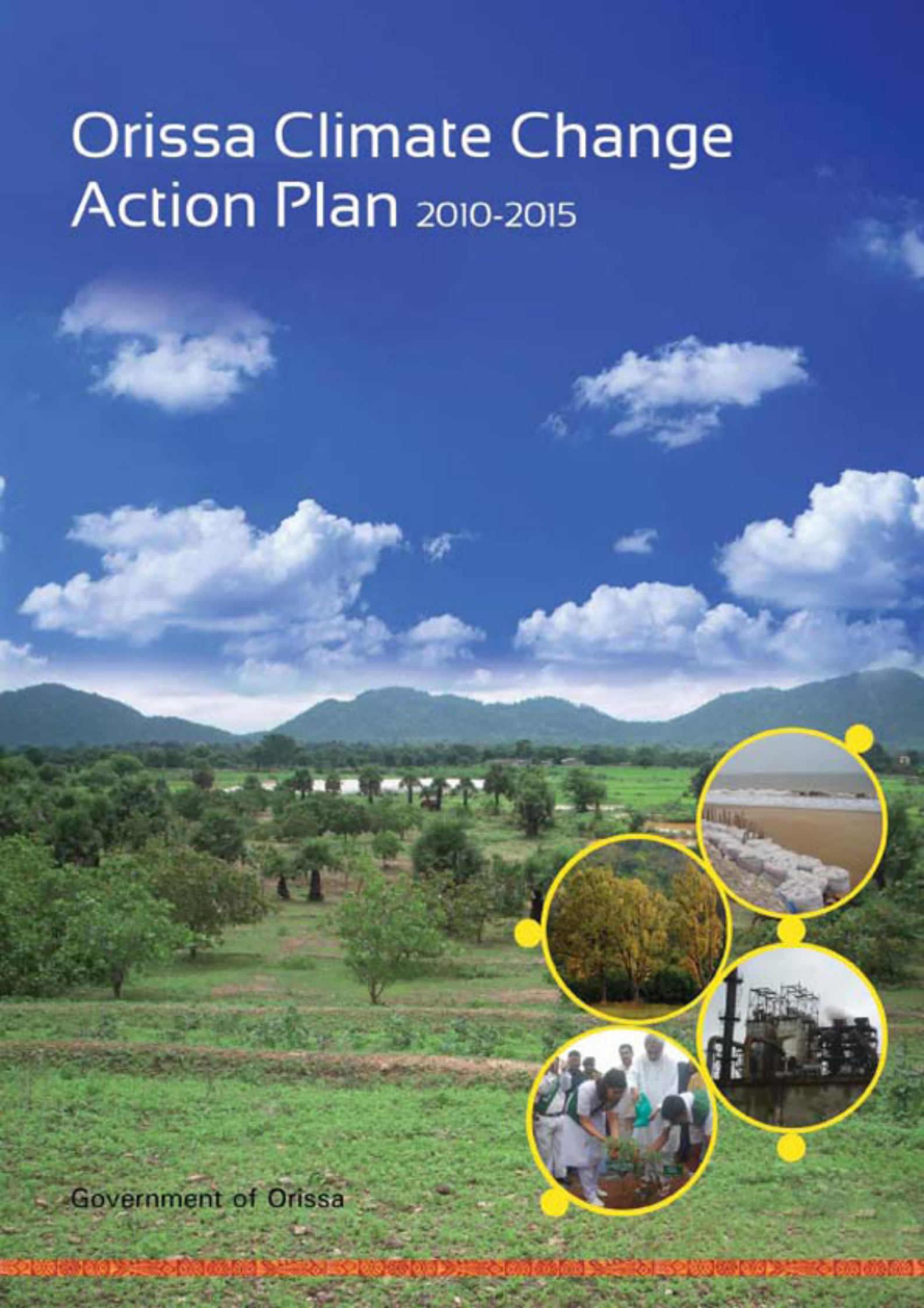
Orissa Climate Change Action Plan 2010-2015



Government of Orissa

NAVEEN PATNAIK
CHIEF MINISTER, ORISSA

सत्यमेव जयते
ORISSA STATE

MESSAGE

Man made green house gas emissions have resulted in a dramatic increase in the earth's temperature over the past century. The projected future increase over the next 100 years due to growing emissions could possibly warm the planet by 5^0C relative to the pre-industrial period. Such a change in the climate can result in physical impacts which in turn could severely limit development. Climate change has special relevance for Orissa for two reasons; because of its location and the geophysical conditions, climate change could have a disproportionate effect on the state and secondly, because the state has an urgent development imperative because of the fact that a large percentage of its population is still deprived of a decent standard living. Under these circumstances the Climate Change Action Plan for the state of Orissa assumes greater significance.

I am happy that different departments, experts and civil society have come together to look at different sectors of the state's economy and put in place an action plan which would help mitigate the impact of climate change in the state and would also help the people cope with climate change. I hope that the action plan will be implemented in right earnest so that the possible adverse impacts of climate change are minimized and the development process is carried out in a manner which reduces carbon foot prints. It will also be necessary to demystify the processes in order that the common people who are the most important stakeholders become willing partners in the implementation of the action plan.

(NAVEEN PATNAIK)

SHRI DEBI PRASAD MISHRA
Minister
Forest & Environment, Orissa

MESSAGE

Climate Change is one of the most important global environment challenges facing humanity with implications for Food Production, Water Supply, Health and Energy, etc. Addressing climate change requires a good scientific understanding as well as coordinated action at Regional, National and Global Level. The adaptive capacity of community likely to be impacted by Climate Change is low in developing countries.

Our state is endowed with rich natural resources which have made us more vulnerable, since three-fourth of our state's population depends on climate sensitive natural resources based livelihood such as Agriculture, Forestry and Fisheries. For more than a decade, the state has been experiencing contrasting extreme weather conditions; from heat waves to cyclones; from droughts to floods. In last four years, calamities have claimed few thousand lives.

Climate change has the potential to derail the current growth strategies and deepen poverty. Considering the concern, our State has taken an early initiative to formulate Climate Change Action Plan in a holistic manner. The Climate Change Action Plan is first of its kind and innovative one. It has focused on 11 critical sectors having linkages to climate change and this is our critical first step and we have a long way to go in reducing the vulnerability. The purpose of the Climate Change Action Plan is to strengthen institutional capacities of different Stage Agencies to integrate environment and climate change issues in development planning, policies and sectoral programmes.

I wish this Climate Change Action Plan will be the foundation stone for preparation of an implementable schedule within a time frame which is urgently required to form an overarching strategic framework for the developmental policy and planning in the State.

(DEBIPRASAD MISHRA)

AUROBINDO BEHERA
Principal Secretary,
Forest & Environment Department

FOREWORD...

Orissa is one of the first states to formulate a comprehensive action plan to address the climate change issues. The plan which has been formulated by an inter-departmental team is a coordinated government response to this important problem which looms large. The plan also incorporates civil society inputs. The climate change advisory firm, CTRAN, was the knowledge partner in facilitating the preparation of the action plan and World Bank provided the sectoral experts who have shared their expertise in giving shape to the plan. The Action Plan which is for a period of five years identifies measures that address climate change issues while recognising the developmental imperatives in the State of Orissa.

The implementation of the plan will be actively monitored. If needed, it will be adapted to changing circumstances. It is our hope that the Climate Change Action Plan will foster cooperative approaches rather than relying exclusively on command and control mandates. There is an implicit assumption that private sector units, civil society and government would work together to improve environmental performance while pursuing goals of economic development in the state. While many of the proposed actions are already a part of Government's regular activities and existing programmes, additional initiatives would also be required on the part of different government departments. A climate change cell has been set up in the Forest and Environment Department to closely coordinate all the recommended actions and also work towards resource mobilisation to implement different components of the action plan in a systematic and time bound manner.

I am sure with the active involvement of all the stakeholders, Orissa would be in a position to achieve important milestones in realising the goal of a climate resilient society.

Aurobindo Behera,
(AUROBINDO BEHERA)

BHAGIRATHI BEHERA, IFS
Director,
Environment Cum Special Secretary,
Forest & Environment Department
Government of Orissa

Acknowledgement

This Climate Change Action Plan has been prepared by Forest and Environment Department of Government of Orissa under the guidance of Principal Secretaries of the Department. The overall guidance and support of Sri T K Mishra, Former Chief Secretary and Sri B K Pattnaik, Chief Secretary, Orissa is gratefully acknowledged. We are indebted to Sri U N Behera, former Principal Secretary of Forest and Environment Department and Dr Aurobindo Behera, Principal Secretary of Forest and Environment Department for their support and constant guidance throughout the preparation of Action plan to bring it to a definite shape. Thanks are due to all Chairpersons, Convenors and working group members of all 11 sectors who had taken pains to participate in deliberations and working group facilitation and moderation of various inputs. Thanks are due to Dr Virinder Sharma of DFID for initial scoping study, Dr Muthukumar Mani and Dr Vaideeshwaran of World Bank for extending technical support and providing sectoral experts for preparing draft Climate Change Action Plan. Thanks are also due to Sri Ashok Kumar Singha, CEO of CTRAN Consulting services and his team members for their active support in consultation workshop and in preparing the draft. Significant contributions from number of Non-Government Organisations, Civil Society Representatives and members of the political parties and academic institutions at several meetings and consultation workshops held at various stages are gratefully acknowledged.

