoral Priorities of SAPCC

We assessed the sector specific priority actions of five key sectors primarily Agriculture, Coasts and Disasters, Forests, Health and Water. We divided the selected actions with proper emphasis on various components of the "ideal" strategy and categorised the actions as: Policy and Institutions, Capacity Building and Knowledge and Research.

On the basis of our analysis we identified the relevant DDMP sections which can directly or indirectly cater to the implementation of proposed sectoral actions of SAPCC. In our analysis, "Directly" means an action/programme specifically catering to the proposed action can be found out in the analysed DDMP whereas "indirectly" means that we could not find the exact action in the analysed DDMP but it can act as a precursor to the proposed action in SAPCC.

Table 8 : Distribution of Adaptation and Mitigation Actions in SAPCC

Sector	Total Number of Actions	Type				Scale		
		Adaptation	Mitigation	Both	Unidentified	State Wide	Particular Area	Unidentified
Agriculture	37	28	4	5		31	6	
Coasts & Disasters	24	18	2		4	2	18	4
Energy	42	0	42			37	5	
Fisheries & Animal Husbandry	14	7	3	4		9	5	
Forests	14	6	8			13	1	
Health	10	4	0	5	1	9	0	1
Industry	60	18	32	10		46	14	
Mining	42	7	29	6		8	5	29
Transport	19	2	17			127		
Urban Planning	21	9	6	6		10	11	
Water	20	20	0			15	5	

Figure 5 : Key to use the table 9 (example- Agriculture)

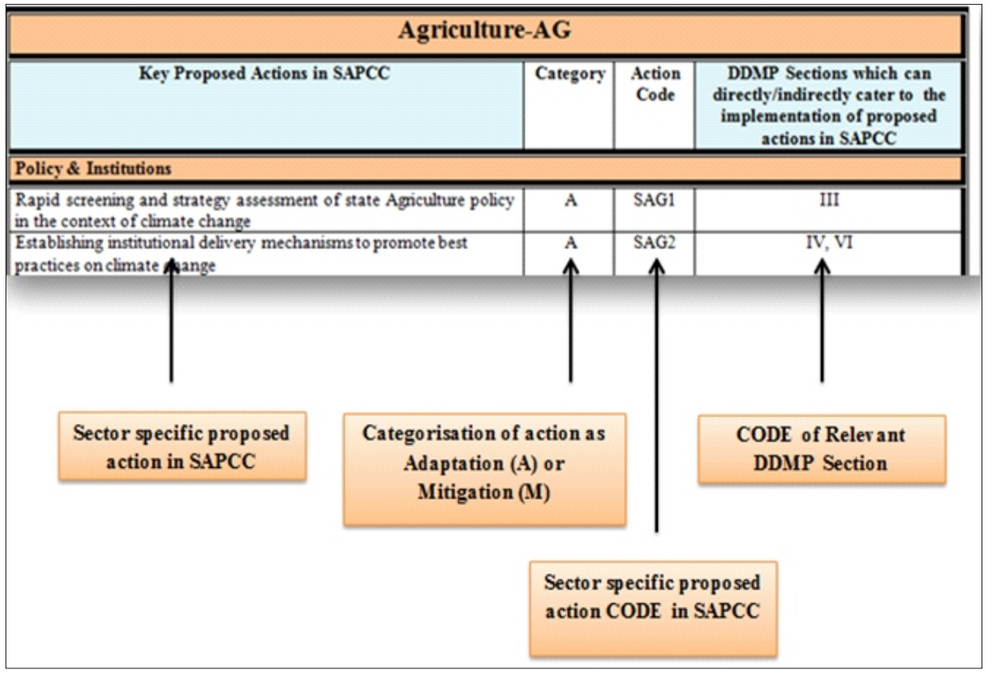


Table 9 : Matrix showing DDMP provisions addressing SAPCC agenda (Agriculture as example)

Agriculture-AG			
Key Proposed Actions in SAPCC	Category	Action Code	DDMP Sections which can directly/indirectly cater to the implementation of proposed actions in SAPCC
Policy and Institutions			
Rapid screening and strategy assessment of state Agriculture policy in the context of climate change	A	SAG1	III
Establishing institutional delivery mechanisms to promote best practices on climate change	A	SAG2	IV, VI
Increase the area under perennial fruit plantation to help cope with uncertain weather patterns	A	SAG3	VII
Stop indiscriminate conversion of agricultural land.	M	SAG4	VII
For enhancing the adaptive capacity of agriculture sector public investment in irrigation, research for adaptive cultivars of main crops and better forecasting model decision support system would be needed and incorporated in the policy.	A	SAG5	VI,VII
Conducting climate-linked research studies	A, M	SAG6	III, VI, VII
Capacity Building			
Capacity Building and Technical Support to CBOs for better management of land and water to adapt to climate risks.	A	SAG7	VI,VII
Capacity Building of Extension Personnel and Farmers.	A, M	SAG8	VI,VII
Use of Gram Panchayat training Hubs for dissemination of information on climate change.	A	SAG9	VI
Continuing the livelihood focused, people-centric integrated watershed development programmes in rain-fed areas vulnerable to climate variations. Sustainable livelihood interventions, There will be a continued investment in integrated watershed development programmes in climate sensitive areas and in furthering their replication across Orissa	A,M	SAG10	VII, XI
Training Needs:			
(i) crop/ varietal diversification (ii) shortening	A, M	SAG11	VI, VII
or lengthening, growing season planting date			
etc. (iii) mixed farming (iv) non-farm enterprise (v) better land and water management along with cropping mix (vi) risk transfer through insurance (vii) Assessment and promoting climate resilient indigenous farming practises.			
Improving monitoring and surveillance Techniques. Deciding on appropriate cropping, strengthening of pest surveillance, building response capacity through training, proactive measures for plant protection and introducing appropriate new farming techniques will be undertaken as a part of this initiative. Steps will be taken for creating massive awareness	A	SAG12	(Training and Capacity Building and Awareness) VI, VII, X, XII
Knowledge and Research			
Develop water-efficient micro irrigation methods for individual and community farm ponds.	A	SAG13	VI,VII
This will require the development of water-use. Efficient micro-irrigation methods such as drip irrigation systems and individual/community farm ponds. Small natural water bodies will be protected and nurtured in the upper catchment area.			
Develop preparedness to tackle emerging scenarios of pests.	A	SAG14	VI
Increase production of rice seeds to meet requirement under various weather scenarios.	A	SAG15	VI, VII
Use of weather data in order to generate appropriate response to possible climate scenarios.	A	SAG16	II, III, VI, VII
Developing sustainable soil, water and crop management practices	A, M	SAG17	VI, VII
Breeding studies on major crops for tolerance /resistance	A	SAG18	VI, VII Agriculture-Capacity Building, Prep
Seed Improvement	A	SAG19	VII

To make the analysis clear we take an example: - "Establishing institutional delivery mechanisms to promote best practices on climate change-CODE-SAG2" is a key priority action under the selected sector agriculture. We have linked Section IV-Institutional Arrangements and Section VI-Preparedness and Capacity Building Plan of DDMP to this action of SAPCC. That means the provisions in these two sections of DDMP can cater to the implementation of this action of SAPCC. The section on institutional arrangements in DDMP gives details of various district level authorities, agencies, local self-governments and PPP.

The key functions of these institutions are clearly mentioned. It is their duty to implement all the policies and plans of state government. If such institutional mechanisms will be there in all the districts of a state, then the priority SAG2 can be implemented successfully. Detailed analysis of DDMP sections further will clearly demonstrate as to which part of this section will cater to implementation of various actions of SAPCC.

Linkages between objectives and key strategies of DDMP with various sections of SAPCC

We analysed different objectives and key- pre, during and post disaster strategies of Puri DDMP and tried to link them with different sections of SAPCC. Direct and Indirect linkages were established between DDMP and SAPPC to show how the objectives of DDMP cater to the needs of different sections of SAPCC. We explain this by taking an example from the given figure 6 and table 9:

Figure 6 : Key to use the table 10

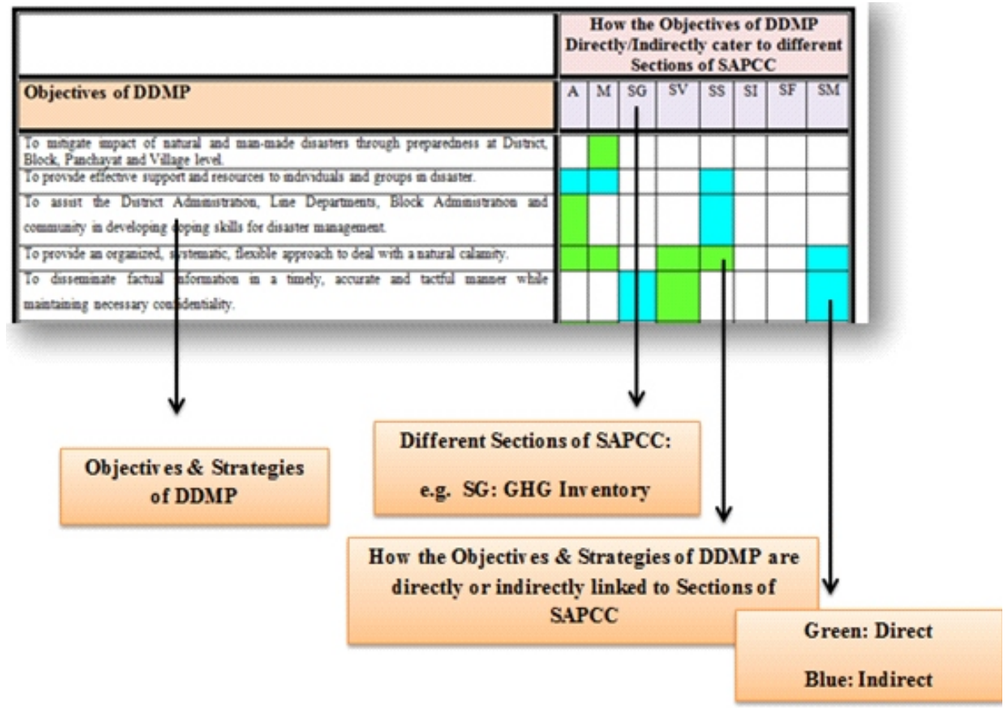


Table 10 : Linkages between objectives and strategies of DDMP with different sections of SAPCC

	DIRECT LINKAGES
	INDIRECT LINKAGES

	How the Objectives of DDMP Directly/Indirectly cater to the needs of different Sections of SAPCC							
Objectives of DDMP	A	M	SG	SV	SS	SI	SF	SM
To mitigate impact of natural and man-made disasters through preparedness at District, Block, Panchayat and Village level.								
To provide effective support and resources to individuals and groups in disaster.								
To assist the District Administration, Line Departments, Block Administration and community in developing coping skills for disaster management.								
To provide an organized, systematic, flexible approach to deal with a natural calamity.								
To disseminate factual information in a timely, accurate and tactful manner while maintaining necessary confidentiality.								
To help develop immediate and long-term support plans for vulnerable people following a disaster.								
To elicit the least possible disruption to the normal life process when dealing with individuals in disaster.								
Ensuring active participation by Government, Community, Volunteers and NGOs at all levels making optimal utilization of man, material and resources at the time of disaster and increase their participation in preparedness, prevention, development, relief, rehabilitation and reconstruction process.								
To have response system in place to face any eventuality.								
Perspective and Strategy of DDMP								
Pre planning a proper sequence of response actions.								
Allocation of responsibilities to the participating agencies.								
Developing codes and standard operating procedures for various departments and relief agencies involved.								
Inventory of existing facilities and resources.								
Mechanism for effective management of resources.								
Coordination of all relief activities including those of NGOs to ensure a coordinated and effective response.								
Coordinating with the State response machinery for appropriate support.								
Testing the plan including mock drills.								
Defining levels of acceptable risk.								
Monitoring and evaluation of actions taken during relief and rehabilitation								
Preparedness (Pre-Disaster)								
Formation of District Disaster Management Committee.								
Formation of District Disaster Management Plan for the running year.								
Hazard Analysis and Resource Inventory.								
Allocation of responsibilities to the individual actors/ Groups/ Institutions/ Organizations.								
Broadly defining the responsibilities and operational jurisdiction.								
Training and capacity building.								
During Disasters								
	A	M	SG	SV	SS	SI	SF	SM
Functioning of District Control Room and other Block/ Tehsil/ Line Departmental Control Rooms.								
Dissemination of warning/ information.								
Coordination meeting with officials at District Control Room in each 12 hours interval to take stock of the situation.								
Alert Line Department and support functionaries.								
Immediate freezing of reasonable POL stock with different Petrol Pumps.								
Rescue Operation / Evacuation teams (already identified) providing infrastructure facility and movement to rescue centres.								
Management of Rescue shelters.								
Administration of Relief								
Preparation of the Daily situation report								
Daily stock of the situation by District Magistrate and Addl. District Magistrate								
Post Disaster								
Assessment and enumeration of damage								
Ensuring safe availability of Drinking water. Provision of Medical facilities and Minimum sanitation.								
Special care to children, Lactating Mothers, Old and infirm.								
Documentation of the entire events.								

Direct Linkage : The objective of DDMP- "To mitigate impact of natural and man-made disasters through preparedness at District, Block, Panchayat and Village level" is directly related to "M" i.e. the mitigation measures in SAPCC. We have observed that the SAPCCs generally maintain a balance between proposed adaptation and mitigation measures. If all the lower administrative levels of a state have plans like Puri DDMP with an objective to mitigate disasters, man-made, natural or climateinduced, then it will directly cater to the implementation of various sectoral needs pertaining to mitigation of climate change and related disasters.

Indirect Linkage : The post disaster strategy "Assessment and enumeration of damage" will indirectly cater to various Adaptation measures "A" proposed in SAPCC. During the process of damage assessment after a disaster, not only structural damage is analysed but the gaps in preparedness are also identified. A lot of knowledge and information is generated related to vulnerability and weaknesses. This will make sure that people will be prepared for further future events by taking proper adaptation measures.

Analysis of various sections of DDMP

District Profile and Vulnerability Assessment

The following tables 11 show how various activities/actions/provisions in the district profile and vulnerability analysis of DDMP are precursors to the proposed actions in SAPCC and hence will help in their implementation.