Bhagirathi Behera

(BHAGIRATHI BEHERA,IFS)

Contents

Abbreviations and Acronyms

BCM	Billion Cubic Metres
CEA	Central Electricty Authority
CAP	Climate Change Action Plan
CBO	Community Based Organization
CDM	Clean Development Mechanism
CDP	Comprehensive Development Plan
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
CPP	Captive Power Plant
DFID	Department for International Development, UK
DPR	Detailed Project Report
DSM	Demand Side Management
ECBC	Energy Conservation Building Code
FSI	Forest Survey of India
GHG	Green House Gas
GoI	Government of India
GoO	Government of Orissa
GSDP	Gross State Domestic Product
ICZMP	Integrated Coastal Zone Management Project
IPCC	Inter-Government Panel on Climate Change
IPP	Independent Power Producer
IPR	Industrial Policy Resolution
JFM	Joint Forest Management
km	Kilometre

LPG	Liquefied Petroleum Gas
Mm	Millimetre
MoEF	Ministry of Environment & Forests
MRTS	Mass Rapid Transport Systems
MSME	Micro, Small & Medium Enterprise
MT	Metric Tons
MW	Mega Watt
MSW	Municipal Solid Waste
NAPCC	National Action Plan on Climate Change
NTFP	Non-timber Forest Produce
NTPC	National Thermal Power Corporation
OERC	Orissa Electricity Regulation Commission
OREDA	Orissa Renewable Energy Development Agency
OSDMA	Orissa State Disaster Management Agency
OWDM	Orissa Watershed Development Mission
PV	Photovoltaic
Rs.	Rupees
SEZ	Special Economic Zones
T & D	Transmission and Distribution
ULB	Urban Local Bodies

Summary

Why Climate Change is a Serious Issue for Orissa?

With a 480 km coast line that is prone to climate-mediated cyclones and coastal erosion and water resources dependent on monsoons, Orissa is relatively more vulnerable to climate change. Water-consuming rice is its main crop and therefore its agriculture is vulnerable to the vagaries of climate-induced weather changes. Though 38 percent of the state's geographical area is recorded as forests, much of these forests are degraded. Vector-borne diseases, particularly malaria, are fairly rampant and climate change may make the prevalence of the disease even more widespread.

Indeed, climate change has the potential to derail the current growth strategy and deepen poverty in Orissa. Continuing climate variation is predicted to alter the sectoral growth, including the ability of the poor to engage in farm and non-farm sector activities. The direct impacts of extreme climate-induced events could include loss of life, livelihoods, assets and infrastructure. All of these could affect the state's economic growth and nullify the effectiveness of macro economic policies and pro poor initiatives.

Climate Risks in Orissa

- High variability of rainfall, leaving people with two peak periods of food shortage
- Drought and dry spells at an interval of every two years in Western Orissa with a major drought every 5-6 years
- Flash floods during rainy season
- Heat waves in summer
- Intense coastal flooding and cyclones

What the Government of Orissa (GoO) is doing?

Context

Of late Orissa has made significant progress in economic and fiscal terms. The Gross State Domestic Product (GSDP) during the 10th five year period (2002-2007) has grown by 8.5 percent per annum which is slightly more than the national rate. Private investment of funds in the state has increased, employment opportunities have grown and growth is also leading to poverty reduction. A remarkable fiscal turnaround was achieved through the state's own efforts and complemented by performance-linked support from the central government. The state's 11th Five Year Plan focuses on addressing the challenges in achieving sustainable, shared economic growth and accelerating human development. GoO recognizes that climate change should not undermine the process of economic development.

Process

Orissa took an early initiative to formulate the State Climate Change Action Plan (CAP). The Chief Minister appointed a High Level Coordination Committee headed by the Chief Secretary to steer its preparation. Eleven sectoral missions were identified and inter-departmental representation ensured co-ordination among sectors. Individual working groups under the chairmanship of concerned departmental Secretaries who are also members of high level coordination committee, deliberated on the issues.The support for the process was available from the World Bank and DFID. The Working Groups interacted with experts in various sectors. Key priorities consistent with those of the National Action Plan on Climate Change (NAPCC) were identified (Agriculture, Coastal Zones and Disasters, Energy, Fisheries and Animal Resources, Forestry, Health, Industry, Mining, Transport, Urban Planning and Water Resources). These key priorities were vetted through a series of stakeholder consultations held at Bhubaneswar, Berhampur, Anugul and Balasore in which representatives of business as well as civil society organisations participated. A synthesis workshop in Bhubaneswar collated and discussed all the feedback received and relevant inputs were incorporated in the CAP.

High-Level Coordination Committee

Chief Secretary	Chairman
Development Commissioner	Member
Agriculture Production Commissioner	Member
Principal Secretary, Finance Department	Member
Principal Secretary, Housing and Urban Department	Member
Principal Secretary, Fisheries and ARD,	Member
Principal Secretary, Steel and Mines Department	Member
Commissioner-cum-Secretary, Agriculture Department	Member
Commissioner-cum-Secretary, Commerce & Transport Department	Member
Commissioner-cum-Secretary, Health and Family Welfare Department	Member
Commissioner-cum-Secretary, Revenue & Disaster Management Department	Member
Commissioner-cum-Secretary, Energy Department	Member
Commissioner-cum-Secretary, Industry Department	Member
Commissioner-cum-Secretary, Water Resources Department	Member
Managing Director OSDMA	Member
Principal Secretary, Forest & Environment Department	Member Convenor

Agriculture

Agriculture holds a predominant position in the state's economy. About 80-85 percent of the state's population is rural and depend on agriculture. The agriculture sector contributes about 26 percent of the GSDP. With almost 60 percent of land under rain fed agriculture and with water-dependent rice, as its main crop, the agriculture sector is particularly vulnerable to the vagaries of climate change. Further, paddy fields in the coastal areas are prone to frequent erosion, salinisation and inundation. Climate projections indicate that drier areas will become drier and flood prone areas will be subject to more flooding. Other problems such as pest and disease outbreaks are also likely to increase due to climate variability.

Agriculture – Key Priorities

- Rapid screening and strategy assessment of State Agriculture Policy
- Establishing an effective institutional delivery mechanism to promote best practices on climate change
- Undertaking capacity building
- Continuing the livelihood-focused, people-centric integrated watershed development in rain fed areas
- Increasing the area under perennial fruit plantation
- Developing water use-efficient micro irrigation methods and individual / community farm ponds
- Improving monitoring and surveillance techniques
- Developing sustainable soil, water and crop management practices
- Breeding studies on major crops for tolerance /resistance
- Conducting climate-linked research studies

Coastal Zones and Disasters

Orissa has long been prone to disasters. Frequent droughts, floods and cyclones are recurrent features in the state and have had a crippling effect on the economy. In 1999 a severe cyclone followed by a super severe cyclone lashed the entire coast of Orissa causing large scale loss of life. Whilst the extent to which climate change will exacerbate floods and droughts is not yet fully understood, it is clear that their frequency and intensity will increase. While Orissa has done pioneering work on disaster management through the Orissa State Disaster Management Authority (OSDMA), the first of its kind in the country, there is a considerable need to improve own understanding of the climatic impacts on disasters and to build capacity of communities to adapt, manage and mitigate their impacts.

Coasts & Disasters – Key Priorities

- Flood mapping, flood forecasting and downscaled climate change projections modeling
- Assessment of erosion prone areas with the help of Digital Elevation model
- Studying coastal erosion
- Conducting micro-level vulnerability assessment
- Constructing flood shelters in unconventionally vulnerable locations
- Needs assessment and constructing multipurpose cyclone shelters
- Developing a hydrological framework
- Dredging and river mouth widening to improve flood management
- Strengthening coastal protection methods
- Developing a techno-legal regime for construction of disaster resilient housing and public infrastructure
- Integrating climate change risk in the state's disaster management policy
- Setting up an integrated training and capacity building protocol
- Assessment of risks due to lightning and thunderstorm
- Improving flash flood management
- Prediction through appropriate modeling the impact of sea level rise on coastal ecosystem
- Study of impact of global warming on the biodiversity of coastal ecosystem with special emphasis on flagship species

Energy

The need for energy is increasing in Orissa which is poised for rapid industrial development. With abundant reserve of coal, power generation is bound to be a priority. Orissa is also on the way to becoming a major energy supplier to the grid and this could come at a high cost in terms of both local environmental quality and contribution to global emissions. The State has had the distinction of being the first state in the country for ushering in sweeping reforms in power sector, which had the objective to provide consumers with reasonably cheap, reliable and uninterrupted supply of power. There are already several initiatives to promote renewable energy, reduce Transmission & Distribution (T&D) losses and to promote energy efficiency in the state. All these efforts become much more important in the climate change context.