The section on District Profile gives the unique features of a district, like socio, economic, demographic, geographic, critical infrastructures and key resources in the district. It also clearly explains the administrative setup in a district. The general narrative of observed climate trends (temperature and precipitation) is also a part of district profile. All such information will help to make the vulnerability analysis of SAPCC more comprehensive by providing the key features of the state at lowest levels.

Figure 7 : Key to use the table

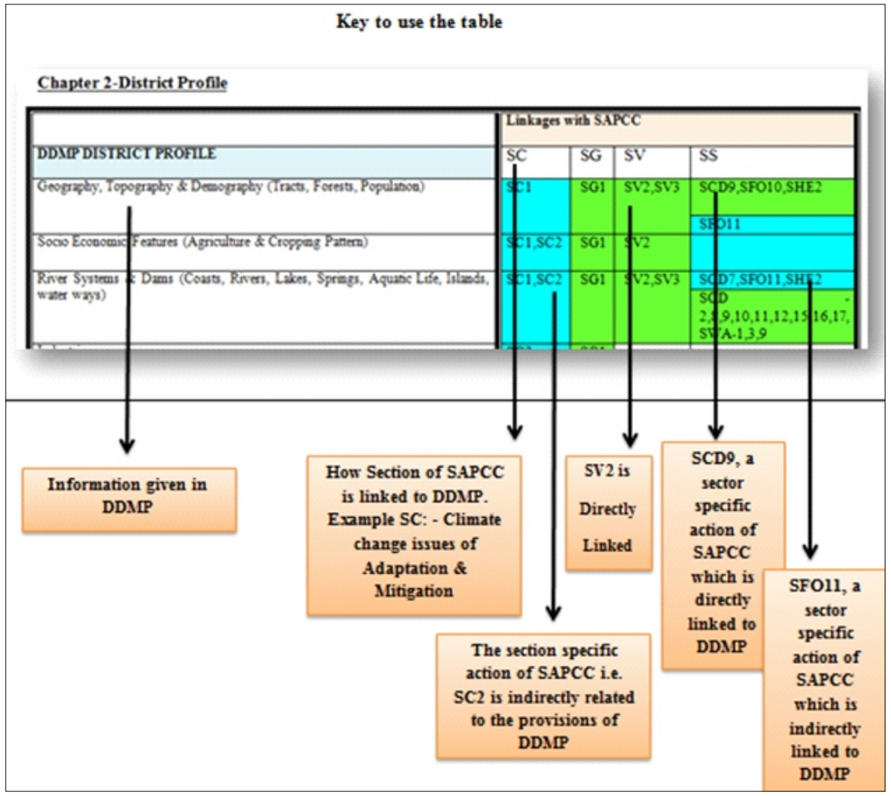


Table 11: Activities in district profile and vulnerability analysis (DDMP) as contribution to SAPCC actions

	Linkages with SAPCC			
DDMP DISTRICT PROFILE	SC	SG	SV	SS
Geography, Topography and Demography (Tracts, Forests, Population)	SC1	SG1	SV2,SV3	SCD9,SFO10,SHE2
				SFO11
Socio Economic Features (Agriculture and Cropping Pattern)	SC1,SC2	SG1	SV2,SV3	
River Systems and Dams (Coasts, Rivers, Lakes, Springs, Aquatic Life, Islands, water ways)	SC1,SC2	SG1	SV2,SV3	SCD7,SFO11,SHE2
				SCD -2,8,9,10,11,12,15,16 ,17, SWA-1,3,9
Industries	SC2	SG1		
Power Stations and Electricity Installations	SC2	SG1		
Transport and Communication Network (Road Transport)		SG1		
Critical Infrastructure (Drinking Water Facilities, Medical Facilities, Law and Order, Cyclone Shelters, STPs, Water Supply			SV2	SCD-5,12, SHE2, SWA1
Climate, Rainfall and Rain Gauge Stations	SC1, 2		SV1	SCD8, SWA1, SAG16, SCD2

The detailed information given in the district profile section will directly or indirectly help in implementing various proposed sectoral actions and also act as precursors to various section specific actions identified for each section of SAPCC. This is explained through the following example:

"SV3" is identified as a section specific action of SAPCC-"Socio Economic Vulnerability Assessment". We have analysed that the socio-economic features (Agriculture, Cropping), the demographic information, the information about major river systems at district level is very important to a socio-economic vulnerability assessment at State level. This micro information from all the districts of a State will combine to give the overall socio-economic vulnerability of the State. This is the reason we have directly linked "SV3" to the provisions of DDMP shown in the table.

To show an indirect linkage we take an example of sector specific priority action from SAPCC-"SFO11" - Assessing additional threats to biodiversity and wildlife. We have linked SFO11 indirectly to "Geography, Topography and Demography" section of DDMP. We have analysed that the information regarding forest cover, various geographical features of State and the information about population density is very important to assess threats to biodiversity and wildlife as forests are home to animals and have rich biodiversity. The geographical features and population density also decides the type of the biodiversity present there. So, this kind of detailed information at district level will cater to assess vulnerability at State level.

The Vulnerability Analysis in SAPCC can be made more comprehensive, effective and grounded by the information provided in Hazard, Risk and Vulnerability Assessment of a DDMP. Significant insights of local level vulnerability and impacts of climate change from the DDMP will cater to a better understanding of impacts of climate change and disasters, and would ultimately lead to a better policy formulation when understood at State level.

According to the NAPCC guidelines, States should have disaster specific vulnerability assessment and sectoral assessment at the state and district levels for preparing contingency plans. The HRVA of a DDMP is the most useful section in this context. This section based on the analysis of the "situation" in a district helps to prioritise hazards and risks and defines the training, equipment and exercise requirements. It determines what hazards can occur in a district, how vulnerable is the district to each hazard and all other essential information at the district level. The risk analysis quantifies the risk and enables a district to focus on those hazards that poses higher threat to life, property and environment. On the basis of hazard and risk analysis, the vulnerability of the district is analysed and mitigation measures are suggested.

Table 12: Contribution of DDMP's HRVCA to SAPCC

	Linkages with SAPCC		
Components of HRVC in DDMP	SC	SV	SS
Disaster Profile, History and Impacts (Economic, Social, Occupational and Educational Profile of Population)		SV1	SCD13
Hazard Analysis (Cyclones and Extreme Precipitation)		SV1,SV2	SAG1,SCD-7,8,9,10,11,12,14,15,16, SFO10, SHE-1,2,3
Remarks: Use of downscaled Regional Climatic Models, Climate projections for Cyclones, Identification of potential hazards for district, Profile and extent of damages to key sectors due to disasters.			
Key Sectors in HRVC of DDMP:-Electricity, Health Buildings and Roads, Irrigation, Agriculture and Horticulture, Animal Husbandry, Fisheries and Rural Infrastructure.			SAG-6,16, SCD-5,17, SFO-5,11, SHE-5,7,8, SWA9
Details of Hazards of the district (Disaster Specific proneness to Various Types of Disasters)		SV1	SCD7
			SCD-10,11
Vulnerability Analysis of the District (Based on Community consultation findings and historical data)		SV1,SV3	SCD-7,10,11,12,13
Remarks: Identification of Vulnerable areas, Disaster Probability/Seasonality			SCD-5,9
Total workforce in the district		SV3	
Ranking and Probability of Disaster Episodes in the District (Floods, Cyclones, Droughts, Tsunami etc.)		SV1	SCD-7,8
			SCD-2,15,16
Hazard Specific Analysis	SC1,SC2	SV1,SV2	SAG1, SCD-8,10,11,13, SWA8
Remarks:- Vulnerability of various sectors like Life, Property and Environment to hazards like cyclones, floods and droughts etc and the impacts of climate change on the vulnerabilities are also given			SAG6, SFO5, SHE-1,3, SWA-3,10
Socio-Economic Dimension of Vulnerability		SV2	SAG1,SCD13
Key Sectors:-Healthcare, Agriculture, Animal Husbandry, Fisheries			SHE-1,2
Physical/Infrastructural dimensions of vulnerability		SV3	SCD13
Key sectors:-Housing Stock, Roads and Buildings, Irrigation, Electricity and Rural Infrastructure			SCD-5,12
Environmental dimensions of vulnerability		SV2	SCD-2,13
Key sectors:-Forests, Land-use, Groundwater.			
Remarks:- Vulnerability of various sectors like Life, Property and Environment to environmental hazards like Fire, Heat-Waves and epidemic etc. and the impacts of climate change on the vulnerabilities are also given			SFO6, SHE-2,5
Vulnerability, Risk and Capacity Analysis	SC1,SC2	SV3	SAG1,SCD-13,14
Remarks: Detailed insights of Vulnerability and Risks due to various hazards are given, hazard specific capacities to cope up and adapt are given.			

The HRVA of a district like Puri which addresses CCA-DRR issues is more comprehensive at the district level and uses downscaled climate models for projections of hazards like cyclone.

We have linked the section specific actions and key priority actions of SAPCC with various provisions of DDMP that can act as precursors to actions in SAPCC and will also cater to their implementation. This is explained through the following example:

"SC1" is a section specific action of SAPCC-"Understanding Adaptation". We have indirectly linked it to "hazard specific analysis" of DDMP which gives the narrative of vulnerability of various sectors like Life, Property and Environment to hazards like cyclones, floods and droughts etc. It also gives the impacts of climate change on vulnerability. All this information on vulnerability will

identify the knowledge gaps and will indirectly cater to a better understanding of adaptation needs at local level. Such information when gathered from all the districts will help to come up with innovative ideas on adaptation at State level.
"SCD7"- Constructing flood shelters in unconventionally vulnerable locations is a sector specific action which is directly linked to "Details of Hazards of the district" in the HRVA of DDMP. This section in DDMP gives disaster specific proneness to various types of disasters including floods. So, in this section the vulnerability of the district to disasters is identified i.e. it caters to identification of vulnerable locations in a State if all the DDMPs in the State have such kind of details of hazards. Once the vulnerable locations are identified by using the information from DDMPs, then flood shelters can be constructed easily in such locations.

Institutional Mechanism

Now, the tables (13 to16) in following sections show on how provisions in different sections of DDMP are catering to the needs of other sections in the same DDMP and how the activities/actions/ provisions in different sections of DDMP can act as precursors to proposed actions in SAPCC.

The section on Institutional Arrangements for Disaster Management in a DDMP gives the details of institutions which draw up and monitor the implementation of disaster management plan for prevention and mitigating effects of disasters and take holistic coordinated and prompt response to any disaster situation. The institutional mechanisms at district level include: District Disaster Management Authority, District Disaster Management Advisory Committee, Local Self Government and District Emergency Operation Centre. This kind of institutional setup at district level makes sure that guidelines for prevention, mitigation, preparedness and response measures laid down by National Disaster Management Authority (DDMA) and State Disaster Management Authority (SDMA) are followed by all Departments of the State Government, at the District level and the Local Authorities in the District. All the proposed actions directly or indirectly related to disaster management and disaster risk reduction in SAPCC are implemented through this institutional mechanism at the lowest administrative level. Involvement of local self-governments like Panchayati Raj Institutions, Town Planning Authorities and Municipalities ensures capacity building at local level for better DRR and DM.

The roles and responsibilities of all the institutions are clearly mentioned in this section which will directly/indirectly cater to the implementation

Figure 8 : Key to use the table 13

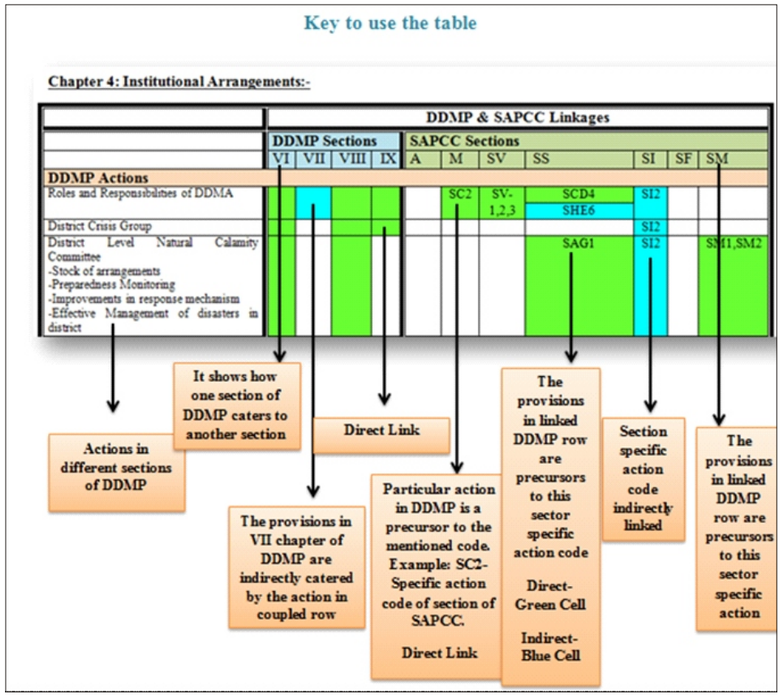


Table 13 : Commonalities between DDMP Actions in different DDMP sections and SAPCC (Institutional Arrangements)

	DDMP and SAPCC Linkages										
	DDMP Sections				SAPCC Sections						
	VI	VII	VIII	IX	A	M	SV	SS	SI	SF	SM
DDMP Actions											
Roles and Responsibilities of DDMA and other district level authorities						SC2	SV-1,2,3	SCD4 SHE6	SI2		
District Crisis Group									SI2		
District Level Natural Calamity Committee -Stock of arrangements -Preparedness Monitoring -Improvements in response mechanism -Effective Management of disasters in district								SAG1	SI2		SM1, SM2
Incident Response System									SI2		
District Emergency Operation Centre. Key Functions:- • Implementation of all policies and plans of state govt. • Implementation of all NDMA guidelines .Department should ensure that all schemes based on the parameters of mitigation, relief and rehabilitation to be identified and implemented • Implementation of all guidelines/ instructions related to disasters from GoI and state government .Implementation of Fire-safety bylaws •.Co-ordination with the different depts. in the district • Training and Capacity Building •Co-ordination with state level agency i.e. OSDMA, Bhubaneswar.					SC1	SC2	SV-1,2,3	SAG1, SFO-6,9, SHE-1,4, SCD5,SFO-5,7, 8, SHE-	SI2 SI1		SM-1,2,3
District Control Room					SC1		SV-		SI2		
Interdepartmental Coordination Needs Water, Health, Agriculture, Forest					SC1	SC2	1,2,3	SAG1, SFO-7,9 SHE-2,3,6,7, SWA3	SI2		SM3
Communication Network/Early Warning Dissemination					SC1	SC2		SHE6 SCD5, SFO-6,7, SHE-2,3,7	SI2		SM1

needs of proposed actions under SAPCC. The section on interdepartmental coordination needs makes sure that all the departments like health, agriculture, fisheries and water resources etc. at district level are working in close coordination with each other. This is a primary requirement for implementation of actions under SAPCC where the departmental needs are identified by coordinated actions, and effective implementation is also ensured.