Key priorities - Energy

- Generating cleaner energy through clean coal approaches
- Institutional development (Capacity building/ restructuring) of Energy Department
- Reduction of Transmission & Distribution losses
- Promoting demand side management & energy efficiency
- Fly ash utilization and emission reduction from power plants
- Promotion of Small and Medium Hydel plants
- Harnessing biomass potential
- Promotion of Grid based wind power generation
- Maximize solar power generation
- Development of Biogas and manure management

Fisheries and Animal Resources

Being water dependent, the fisheries sector in Orissa will be impacted by climate change. The livelihoods of the fisher folks will be affected most, not only due to sea level rise and climate mediated hazards, but also due to erratic rainfall that affects the open reservoirs and ponds/tanks. Animal resources - support a large part of rural livelihoods – will be impacted by heat stress and other climatic impacts. Methane emission from the livestock is a key concern.

Fisheries and Animal Resources – Key Priorities

- Vaccination against contagious diseases,
- Deworming and early disease warning system, emphasis on Green fodder, pasture development and grazing,
- Training on fodder production, fodder conservation, rotational grazing, Rain Water harvest technology, Methane gas harvesting technology, biogas tanks management
- Conservation of local hardy animals.
- Gobar Gas tanks/packing to cylinders
- Easy and handy Methane Harvest at farmers point
- Enhancing Disease Early Warning Systems with climate change considerations
- Application of biotechnology and skilled animal breeding for development of better adopted species
- Capacity building of livestock keepers
- Research on disease early warning system relevant to livestock
- Impact of climate change on inland and coastal aquaculture
- Development of infrastructure for early warning systems in coastal areas for fishermen

Forests

Forests provide livelihoods to a large proportion of tribal populations and rural poor. The forests also have important ecological functions, checking soil erosion and reducing the impact of droughts, floods and cyclones (mangroves).

Mining and other industrial projects are bound to have some adverse effects on forests, and would create conflicts between wild animals and local inhabitants due to fragmentation of forests. Forestry sector is also particularly important both from climate mitigation as well as adaptation perspectives. While no assessment of the impact of climate changes on Orissa's forests has yet been undertaken, it is nonetheless necessary to evaluate the long-term effects of climate change on forests and determine what the community might do in response.

Forestry - Key Priorities

- Increasing reforestation / afforestation activities in degraded forest areas
- Protecting existing forest stocks to act as carbon sink with stronger conservation
- 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
- Covering bald-hills with suitable species mix
- Increasing and protecting existing mangrove cover along the coast
- Assessing fire management strategies
- Improving tree planting and forest management to integrate with watersheds and water resources management
- Working to establish new systems to support for community users.
- Undertaking studies on indigenous trees species to assess their vulnerability to climate change
- Assessing additional threats to biodiversity and wildlife
- 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
- Monitoring carbon stock and biodiversity at regular intervals

Health

In Orissa, increased health risks will arise due to climate change. There is already high prevalence of malaria and vector-borne diseases in certain areas. With erratic nature of rainfall and extending seasons, these may become more widespread. Climate change has the potential to aggravate vector-borne, water-borne and food-borne diseases . The intensity and frequency of extreme events such as heat waves and cyclones could further expose the vulnerable population to health risks.

Health - Key Priorities

- Capacity Building of the health sector on climate change
- Integrating climate change considerations in the State Health policy
- Strengthening approaches to manage vector borne disease that have worsened due to climate change impacts
- Strengthening approaches to deal with heat wave conditions exacerbated due to climate change
- Strengthening approaches to deal with the physical and psychological impacts due to extreme weather conditions caused by climate change
- Addressing drought, nutrition & food security due to increased risk of drought, consequent decline in agriculture and increased malnutrition & food security
- Undertaking measures to manage water borne disease that have worsened due to climate change impacts
- Research & studies on climate change and health impacts
- Addressing food safety that is undermined as a result of increased ambient temperatures and extreme events
- Studying the interlinkages between air quality and climate change, and implications on health

Industry

The industrial sector in Orissa mainly comprises mineral-based industries. Since these industries are energy-intensive, the acceleration of industrialization is closely linked to carbon emission. There is significant potential for improving energy efficiency through the use of cleaner production technologies, methods and practices. The workers in mineral-based industries have to work in extremely hot conditions and with the likely increase in the average temperatures due to climate change, this will also become an occupational health issue in future. With the prediction of increased intensity and frequency of extreme weather events, protection of coastal industrial assets will have to be accorded greater attention.

Industry - Key Priorities

- Integrating climate concerns in policies and plans
- Assessing GHG profiles of major industrial clusters
- Conducting heat-island study for Talcher and Jharsuguda area
- Training various stakeholders on climate change issues
- Implementing a system of compensatory water harvesting
- Streamlining institutional arrangement and strengthen OSDMA to tackle extreme climate events in coastal area
- Carrying out energy efficiency studies
- Promoting recovery, recycle and reuse of waste material
- Setting emission standards for thermal power plants

Mining

Mining is a major economic activity in the state and it contributes significantly to the growth process. Yet mining in Orissa has serious local environmental and social impacts. These include air pollution (particulates), water pollution (mine water discharges), social impacts (displacement and rehabilitation) and forest impacts (most of the mining area is in forest areas or in their vicinity). Mining being energy intensive is also a big contributor to global greenhouse gas emissions.

Mining – Key Priorities

- Incorporating climate concerns in State Mineral Policy
- Analyzing appropriate policies to promote energy-efficiency
- Realizing the potential of low-grade mineral beneficiation
- Strengthening environmental monitoring
- Protecting water bodies
- Expanding and maintaining green zones
- Building capacity and generating awareness
- Realizing energy-savings potential in mining

Transport

Increasing motorization with greater availability of affordable vehicles has resulted in a commensurate increase in the emissions from the transport sector. In the absence of railway connectivity to interior areas and without any inland water way worth the name. Orissa is largely dependent on the road network that is the least carbon friendly among different modes of transport. This has local pollution implications as well. No alternative such as less carbon-emitting CNG fuel exists in the state and effort to move to a more carbon-friendly mass rapid transport system is only at a very early stage.

Transport – Key Priorities

- Revising state transport policies
- Integrating urban and transport planning
- Enhancing the use of rail
- Moving towards low carbon fuel
- Piloting low carbon, green highways
- Encouraging fuel use efficiency and tightening enforcement
- Promoting non-motorized transport
- Sequestering carbon through avenue plantations
- Estimating carbon emissions from the sector
- Developing inland waterways

Urban Planning

The continuous exodus of rural population to urban areas in Orissa has contributed to urban growth. There is already a severe strain on the existing urban infrastructure. However, as the population living in urban areas in Orissa is significantly lower than the national average, GoO is in a unique position to chart out an urban development path that is based on lessons from past mistakes / experiences of other Indian cities (particularly the metropolitan cities). Given the climate change dimension, Orissa can go further by defining a climate-responsible urban development path.

Urban – Key Priorities

- Building capacity on climate change
- Incorporate climate considerations in water supply and sewerage design
- Working towards greater water-efficiency
- Preparing a climate-friendly MSW management plan
- Orienting towards energy-efficient street lighting through CDM
- Developing a climate-responsible master plans
- Strengthening infrastructure for promoting non-motorized transport
- Improvements to water harvesting in urban areas with restoration of water tanks and artificial recharge
- Developing models of urban storm water flows and capacities of existing drainage systems with climate change

Water

Impact of climate change on water resources in Orissa is likely to be due to the vagaries of monsoons creating variability in river flows and increased frequency/intensity in extreme events such as floods, droughts and cyclones. Heavy flood or drought occurs almost every alternate year due to disproportionate distribution of rainfall. In recent years, wide fluctuation in climate has been observed and irregular rainfall causing both floods and droughts is a major concern. The impact of droughts on farmers has been crippling in some areas.

Water Resources – Key Priorities

- Expansion of hydrometry network
- Development of flood forecasting models
- Downscaling of Global Circulation Model
- Increasing the water use efficiency in irrigation
- Constructing and protecting water harvesting structures
- Improving drainage systems
- River health monitoring and eco-systems environmental flow demand studies
- Raising awareness raising with Pani Panchayat through Farmers' Training Programme and creating agro-climatic stations
- Integrated Water Resources Management

Way Forward

The CAP will lead Orissa to move towards a carbon-conscious, climate resilient development path. A monitoring and evaluation framework will be put in place to supervise progress and effectiveness of interventions. Besides the existing provisions in the budget for activities which are climate and environment friendly, additional resources which may be required for undertaking mitigation and adaptation measures will also have to be located. A rough and ready estimate puts the resource requirement at Rs. 17000 crores over a period of five years. Efforts would be made to take advantage of global funds available for both adaptation and mitigation. Setting up a climate change cell/agencies would be considered to provide a single-window contact.