We analysed the institutional mechanism in a DDMP and linked it to various other sections of the same DDMP to show how a comprehensive DDMP like that of Puri addresses each part of disaster management cycle. This can be explained through an example: - We have directly linked the provision "Roles and Responsibilities of DDMA" in the section Institutional Arrangements to the chapter "VI" of DDMP "Preparedness and

Capacity Building Plan". This can be justified by the fact that all the actions in chapter VI like planning, organizing, training, equipping, exercising, evaluating and taking corrective actions etc. are the responsibilities of these institutions only. DEOC, District Control Room, Block Development Officials and various other officials of line departments are involved in the preparedness cycle.

To show an indirect linkage we take the example of "Interdepartmental Coordination Needs". We have indirectly linked it section "VIII"-i. e. Response Plan of the same DDMP. This plan ensures a rapid and disciplined incident assessment to ensure a quickly scalable, adaptable and flexible response. It identifies the roles and responsibilities of various departments for incident response across all levels of government and the private sector. According to our analysis, interdepartmental coordination is very necessary for response plan activation and management, and that it why there is an indirect linkage between the two.

To explain the linkages between DDMP and SAPCC from this section we take two examples: The section specific action of SAPCC "SC2":- Understanding mitigation is directly linked to "Communication Network/Early Warning Dissemination". This can be explained by the fact that we can minimise the impacts of disasters on various sectors of a state and even mitigate them if the communication system at lower levels like that at district level is strong enough. Early warning dissemination can cater to both climate change adaptation and mitigation.

We have indirectly linked the sectoral priority action "SHE6- Undertaking measures to manage water borne disease that have worsened due to climate change impacts" to the "Roles and Responsibilities of DDMA and other district level authorities". Since it is the responsibility of various authorities and committees at District level to take response measures, to monitor preparedness and suggest improvements in response mechanisms and effective management of disasters, the above mentioned action will also be indirectly implemented by these authorities only when such situation of vector borne diseases will appear at the district level. If all such institutional arrangements are working in close coordination with each other at lowest administrative levels, then the implementation process of proposed actions under SAPCC becomes easy and effective.

Preparedness Plan

Preparedness and Mitigation Plans in DDMP are the two most useful sections which can act as effective tools for implementation of actions proposed in SAPCC. The Preparedness and Capacity Building Plan of a DDMP addresses each part of a Preparedness Cycle at the district level. Capacity Building at lowest administrative levels is very important as it develops and strengthens

Table 14 : Commonalities between DDMP Actions in different DDMP Sections and SAPCC (Preparedness)

	DDMP and SAPCC Linkages							
	DDMP Sections		SAPCC Sections					
	VIII	IX	A	M	SV	SS	SI	SM
DDMP Actions								
DRR Programmes and Projects.			SC1	SC2	SV1,SV3	SAG-1,6	SI2	SM-1,2,3
(Caters to vulnerability, Interdepartmental Coordination, community participation, M and E for DRR and CCA and training and capacity building for CCA-DRR)						SAG-5,7,8,9,12,13,17,18,SCD-1,6,12,13, SFO8		
Preparedness Checklist			SC1	SC2	SV-1,2,3	SAG-2,7, SCD1	SI2	
(Vulnerability map, Capacity Analysis, List of Food Storage facilities and Dealers, Dissemination of warning/coordination, Department wise checklist-Agriculture, Health,						SAG-11,12,13,14,SCD6, SHE-2,3,5,6		
Community Based Shelter Management (Cyclone Shelters, Health)			SC1			SCD14		
						SCD-1,7, SHE4		
Preparedness measures for different departments like Health, NGO			SC1	SC2		SHE-3,4,5, SWA-3,5,7		
						SAG-8,14,15, SCD-1,5,6,14,16, SFO-6,7		

skills, competencies and abilities of both government and nongovernment officials and communities to achieve their desired results during and after disasters, as well as preventing hazardous events from becoming disasters. The indigenous traditions, knowledge and methods are incorporated in planning at local level through this plan. Community involvement in this plan is the most important part, as it would help in implementation and maintenance of mitigation measures. The preparedness plan ensures that the capacity building occurs at the following levels: - Institutional capacity building (officials, policy makers, engineers, doctors and academicians etc.), Community capacity building focussing on vulnerable groups and Knowledge management, networking and sharing etc. All these activities are very important for the implementation of any plan whether at district level or state level. If all the districts have their own DDMPs, then with such capacity building and preparedness programmes the SAPCC can be implemented successfully.

To explain the above table we take an example: On the basis of our analysis we have directly linked section specific action "SM1": The monitoring of impacts of climate change and of progress in achieving key targets" to the DRR/ CBDRR programmes in DDMP. These programmes are national and international projects to be implemented at district level. These projects are centred at integrating and mainstreaming CCA-DRR and then scaling them up to sub-national and national level. Monitoring and Evaluation of various impacts of climate change at district level is a part of these programmes. If such programmes are there at all the districts of a state, then it will help in Monitoring and Evaluation framework proposed in SAPCCs.

To show an indirect linkage we take an example of sector specific action "SAG11- Training needs", e.g. Assessment and promoting climate resilient indigenous farming practises. We have indirectly linked it to "Preparedness Checklist" in DDMP. To ensure preparedness and to build capacity for DM and DRR, this preparedness checklist is there for various departments, including agriculture. This activity of assessment and promoting climate resilient indigenous farming practises can be a part of this checklist at district level to minimise the impact of climate-related disasters. Similarly, if all the departments at district level will have their own preparedness plans including climate change concerns then many of the proposed actions in SAPCC will be implemented automatically.

Mitigation Plan

A mitigation plan in DDMP puts focus on the impact of a hazard, gives structural and non-structural measures and approaches to eliminate

Table 15 : Commonalities between DDMP Actions in different DDMP Sections and SAPCC (Mitigation)

	DDMP and SAPCC Linkages								
	DDMP Sections			SAPCC Sections					
	VI	VIII	IX	A	M	SV	SS	SF	SI
DDMP Actions									
Planning assumptions for different departments				SC1					
Disaster Specific Measures and Approaches				SC1	SC2		SCD-15,16,SHE5,SWA4		SI2
(Heat wave, Water, Disaster-Floods, Cyclones, Food)									
Climate Change Action Plan				SC1	SC2	SV1,	SAG-3,4,11,13, SHE2, SWA-4,5,7		
Remarks: Department/Sector wise impacts against each disaster are given along with existing coping practices (Disasters:-Cyclones, Floods, Drought, Heavy Rains)						SV2			
(Department/Sector:-Agriculture, Health, Water)							SAG-7,17,SCD2		
Understanding Disaster Risks				SC1		SV1,SV2			
Inter-Agency Coordination for Disaster Management							SAG2,SCD4		SI2
National/State Schemes for CCA-DRR (Health, Water, Agriculture, Disaster Preparedness)				SC1	SC2	SV2,SV3	SAG-4,6,7, 9,17, SCD11,SHE2		
Investing in DRR Structural and Non-Structural Measures				SC1	SC2		SAG-1, 5,8,10,11,12,13,19, SCD5, SFO-1,2,3,4,5,SHE2,5	SF1	
(Agriculture, Forestry, Health)									
Specific capacity needs for various departments (Health, Forest, Agriculture)									

or limit a hazard's exposure and the impact on people, property and the environment. The mitigation plan of Puri district is unique in its own way as it incorporates a climate change action plan. Special focus is given to reduce the risk of climate-induced disasters and long-term coping mechanisms are also given. Some of the mitigation activities include: Planning, adopting and enforcing stringent building codes, flood-proofing requirements, awareness generation and capacity building for mitigation.

To explain the above table we take an example: - On the basis of our analysis we have directly linked sector specific action “SWA4:- Constructing and protecting water harvesting structures” to “Climate Change Action Plan” in DDMP. As we mentioned earlier, this section of DDMP provides sector specific impacts of each type of disaster along with long term coping practices. The action SWA4 is a part of this section of DDMP and hence directly linked. If all the DDMPs have Climate Change Action Plan incorporated in them, then it will automatically ensure the implementation of section and sector specific actions of SAPCC.

Financial Mechanisms

Financial resources for the implementation of DDMP are:- Disaster Response Funds, Disaster Mitigation Funds and Disaster Relief Funds at district and state level. National Disaster Response fund is there at national level. There are also many department and district funds. These funds are used to meet the expenses for emergency response, relief, rehabilitation in accordance with the guidelines and norms laid down by the Government of India and the State Government.

Various mitigation and adaptation projects are also funded by these district level funds. From the analysis of financial requirements of SAPCC, it is quite clear that apart from the funds especially allocated for a particular action additional funds are also required. These funds will come from the district level funds. Various actions of SAPCC will be implemented by using funds from the annual budget of line departments at district level. If these funds are allocated and used properly at district level, then lack of sources of funds for implementation of actions will no longer be there at state level.

Table 16 : Commonalities between DDMP Actions in different DDMP Sections and SAPCC (Finance)

	DDMP and SAPCC Linkages					
	DDMP Sections			SAPCC Sections		
	VI	VIII	IX	M	SS	SF
DDMP Actions						
State Disaster Response Fund				SC2	SAG10	SF1
National Disaster Response Fund				SC2		SF1
Chief Minister’s Relief Fund					SAG10	SF1
Departments and Districts Funds					SAG10	SF1

Monitoring and Evaluation

Monitoring and Evaluation of a DDMP involves combination of training events, exercises etc. to determine whether the goals, objectives, decisions, actions and timing outlined in the plan will result in an effective response. Various steps are involved in the M and E process of a DDMP. Not only the district level authorities but the state level authorities also play a crucial role in this process. This framework will indirectly help in the M and E framework of SAPCC by building capacities of officials at local level with the help of drills and training exercises. This mechanism also ensures that all the responsible departments coordinate with each other. To show the usefulness of M and E of the DDMP in the M and E of SAPCC we give the following example:

Table 17 : Commonalities of DDMP Sections with SAPCC (M&E)

Component 4, 6 and 7 of M and E framework of DDMP will be helpful for this particular impact

Codes given to different key components of M and E Framework of DDMP

Sector	Key Impacts to monitor	Targets to Monitor	Key Programmes to evaluate	Key DDMP components from M and E section
Agriculture	Changes in yields for key crops (4,6,7)	Increases in yields in watershed development program areas (2,4, 6,8)	Integrated watershed development program (1,5,6)	1) Implementation of all policies and plans of state government by DEOC.
	Frequency of crop failures	Addition to areas under perennial plantation.	Micro irrigation and farm ponds	
	(4,6,7)	(2,4,6,8)	(1,5,6)	2) Implementation of all guidelines/ instructions by DEOC related to disasters from GoI and state govt.
		Adoption of improved seed Varieties (2,4,6,8)		3) Implementation of Fire-safety bylaws by DEOC
				4) Adequacy of resources 5) Co-ordination between various departments/ agencies
	Frequency of extreme events	Building targets to provide protection measures	Effectiveness of implemented protection	6) Community participation
	(4,7)	(2,4,8)	Measures	7) Training of frontline departments.
			(1, 2,5,6)	8) Audit (Environment.
Coasts and Disasters	Losses per event (4,7)	Investment programs to protect ecologically sensitive areas (2,4)	Program to control erosion losses (1,2.5,6)	
	Loss rates for flagship species		Program to protect ecologically sensitive	
	(4,7)		Areas	
			(1,2, 5,6)	
	Rates of erosion in sensitive areas (4,7)			
	Loss rates for forest biomass	Reforestation rates	Reforestation/afforestation program	
	(4,7)	(2,4,8)	(1,5,6)	
	Loss rates for mangroves (4,7)	Reduction in loss of forests (2,4,8)	Forest conservation program (1,5,6)	
		Coverage of bald hills with Forest	Bald Hill coverage program	
Forests		(2,4,6,8)	(1,5,6)	
		Mangrove expansion rates (2,4,8)	Mangrove program (1,5)	
		Watershed plantation rates	Fire management program	
		(2,4,8)	(1,3,5,6)	
		Losses from fires (2,4,8)	Capacity building in Panchayati Raj. (1,5,6)	
Health	Incidence of vector borne Diseases (4,6,7)	Vector borne disease impacts relative to baseline (2,4,6,8)	Vector borne disease program (1,5,6)	
	Incidence of water borne Diseases (2,6,7)	Water borne disease impacts relative to baseline (2,4,8)	Water borne disease program (1,5,6)	
	Frequency of heat wave	Nos. affected by heat waves	Heat wave impacts program	
	Losses (2,6,7)	(2.4,6,8)	(1,5,6)	
		Cases of food poisoning (2,4,6,8)		
	Frequency of rainfall in	Accuracy of flood forecasting	Flood forecasting program	
	different seasons (4,7)	(2,4,8)	(1,5,6)	
Water		Water use efficiency rates	Water use efficiency program	
		(2,4,6,8)	(1,5,6)	
		No of harvesting structures built (2,4,8)	Water harvesting structures investment program (1,5,6)	
		Drainage of water indicator (2,4,8)	Improvement of drainage program (1,5,6)	
			Environmental flow in wetlands program (1,5,6)	

Taking the example of Agriculture sector from SAPCC, we say that the component "(4) Adequacy of resources" will help to monitor the impact "Changes in yields for key crops" from SAPCC. This can be justified by the fact that to monitor changes in crop yield due to climate change, adequate resources at lower level will be required like human resources to see the change, capital resources and technological resources. This impact of climate change will be monitored at lower levels and then by compiling the information from lower levels, a state level statement can come out about changes in crop yield due to climate change.