Chapter 1

Background

1.1 Introduction

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) indicates that the Earth's climate is changing at an unprecedented pace with potentially serious economic impacts and implications for sustainable development. Climate model projections indicate that global average temperature will increase, with disproportionately higher temperatures in the tropics and at the poles. South Asia is especially vulnerable to climate change due to its high levels of population density, prevalent poverty and a high dependence on natural resources.

India is already the fifth largest emitter of greenhouse gases. From the viewpoint of per capita emissions, India's contribution is very low but it is substantial in a cumulative sense. Climate projections for India suggest that impacts are likely to be varied and heterogeneous, with some regions experiencing more intense rainfall and flood risks, while others will encounter sparser rainfall and prolonged droughts. Among the more substantial effects is a projected spatial shift in the pattern of rainfall towards the already flood-prone coastal areas, while water-scarce regions become even more drought-prone and unproductive. India will also suffer from higher tides, more intense storms fueled by warmer oceans and further erosion along its coastline due to sea level rise. For India, climate variability and climate change pose huge risks to human life and threaten to endanger the sustainability of the country's fast growing economy. India's immense geographic diversity adds to the complexity of developing and implementing an adaptation strategy. The impacts will vary across states, sectors, locations and populations. Consequently, there can be no one-size-fits-all climate change strategy. Approaches will need to be tailored to fit state and local vulnerabilities and conditions.

In June 2008, Government of India's (GoI) National Action Plan on Climate Change (NAPCC) was announced. The objective is to adapt and to enhance ecological sustainability of India's development path. The vision is to create a prosperous (not wasteful) self-sustaining economy. The principle is to maintain a high growth rate and reduce vulnerability. There are 8 national missions that are to be developed in greater detail (Refer to Chapter 3 for a further elaboration). These include the following subjects: solar, energy efficiency, water, sustainable habitat, water, Himalayan eco-system, forests, sustainable agriculture and strategic knowledge. In August 2009, the Hon'ble Prime Minister of India urged each state Government to formulate its own state level action plan consistent with the strategies in the National plan. This was re-emphasized by the Union Minister of State, Environment & Forests (MoEF), at the meeting of the Chief Secretaries in February 2010. Simultaneously the Honb'le Chief Minister Shri Naveen Pattanaik, while expressing his concern as the climate change issues, constituted the High Level Co-ordination committee for formulation of State Climate Change Action Plan for Orissa.

Orissa is a state that is endowed with a variety of mineral resources. It has the potential to generate coal-based thermal power not only to meet the state's needs but also need of the region. Being mineral-rich, the state has a predominance of mineral-based industries that are both energy and water intensive. The energy, mining and industry sector also contribute to the local environmental and social problems. About 38 percent of the state's geographical areas belong to the catagory of forests, and therefore in an advantageous situation in terms of providing for carbon sinks. The state also has 10 percent of the country's water resources for just 4 percent of the population. There is sufficient water in the state as a whole but still there are water shortages in certain parts of the state and in certain times of the year. Agriculture is largely rainfed as the irrigation network is limited.The main crop of the state is rice, which is highly water-intensive crop. It has a 480 km vulnerable coast line, which is prone to climate risks such as cyclones and coastal erosion. In terms of health, the vector-borne disease - malaria - is fairly rampant in many parts of the state. Given its profile, climate change is an important concern for the state as it is presently on a carbon-oriented development path and at the same time, it is vulnerable to climate variations.

GoO recognizes that the climate change has the potential to erode the progress achieved and to be achieved through economic growth. Given its importance, GoO is committed to demonstrate continued leadership in this new and important area.

1.2 Methodology

GoO initiated the climate change scoping study with a view to understanding the range of issues that need to be addressed. GoO provided information on possible issues and the Orissa context to consultants who put together a short, focused report on the issues that GoO needs to address. Most of the GoO Departments that deal with activities which contribute to carbon dioxide emissions or will need to adapt to climate change were consulted during the scoping study. This scoping study was done between November 2009 and February 2010.

When the findings of the scoping study were presented, GoO decided to establish a High Level Co-ordination Committee headed by the Chief Secretary to steer the preparation of the CAP. This was done recognizing the need for the senior bureaucracy within the GoO to be involved in the assessment of climate change issues that the scoping study revealed. The composition of the Committee is shown in the adjoining text box. At the same time, the GoO established 11 working groups to cover issues in 11 different sectors that are relevant to climate change. The list of the working groups formed and sectors addressed are in the text box

High-Level Coordination Committee

Chief Secretary	Chairman
Development Commissioner	Member
Agriculture Production Commissioner	Member
Principal Secretary, Finance Department	Member
Principal Secretary, Housing and Urban Department	Member
Principal Secretary, Fisheries and ARD,	Member
Principal Secretary, Steel and Mines Department	Member
Commissioner-cum-Secretary, Agriculture Department	Member
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Commissioner-cum-Secretary, Energy Department	Member
Commissioner-cum-Secretary, Industry Department	Member
Commissioner-cum-Secretary, Water Resources Department	Member
Managing Director OSDMA	Member
Principal Secretary, Forests & Environment Department	Member-Convenor

below. GoO ensured that the membership was drawn not only from the primary department but also from the different associated departments/organisations. Chaired by the Principal Secretary/Secretary of the primary Department, meetings were held by these working groups to deliberate on the relevance of climate change pertaining to the sectors in the Orissa context. A convenor was appointed to co-ordinate the regular conduct of meetings, to collect/collate the required information and to develop the plans pertaining to each of the sectors. Annex 1 provides the composition of all the working groups – chairpersons, convenors and the individual members.

Templates were prepared for listing the various activities relevant to climate change, prioritizing the activities as high, medium and low priorities, and developing an outline of the sub-activities to be done under the high priority activities while estimating the budget and sources of funding. These templates are included in Annex 2. Each Working Group completed these templates and the high priority activities were reviewed. In the deliberations of the high priorities during the meeting of the High-Level Co-ordination Committee, it was agreed that each Working Group will rationalize and determine about 10-12 key priorities which will be focus of the first period of the CAP [2010-2015].

To provide technical advice to these working groups, climate change specialists as well as national / international sector experts were invited for interactions on different subjects. This ensured that the working groups were on track, were addressing issues that are important in context of Orissa and were in line with the responses both at the national/ international level. A list of climate change specialists and sector experts, who advised the different working groups, is provided in the Acknowledgements.

Using the scoping study findings as the first-cut, the different working groups expanded to all the possible activities that are relevant in the climate change context in their respective sectors. Recognizing that all activities are equally important , the working groups developed a prioritization approach to divide the comprehensive list of activities into high, medium and low priority activities. Once this was done, the working groups went ahead and defined key priorities in order to get a sharper focus. Finally, each working group identified 10-12 key priorities for the five year period between 2010 and 2015. Description of the key priorities was developed, organizations to be involved in the implementation were identified and budgets to implement these activities were estimated.