The following table shows the gist of this analysis. It qualitatively categorises the usefulness of various sections of DDMP in implementation of actions/programmes in SAPCC:

Table 18 : Usefulness of DDMP in implementation of SAPCC

	Usefulness of DDMP in implementation of SAPCC				
Components of DDMP	Very High	High	Medium	Low	Very Low
District Profile		✪			
HRVCA	✪				
Institutional Arrangements			✪		
Inventories and Evaluation of Resources					✪
Preparedness and Capacity Building Programmes	✪				
Mitigation Plan	✪				
Response Plan				✪	
Damage Assessment, Reconstruction and Rehabilitation Plan as per State DM Policy					✪
Standard Operating Procedures			✪		
Budget and Financial Allocation			✪		
Monitoring and Evaluation		✪			

From the analysis of Puri DDMP, it has become quite clear that DDMP can be used as an effective tool for implementation of SAPCC. The above table indicates that the section on HRVCA, Preparedness and Capacity Building Plan and Mitigation Plan are the most useful sections for implementation purpose.

Although the analysed SAPCCs are consistent with the National Missions in NAPCC, the relevant capacity building and resources that are required to implement the plans and policies are still lacking at institutional, stakeholder and community level. Various DRR measures suggested by NAPCC like disaster specific vulnerability assessment at district level and disaster response training at community level are integral part of DDMP. The capacity building programmes and training needs are very important in district disaster management planning.

The strategic knowledge that is generated at local level by these training and capacity building programmes can be scaled up and replicated at State level. This will help in the successful implementation of existing priority actions. In fact it will lead to development of new priorities, plans and programmes with the knowledge of local level vulnerability and enhanced strategic knowledge about the impacts of climate change and disasters.

Conclusion and Recommendations

- With the help of SAPCCs, sub-national governments have created a policy framework to address responses to climate change mitigation and adaptation. The study finds that among the three states, Uttarakhand identifies adaptation as its primary need while the other two states have maintained a balance between their proposed adaptation and mitigation options.
- The analysis of aim and objectives of the SAPCCs indicates that issues related to DM and DRR are seldom given importance in climate action planning at state level. Only Uttarakhand's SAPCC identifies the importance of DRR measures along with adaptation options.
- The sub-national plans are somewhere between the national policy and the ground level implementation of proposed actions and programmes at the lowest administrative levels, be it district level or village level. The implementation of SAPCCs at local level requires clarity on institutional, financial and monitoring mechanisms. With the help of QCS, the study demonstrated that Climate Smart DDMPs can act as effective tools to implement various actions proposed by SAPCC. The study also demonstrated that how a comprehensive DDMP like Puri addresses each part of the DM cycle and how different sections of DDMP caters to the needs of other sections of the same DDMP.
- The provisions of SAPCCs are consistent with the principles and guidelines of NAPCC which identifies DM and DRR as important part of climate resilient development. But all the SAPCCs do not clearly address the issues of DM and DRR within their structure. Here, a DDMP like that of Puri with integration and mainstreaming of CCA-DRR concerns can help achieve various priority actions in SAPCC.
- The study deals with the bottom-up approach of integrating and mainstreaming CCA and DRR into developmental planning. It focuses on the knowledge and implementation experience gained through disaster management planning at district level and scaling it up to help in the implementation of state level plans to deal with climate change. CCA-DRR integration and mainstreaming at district level planning like in Puri, Almora and Gorakhpur DDMP, is the lowest level entry point to achieve the policy implications at national level. By learning from the initiatives of these districts, all other DDMPs should integrate CCA-DRR within their structure.
- In district disaster management planning, specific roles are assigned to various government agencies at local level like municipal bodies and local governments. The proposed actions in SAPCC will actually be implemented by these agencies as they are well aware of the impacted stakeholders and it is also their duty to implement the state level policies and plans of government. Specific targets, timelines and financial allocations to district level agencies will make the implementation process easy and successful. DDMPs also create awareness at local level which is the key requirement of many sector specific priority actions in SAPCC. The mechanisms demonstrated to increase the inter-departmental and inter-agency coordination are very useful for effective implementation of proposed strategies.
- A detailed implementation framework is lacking in the structure of SAPCCs. Since SAPCCs are dynamic documents which can undergo revisions and reviews, and can be updated as new evidences and knowledge evolves, this study recommends that for strengthening the implementation process of proposed actions, a framework has to be there which can integrate the provisions of DDMP to act as tools in implementation as demonstrated by this study.

APPENDIX

(1) Key sectors of DDMP

Coasts and Disasters: CD			
Key Proposed Actions in SAPCC	Category	Action Code	DDMP Sections which can directly/indirectly cater to the implementation of proposed actions in SAPCC
Policy and Institutions			
Strengthening delivery and monitoring system and preparedness in disaster prone coastal areas.	A	SCD1	VI,X,XII
Developing a hydrological framework.	A	SCD2	II, III, VII ,IX,XII
Identification, protection and rejuvenation of traditional water bodies, natural drainage channels and moribund river channels will be necessary. Ground water conservation/ replenishment through a watershed based approach will be taken up.			
Strengthening coastal protection methods	A, M	SCD3	VII
Integrating climate change risk in the state's disaster management policy.	A	SCD4	IV,VII
The existing disaster management policy needs to be strengthened to deal with extreme events.			
Capacity Building			
Developing a techno-legal regime for construction of disaster resilient housing and public infrastructure.	A	SCD5	II, III, IV, VI, VII
Setting up an integrated training and capacity building protocol.	A	SCD6	VI
Raising awareness of community and stakeholders on the coping mechanisms would be done under this initiative.			
Constructing flood shelters in unconventionally vulnerable locations.	A	SCD7	II, III, VI
Capacity building of the community to face the changing weather pattern is required as a part of climate change adaptation.			
Knowledge and Research			
Flood mapping, flood forecasting, downscaled climate change projections Modeling.	A	SCD8	II, III
Assessment of erosion prone areas with the help of Digital Elevation Model.	A	SCD9	II, III
Prediction through appropriate modeling the impact of sea level rise on coastal ecosystem	A	SCD10	II, III
Study of impact of global warming on the biodiversity of coastal ecosystems.	A	SCD11	II, III,VII
Studying Coastal Erosion.	A	SCD12	II, III, VI
Focussing on settlements and public infrastructure.			
Conducting micro-level vulnerability assessment.	A	SCD13	II, III,VI
It will need data on Housing, public infrastructure, livelihood, effects of extreme weather events and socio-economic information			
Needs assessment and constructing	A	SCD14	III, V, VI, VIII
Multi-purpose cyclone shelters.			
Provision of emergency equipment to the cyclone shelters and strengthening of the capacity of local people for disaster management are envisaged in the projects.			
Dredging and river mouth widening to improve flood management.	A, M	SCD15	II, III, VI
For this locations will be identified for dredging and river mouth widening.			
Improving flash flood management.	A, M	SCD16	II, III, VI,VII
Potential locations for possible occurrence of flash floods will be identified across the state. Wherever viable, check dams will be constructed to contain flash flooding in high gradient river basins			
Prediction through appropriate modeling the impact of sea level rise on coastal ecosystem.	A	SCD17	II, III
Research studies will be done using appropriate modeling to generate different scenarios pertaining to Chilika. This will include the prediction of the changed salinity regime, salinity flushing, upstream breeding migration, impact on the lake fishery and biodiversity through modeling.			

Forests: FO			
Key Proposed Actions in SAPCC	Category	Action Code	DDMP Sections which can directly/indirectly cater to the implementation of proposed actions in SAPCC
Policy and Institutions			
Increasing reforestation / afforestation activities in degraded forest areas	M	SFO1	VII
Protecting existing forest stocks to act as carbon sink	M	SFO2	VII
Increasing planting on non-forest land and also exploring where new and increased tree planting could create barriers to storm and cyclone impacts in coastal zones	M	SFO3	VII
Covering bald-hills with suitable species mix	M	SFO4	VII
Increasing and protecting existing mangrove cover along the coast.			
It is also proposed to establish a mangrove study centre, which will take up research on mangroves and associated biodiversity vis-à-vis climate change.	A, M	SFO5	III,IV, VII
Capacity Building			
Assessing fire management strategies	M	SFO6	III,IV, VI
Working to establish new systems to support for community users	A	SFO7	IV, VI
Capacity building of JFM and CFM Committees and Panchayati Raj Institutions to adapt to climate change	A	SFO8	IV,VI
Monitoring carbon stock and biodiversity at regular intervals			
Under this initiative, developing a new and independent organization – a forest monitoring agency – under the Forest department will be undertaken. Roles, responsibilities, authorities and resources for this new and independent organization will be formulated; and the organization will be made operational.	M	SFO9	IV, XII
Knowledge and Research			
Studies on indigenous trees species to assess their vulnerability	A	SFO10	II,III
Assessing additional threats to biodiversity and wildlife			
A suitable species conservation plan needs to be formulated. Strengthening the resilience of plants and wildlife through the development of protected areas and wildlife habitat is necessary. The risk of floods, landslides, erosion and loss of ecosystem services will largely be reduced.	A	SFO11	II, III,X
Improving tree planting and forest management to integrate with watersheds and water resources management.			
Some of the measures indicated here are drainage line treatment, contour trenches, check dams, percolation tanks, planting pits, etc.	M	SFO12	VII

Health: HE			
Key Proposed Actions in SAPCC	Category	Action Code	DDMP Sections which can directly/indirectly cater to the implementation of proposed actions in SAPCC
Policy and Institutions			
Integrating climate change considerations in the state health policy	A, M	SHE1	III, IV
Strengthening approaches to manage vector borne disease that have worsened due to climate change impacts	A	SHE2	II, III, IV, VI, VII,X
Strengthening approaches to deal with the physical and psychological impacts due to extreme weather conditions caused by climate change	A	SHE3	III, IV, VI,X
Capacity Building			
Capacity building of the health sector on adaptation and mitigation	A,M	SHE4	IV,VI, VII,X
Strengthening approaches to deal with heat wave conditions exacerbated due to climate change	A	SHE5	III,VI,VII,VIII, IX
Undertaking measures to manage water borne disease that have worsened due to climate change impacts	A,M	SHE6	IV,VI, VII,X
Knowledgeand Research			
Studies on climate change and health impacts			III
Addressing increased drought, malnutrition and food security issues due to climate change	M	SHE7	VI,VII,III,IV,V,VIII
Inter-linkages between air quality and climate change, and implications on health	A,M	SHE8	III

Water Resources: WA			
Key Proposed Actions in SAPCC	Category	Action Code	DDMP Sections which can directly/indirectly cater to the implementation of proposed actions in SAPCC
Policy and Institutions			
Expansion of hydrometry network	A	SWA1	II,VI
Increasing the water use efficiency in irrigation	A	SWA3	VI,IV,X,III
Constructing and protecting water harvesting structures	A	SWA4	VI,VII, IX
Improving drainage systems	A	SWA5	VI,VII
Capacity Building			
Raising awareness with Pani Panchayat through Farmers' Training Programme and creating agro-climatic stations	A	SWA6	VI
Integrated Water Resources Management	A,M	SWA7	VI,VII
Knowledge and Research			
Development of flood forecasting models	A,M	SWA8	II, III, VI
Downscaling of Global Circulation Model	A	SWA9	II, III
River health monitoring and ecosystems environmental flow demand studies	A	SWA10	II,III

(2) DDMP and SAPCC Linkages

Inventories and Evaluation of Resources (Chapter 5)

	DDMP and SAPCC Linkages									
	DDMP Sections			SAPCC Sections						
	VI	VIII	IX	A	M	SV	SS	SI	SF	SM
DDMP Actions										
Food Storage Locations in details				SC1			SCD14			
Dry Food Storage Location							SCD14			
Inaccessible Pockets: Where Food stuff to be stored				SC1			SCD14			
List of NGOs and CBOs				SC1		SV3	SCD14			
NSS Volunteers							SCD14			
Human Resource (Hospitals, Dispensaries, PHC andHealth Care Facilities etc.)							SCD14 SHE7			
Details of Livestock Shelters and Mounds										
Police/Defence Services										
List of flood and cyclone shelters				SC1			SCD14			
List of financial Institutions				SC1	SC2				SF1	
List of Industries					SC2, SG1, SG2					SM1
List of Telecommunication Systems				SC1				SI2		

Response Plan (Chapter 8)

	DDMP and SAPCC Linkages					
	DDMP Sections	SAPCC Sections				
	VI	A	M	SI	SS	SM
DDMP Actions						
Incident Response System				SI2		
Preparedness andCapacity Building Plan		SC1	SC2	SI2	SCD14	SMI1,SM13
Remarks: 1) Coordination with other departments						
2) Pre- positioning of critical supplies in the disaster prone areas						
3) Mock Drill						
4) Capacity Building Plan						
5) Zoning (Vulnerability Assessment)						
6) Response Plan(For each type of disaster the Pre-During –Post Disaster activities are given)					SHE5	
Health Care		SC1	SC2		SHE5	
Remarks:(i)Providing preventive, Primitive and Curative Health care services						
(ii) Planning and Implementation of national health Programmes						
(iii) Financial management and Administration						
(iv) Capacity building of staff						
(v) Improving Public Health Behaviour through Awareness.						

Damage Assessment, Reconstruction and Rehabilitation Plan as per State DM Policy (Chapter 9)

	SAPCC Linkages		
	SAPCC Sections		
	SV	SS	SF
DDMP Actions			
Rapid Damage Assessment	SV2		
Detailed Damage Assessment and Preparation of Rehabilitation and Reconstruction	SV2	SAG2	SF1
Plan		SCD2,SWA4	

Standard Operating Procedures (Chapter 10)

	DDMP and SAPCC Linkages					
	DDMP Sections			SAPCC Sections		
	VI	VII	VIII	A	M	SS
DDMP Actions						
SOP for Line Departments				SC1	SC2	SCD1
Remarks:-PHE dept., Action- Early Warning						SHE-2,4,6, SWA3
Water Resource Dept., PWD,Forest, Health, Agriculture, Disaster Emergency Operations						

Monitoring and Evaluation (Chapter 12)

	DDMP and SAPCC Linkages				
	DDMP Sections		SAPCC Sections		
	VI	VIII	A	SM	SS
DDMP Actions					
Implementation, Monitoring and Update of DDMP			SC1	SM1,2,3	SAG12, SCD-1,2, SFO9

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