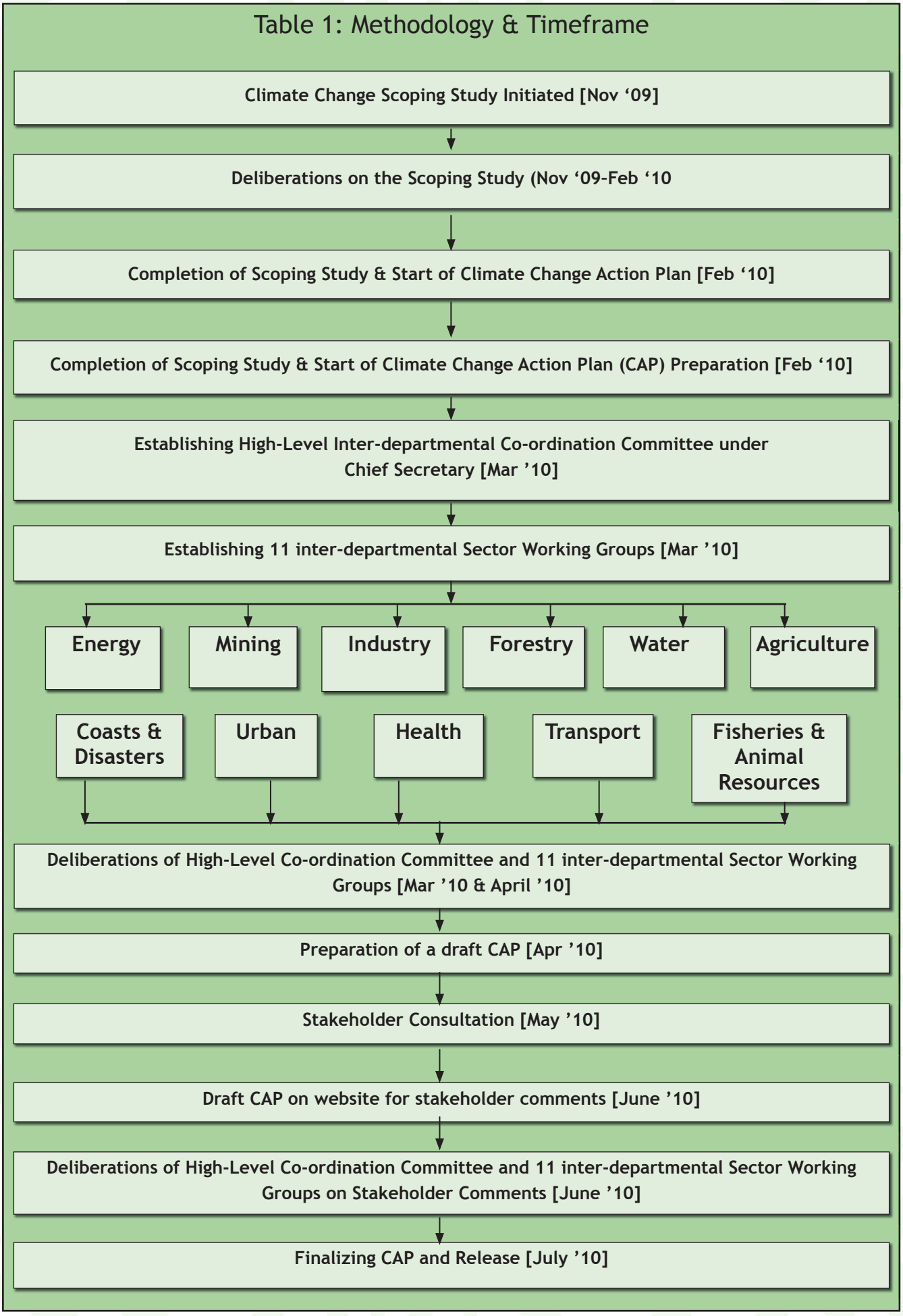
Working Groups

- Agriculture
- Coastal Zones and Disasters
- Energy
- Fisheries and Animal Ressources
- Forestry
- Health
- Industry
- Mining
- Transport
- Urban Planning
- Water Resources

The process adopted and the key priorities identified were then shared with the external stakeholders. With a view to collecting feedback from across the state, GoO arranged stakeholder consultation workshops at Bhubaneswar, Berhampur, Angul and Balasore. In each of these consultation workshops, specific sectors were discussed in detail. These stakeholder consultations concluded with a synthesis stakeholder workshop that covered all the 11 sectors. The feedback obtained from these stakeholder workshops were considered by the different working groups.

The scoping study was done with technical support from the Department for International Development (DFID), UK. The World Bank provided technical assistance in providing

Table 1: Methodology & Timeframe



the climate change experts, assigning the sector experts to different working groups and in supporting the external stakeholder consultations. DFID-UK also assisted in sourcing sector experts and provided support for the first printing of this CAP document.

1.3 Structure of the CAP document

The CAP document begins with this background chapter, which introduces the context, provides the methodology and outlines the structure of the document. The second chapter gives an overview of the National Action Plan on Climate Change, eight missions and other initiatives. The third chapter describes the vulnerability assessment of Orissa and highlights climate sensitivity from both biophysical and socio economic perspectives. The fourth chapter indicates the green house gas emission with per capita emission in the state.

The next chapter highlights a detailed overview of the Climate Change Issues relevant to Orissa. This covers all the 11 sectors and also includes a section that identifies the issues that are cross cutting. The subsequent chapter analyses and synthesizes the sector information to arrive at the key findings. The last chapter provides the conclusions and recommendations. The Annexes include the composition of the working groups (Chairpersons, Convenors and Members), list of external stakeholder consultations held, summary of stakeholder consultations, sectorwise table of key priorities, comprehensive list of activities considered and list of references.

Chapter 2

National Action Plan on Climate Change

2.1 Introduction

India released its National Action Plan on Climate Change (NAPCC) on 30th June 2008 to outline its strategy to meet the challenge of Climate Change. The National Action Plan advocates a strategy that promotes, firstly, the adaptation to Climate Change and secondly, further enhancement of the ecological sustainability of India's development path.

2.2 Approach to Climate Change

The National Action Plan recognises that climate change is a global challenge and, that it should be successfully overcome through a globally collaborative and cooperative effort based on the principle of equity. The Action Plan expresses India's willingness to play its role as a responsible member of the international community and to make its contribution. However, it emphasises that, this requires not only sustainable production processes, but also sustainable life styles across the globe. In this effort, every citizen of the planet should have an equal share of the planetary atmospheric space. The Action Plan suggests that the long-term convergence of per capita GHG emissions is the only equitable basis for a global agreement to tackle climate change. The Action Plan assures the international community that India's per capita GHC emissions would not exceed the per capita GHG emissions of developed countries, despite India's developmental imperatives.

2.3 Domestic Action

India's National Action Plan stresses that maintaining a high growth rate is essential for increasing living standards of the vast majority of people of India and reducing their vulnerability to impacts of climate change. Accordingly, the Action Plan identifies measures that promote the objectives of sustainable development of India while also yielding co-benefits for addressing climate change. Eight National Missions which form the core of the National Action Plan represent multi-pronged, long term and integrate strategies for achieving key goals in the context of climate change. The focus is on promoting understanding of Climate Change, adaptation and mitigation, energy efficiency and natural resource conservation. While, several of these programmes are already a part of the current actions, the Action Plan seeks to enhance them in scope, and effectiveness and implement them in an accelerated manner through time bound plans.

2.3.1 Solar Mission

This mission aims at promoting the development and use of solar energy for power generation and other uses, as well as to render solar energy competitive with fossil-based energy options in urban areas, industry, and commercial establishments. Its goal is to generate at least 10,000 megawatts of solar power and to create a solar research center, among other things.

2.3.2 Mission for Enhanced Energy Efficiency

This mission seeks to yield savings of 10,000 megawatts by 2012 through the implementation of certain initiatives, such as energy incentives (including differential taxation on energy-efficient appliances); setting up financing platforms for public-private partnerships to reduce energy consumption through demand-side management programs; and establishing a system for large energy-intensive industries and facilities to trade energy-savings certificates so that they can meet government-mandated reductions in energy consumption, as per the Energy Conservation Act.

2.3.3 Mission on Sustainable Habitat

This mission seeks to promote energy efficiency in urban planning through measures such as putting more emphasis on 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.

2.3.4 Water Mission

This mission aims to increase water use efficiency by 20 percent through pricing and regulatory measures, including the recycling of wastewater, increases in irrigation efficiency, and incentives to promote water-neutral or water-positive technologies and groundwater recharge.

2.3.5 Mission for Sustaining the Himalayan Ecosystem

This mission seeks to promote the 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.

2.3.6 Mission for a "Green India"

The mission plans to expand forest cover in India by 10 percent through afforestation of 6 million hectares of degraded forest lands.

2.3.7 Mission for Sustainable Agriculture

The mission will foster adaptation in the agricultural sector by supporting the development of climate-resilient crops and the expansion of weather insurance mechanisms, among other measures.

2.3.8 Mission on Strategic Knowledge for Climate Change

This mission will promote "a better understanding of climate science, impacts and challenges." It calls for the establishment of a new Climate Science Research Fund, improved climate modeling, and increased international collaboration. It will also foster private sector initiatives aimed at developing adaptation and mitigation technologies through venture capital funds.

2.4 Other Initiatives

Apart from the eight National Missions, the National Action Plan also envisages other initiatives aimed at enhancing mitigation and adaptation. These include research & development in the area of ultra super critical boilers in coal-based thermal plants; integrated gasification combined cycle technology to make coal based power generation efficient; setting up more combined cycle natural gas plants; promotion of nuclear energy through adoption of fast breeder and thorium-based thermal reactor technology in nuclear power generation; adoption of high-voltage AC and high-voltage DC transmission to reduce technical losses during transmission and distribution; small and large scale hydro power; promotion of renewable energy technologies such as bio-mass combustion and gasification-based 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 addition, the Action Plan envisages effective disaster management strategies that include mainstreaming disaster risk reduction into infrastructure project design, strengthening communication networks and disaster management facilities at all levels; protection of coastal areas, provision of enhanced public health care services, and assessment of increased burden of disease due to climate change. The Action Plan also highlights the role of Central Government, State Governments and local Bodies in putting in place appropriate delivery mechanisms and building adequate capacity and knowledge in the relevant institutions for effective adaptation and mitigation actions.

2.5 Institutional Mechanism

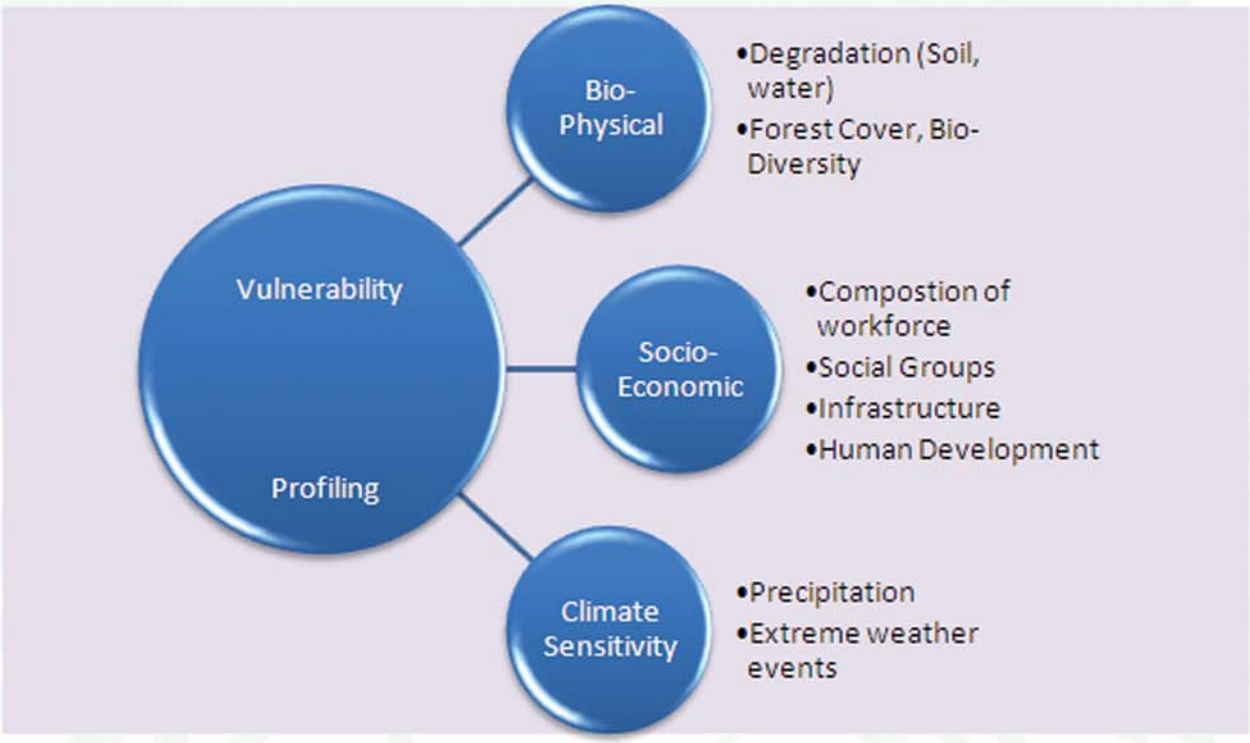
The National Missions are to be institutionalized by the respective Ministries and will be organized through inter-sectoral groups. Appropriate mechanisms including public-private partnership and civil society actions, will be devised, as suited, for effective delivery of each individual Mission's objectives. Comprehensive Mission documents detailing objectives, strategies, plan of action, timelines and monitoring and evaluation criteria of all eight Missions and Other Initiatives are to be developed by December 2008 and submitted to the Prime Minister's Council on Climate Change. The work is to be coordinated by the Ministry of Environment & Forests.

Chapter 3

Vulnerability Analysis

3.1 Introduction

Climate Change is a multi dimensional problem therefore, the vulnerabilities arising out of climate change are multidimensional and inter-linked. One sector can compound the vulnerability in the other. The vulnerability and adaptive capacities are diverse and varies from state to state based on several sectoral and cross sectoral parameters. Sectoral parameters include key sectors of the state's economy and cross sectoral factors include (a) Poverty (b) inequality and social discrimination over property rights (c) access to resources (d) social attrition/ migration, and (e) unequal and unsustainable competition for scarce natural resources.



The composite profiling done by TERI has been shown below:

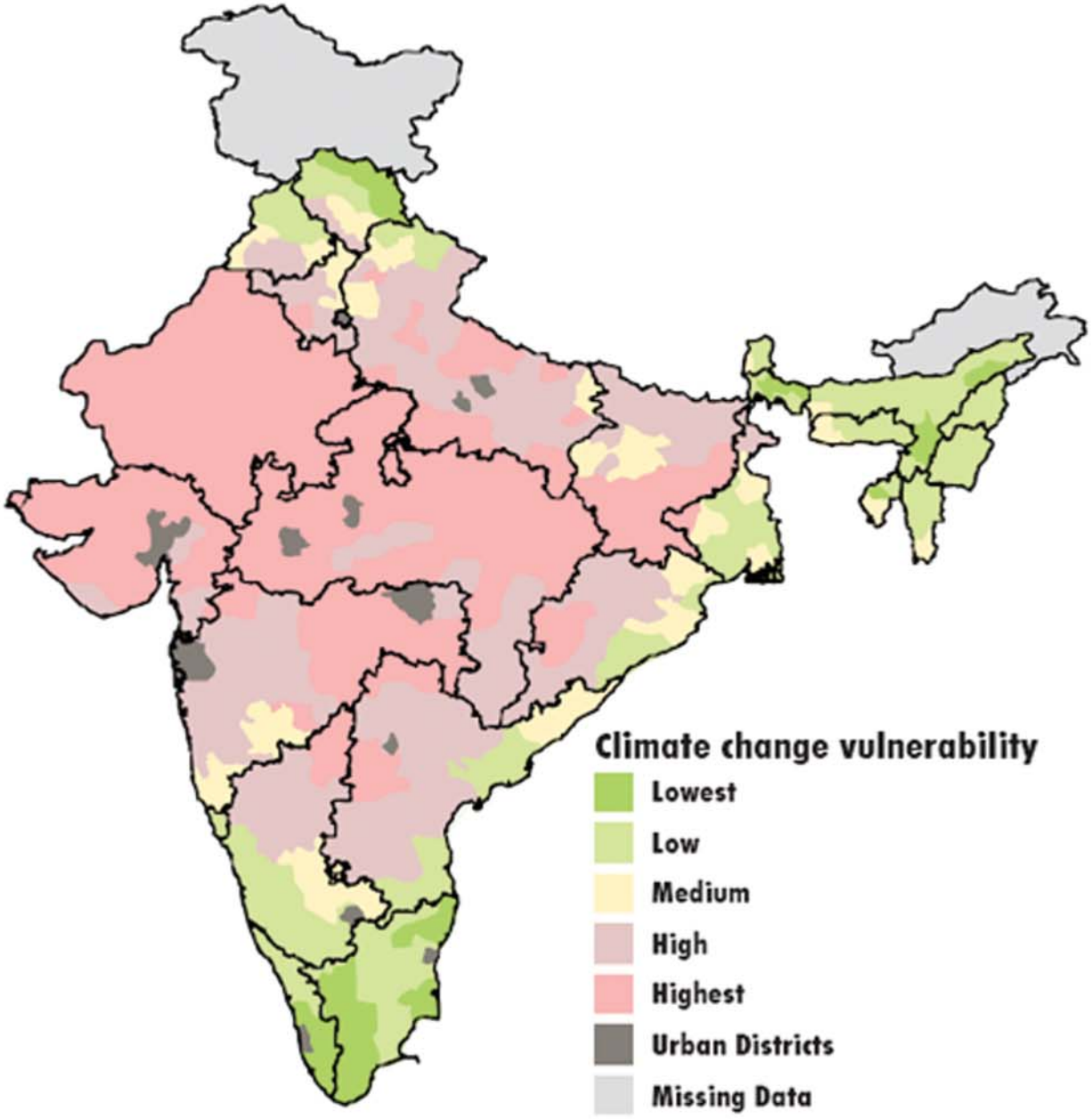


Figure Climate change vulnerability profile generated by integration of adaptive capacity & climate sensitivity profiles (TERI, 2003)

The spatial data show that the state has moderate to the highest level of vulnerability in several pockets. This has prompted designing the Climate Change Action Plan in such a manner that the local as well as holistic vulnerabilities are addressed in a cogent manner.

In order to prioritise programmes/ schemes and assess their performance vis-à-vis adaptation targets, it is imperative to take into consideration intended outcomes of these against their impact on the local communities and in building resilience to climate change.

3.2 Climate Sensitivity

Orissa State Disaster Management Authority has done a multi-hazard mapping for all the thirty districts of the state. The results are given below:

HAZARDS / DISTRICTS	WIND & CYCLONE	FLOOD	DROUGHT	EARTHQUAKE	ACCIDENTS
Mayurbhanj	1, 2	2	3	1, 2, 3	2
Balasore	1	1	3	1, 2	1
Bhadrak	1	1	3	2	1
Cuttack	1, 2	1, 2	2	1, 2	1
Jajpur	1	1, 2	2	1, 2	2
Jagatsinghpur	1	1, 2	3	1	2
Kendrapada	1	1, 2	3	1	2
Puri	1	1, 2	3	1	1
Khurda	1	2	3	1, 2	1
Nayagarh	2	2	3	2, 3	1
Ganjam	1,2	1, 2	3	2, 3	1
Gajapati	1,2	2	3	2, 3	1
Boudh	3	2	3	2, 3	2
Phulbani	4	2	3	3	2
Dhenkanal	1,3	2	2	1, 2	1
Angul	3	2	2	1, 2	1
Keonjhar	1, 2, 3	2	2	2, 3	1
Sundergarh	3, 4	2	1	1, 2	1
Jharsuguda	4	2	1	1, 2	1
Deogarh	3	2	1	1, 2	2
Bargarh	3	1, 2	1	1, 2, 3	1
Sambalpur	3, 4	1, 2	1	1, 2	1
Sonepur	3	2	1	1, 2	2
Bolangir	3	2	1	3	2
Kalahandi	3, 4	2	1	3	2
Nuapada	3	2	1	3	2
Koraput	2, 4	1, 2	2	3	2
Nowrangpur	4	2	1	3	2
Malkangiri	2, 4	1, 2	2	3	2
Rayagada	2, 4	2	2	3	2

WIND & CYCLONE: 1=Very High Risk Zone; 2=High Risk Zone; 3=Moderate Risk Zone ; 4=Slight Risk Zone ;

FLOOD: 1=Liable to get flooded; 2= Protected areas;

DROUGHT: 1=Very High Risk Zone; 2=High Risk Zone; 3=Slight Risk Zone;

EARTHQUAKE: 1=Moderate Damage Zone; 2=Less Damage Zone; 3=Very Low Damage Zone;

ACCIDENTS: 1=Major Accident Prone Areas; 2=Minor Accident Prone Areas;

As per the statistics of IMD, Orissa is most vulnerable to floods and heavy rainfall. The state has experienced about 88 such disasters within a 20 years timeframe. Heavy lightning and corresponding losses and deaths are also quite frequent in the state.

An account of Natural disasters in Orissa

Year	Normal Rainfall	Actual Rainfall ((mms))	Khariff Rice Production (in lakh mts)	Remarks	Year	Normal Rainfall	Actual Rainfall ((mms))	Kharif Rice Production (in lakh mts)	Remarks
1961	1502.5	1262.8	36.99		1984	1502.5	1302.8	38.5	Drought
1962	1502.5	1169.9	36.32		1985	1502.5	1606.8	48.8	Flood
1963	1502.5	1467	42.47		1986	1502.5	1566.1	44.56	
1964	1502.5	1414.1	43.59		1987	1502.5	1040.8	31.03	Severe drought
1965	1502.5	997.1	31.89	Severe drought	1988	1502.5	1270.5	48.96	
1966	1502.5	1134.9	35.37	Drought	1989	1502.5	1283.9	58.4	
1967	1502.5	1326.7	34.43	Cyclone and flood	1990	1502.5	1865.8	48.42	Flood
1968	1502.5	1296.1	38.48	Cyclone and flood	1991	1502.5	1465.7	60.3	
1969	1502.5	1802.1	38.39	Flood	1992	1502.5	1344.1	49.76	Flood, Drought
1970	1502.5	1660.2	39.13	Flood	1993	1502.5	1421.6	61.02	
1971	1502.5	1791.5	33.76	Flood, Severe Cyclone	1994	1502.5	1700.2	58.31	
1972	1502.5	1177.1	37.35	Drought, flood	1995	1502.5	1588	56.48	
1973	1502.5	1360.1	41.91	Flood	1996	1502.5	990.1	38.27	Severe drought
1974	1502.5	951.2	29.67	Flood, Severe Drought	1997	1502.5	1493	57.51	
1975	1502.5	1325.6	42.74	Flood	1998	1502.5	1277.5	48.85	Severe drought
1976	1502.5	1012.5	29.58	Severe drought	1999	1502.5	1435.7	42.75	Severe cyclone
1977	1502.5	1326.9	40.5	Flood	2000	1502.5	1035.1	41.72	Drought, flood
1978	1502.5	1261.3	41.89	Tornados, Hail storm	2001	1482.2	1616.2	65.71	Flood
1979	1502.5	950.7	27.34	Severe drought	2002	1482.2	1007.8	28.26	Severe drought
1980	1502.5	1321.7	40.31	Flood drought	2003	1482.2	1663.5	61.99	Flood
1981	1502.5	1187.4	36.63	Flood drought, Tornado	2004	1482.2	1256.7	58.84	Moisture stress
1982	1502.5	1179.9	27.07	Severe flood, drought, cyclone	2005	1451.2	1497.7	62.49	Moisture stress
1983	1502.5	1374.1	47.63		2006	1451.2	1682.8	61.96	Moisture stress, flood
Source;Status of Agriculture in Orissa, 2008, Directorate of agriculture and Food production					2007	1451.2	1583.2	68.26	Flood

From the above table it is clear that flood, drought and cyclone with varying intensity are regular phenomena in the state. The frequent occurrence not only has a negative impact on human, animal life and agriculture based livelihoods, it also involves a lot of human and capital resources that go into repair, restoration and relief work to reduce the effects of various kinds of natural disasters impacting the lives of human beings. The centre and the state shell out a huge amount of money in the Five Year Plans for mitigation of natural calamities. The anticipated expenditure under Drought prone Area Programme

was Rs 486.72 crore during 9th Plan period and for the Irrigation and Flood Control Programmes it was Rs 4376 crores. The 9th plan anticipated expenditure for crop insurance was about Rs708.08 crore.

3.3 Bio-Physical Factors and Sectoral Segmentation of Climate Induced Vulnerability in Orissa

The following table shows the sectoral segmentation of vulnerability in Orissa.

Sectors	Vulnerability	Socio-Economic Risks
Agriculture & Food security	• Temperature Stress • Erratic Precipitation • Reduced soil moisture • Flood/Drought Conditions • Invasion of parasiticspecies or disease	• Increased risk of desertification & land degradation (South_west Orissa) • Decline in crop yield and production (Northern Orissa) • Decline in availability of food and increased incidence of malnutrition (South_west Orissa)
Coastal Zones and Fishing	• Salt water intrusions • Storm surges and Flooding • Cyclonic events • Stability of wetlands and mangroves • Ocean ecosystems • coral reefs	• Threat to inland freshwater resources • Degradation of coastal infrastructure • Threat to livelihood dependent on marine fisheries and aquaculture • Dislocation of coastal and island population
Forestry and Bio-Diversity	• Long dry spells • Intensity of land use • Fragmentation of habitats • Species invasion • Desertification and land degradation	• Loss of ecosystems services • Loss of livelihood for people dependent on forestry resources • Decline in ambient air and water quality leading to health hazards • Extinction of species
Health	• Availability of fresh water • Availability of sanitation facilities • Vector borne diseases • Thermal stress	• Increased morbidity & mortality • Increased burden of health care on households in affected areas
Water Resources	• Availability of fresh water • Reduced quality of available water resources • Reduced stream flow • Depletion in groundwater resources • Flood anddrought conditions	• Stress on water storage • Reduced supply of drinking water • Increased morbidity • Reduced availability of water for industrial and food production purposes • Reduced potential of hydroelectric power generation

Climate determines the season and seasonality has a bearing on agriculture, the mainstay of the people in the state (3/4th of the population depends on agriculture and a single crop paddy). Over the years implementation of various programmes in the realm of food and agricultural production, income generation and distribution has substantially improved the general food security situation in vulnerable pockets. The extreme weather events often upset the delicate gains achieved so far. The crop loss due to the combination of weather events has been given below.

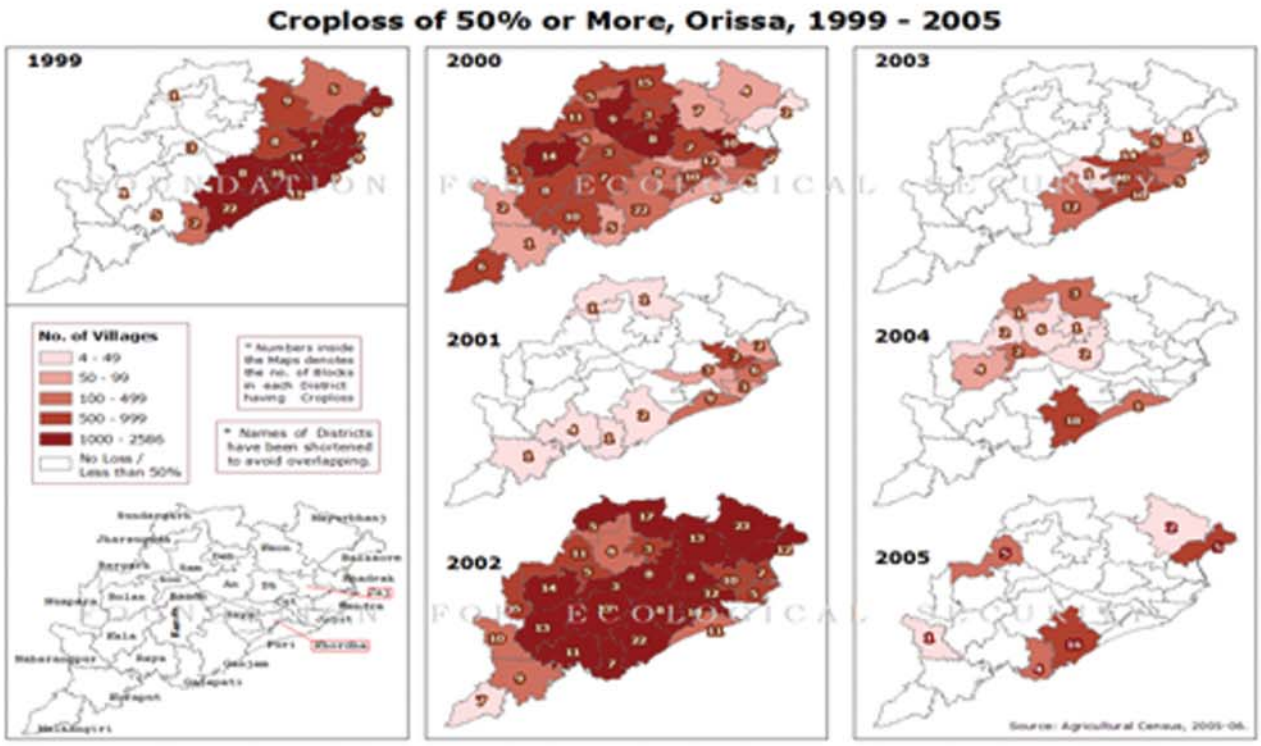


Figure Crop Loss due to various weather events

3.3.1 Seasonality, agriculture and food security:

Seasonality is related to food security and vulnerability especially amongst rural households. In certain periods of the year, the vulnerable people do not even have access to 30% of their food requirement. Overall in Orissa, June to September are critical months for most food vulnerable population with as high as 77% facing food shortages.

Vulnerable Segment	% Vulnerable to sample population	% Vulnerable to sample population
Coastal	3.36	9.63
Northern	9.07	15.11
Southern	14.78	19.81
KBK	13.19	18.00
WODC	8.14	12.28
Agricultural labour	11.84	17.41
Cultivator	10.9	14.51
Other Labourer	5.81	9.44
Self employed	3.36	9.24
General	4.58	9.55
SC	7.76	12.92
ST	16.53	21.61
Orissa	8.63	14.76

Source: Poverty Task Force Report

3.3.2 Climate Determined Low Productivity

The irrigation intensity of Orissa is 30.9% and is below the national average of 44.3%. The reduction of net sown area and decline in the yield of the main crop paddy (74% of the area is under paddy) is largely due to vagaries of monsoon. Rice productivity, even though has doubled in 2008-09 since 2002, is below the national average.

3.3.3 Desertification

Orissa has about 54,69,336 ha of degraded land, more than that of geographically bigger states like Andhra Pradesh, Uttar Pradesh, Madhya Pradesh and Karnataka. Orissa's degradable land mass constitutes 5.18 percent of total geographical area of India. Water erosion is the most pronounced process of land degradation and desertification. Water erosion is witnessed in an area of 32,06,507 ha of land of the State, which ranks close to States like Rajasthan. Only Maharashtra and Gujarat have more areas categorised under water erosion. Another major feature relating to Orissa is that it has more area getting waterlogged than any other State in the country.

3.3.4 Food security

The hunger profile of the state computed by experts has been presented below which is based on requirement, availability and absorption basis:

DIST	Availability		Access		Absorption		FSI		FSOI	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Angul	0.326	27	0.473	11	0.268	29	0.390	18	0.485	12
Balangir	0.433	17	0.356	17	0.519	9	0.409	15	0.467	13
Balasore	0.495	11	0.505	9	0.658	2	0.526	7	0.600	5
Bargarh	0.601	4	0.410	13	0.742	1	0.529	6	0.410	21
Boudh	0.441	15	0.351	19	0.337	23	0.379	20	0.402	22
Bhadrak	0.601	3	0.576	3	0.632	4	0.594	3	0.414	20
Cuttack	0.593	5	0.587	1	0.375	19	0.553	4	0.692	3
Deogarh	0.443	14	0.334	20	0.308	27	0.366	21	0.504	11
Dhenkanal	0.406	20	0.478	10	0.276	28	0.420	14	0.565	6
Gajapati	0.274	29	0.320	22	0.315	26	0.304	29	0.294	28
Ganjam	0.511	9	0.442	12	0.389	18	0.456	12	0.389	24
Jagatsinghpur	0.654	1	0.581	2	0.629	5	0.624	1	0.624	4
Jajpur	0.515	8	0.572	4	0.365	20	0.518	8	0.452	15
Jharsuguda	0.503	10	0.385	15	0.513	10	0.446	13	0.830	1
Kalahandi	0.484	12	0.297	25	0.535	8	0.399	16	0.395	23
Kandhamal	0.164	30	0.302	24	0.249	30	0.247	30	0.237	30
Kendrapara	0.441	16	0.571	6	0.503	12	0.516	9	0.508	9
Keonjhar	0.405	19	0.396	14	0.330	25	0.389	19	0.415	19
Khordha	0.531	7	0.571	5	0.457	16	0.538	5	0.507	10
Koraput	0.395	21	0.253	28	0.468	13	0.336	26	0.386	25
Malkangiri	0.381	24	0.284	27	0.504	11	0.353	23	0.276	29
Myurbhanj	0.393	22	0.330	21	0.331	24	0.351	24	0.564	7
Nabarangpur	0.365	25	0.207	30	0.585	7	0.322	27	0.452	14
Nayagarh	0.424	18	0.516	8	0.363	21	0.461	10	0.706	2
Nuapada	0.447	13	0.291	26	0.586	6	0.392	17	0.344	26
Puri	0.625	2	0.561	7	0.641	3	0.596	2	0.563	8
Rayagada	0.362	26	0.232	29	0.461	14	0.313	28	0.302	27
Sambalpur	0.385	23	0.354	18	0.343	22	0.362	22	0.422	16
Sonepur	0.586	6	0.374	16	0.457	15	0.456	11	0.422	17
Sundargarh	0.322	28	0.320	23	0.453	17	0.343	25	0.416	18

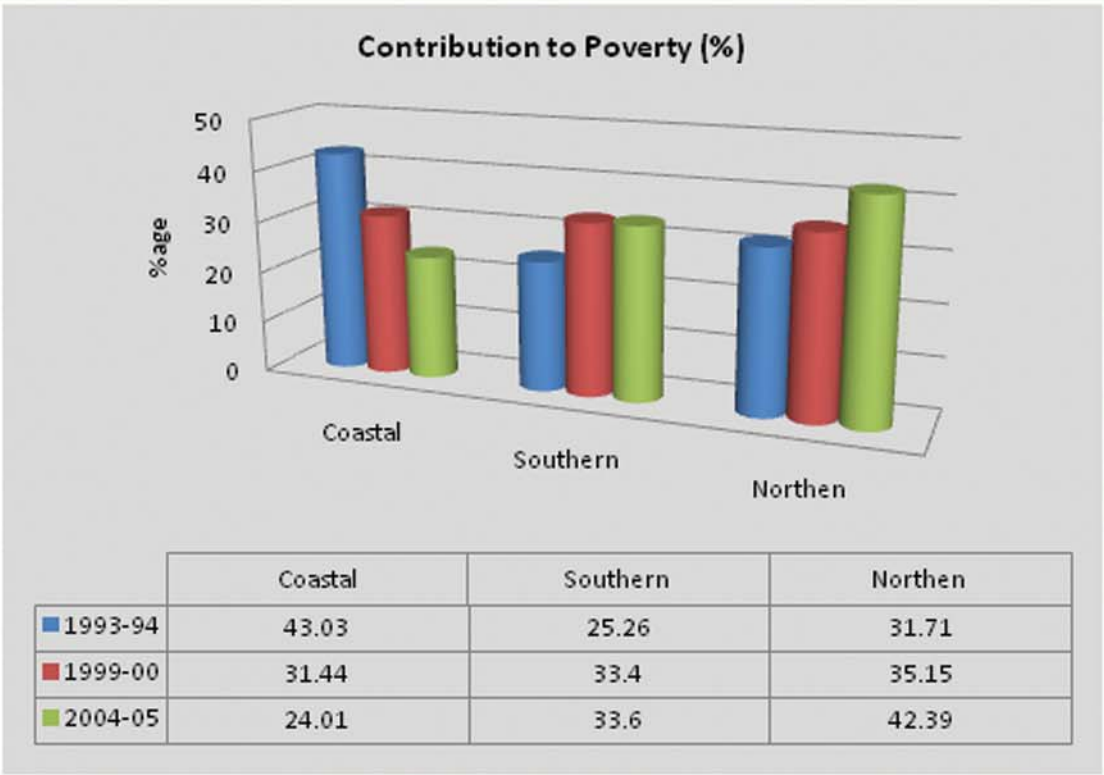
Figure Food Security Index of Orissa, Source: Food Security Atlas of Rural Orissa, WFP, 2008

3.4 Socio-Economic Factors: Poverty and Vulnerability:

3.4.1 People in climate stressed regions

Orissa is prone to climate related disasters. The history of disasters substantiates the fact that about 80% of the State's population is prone to one or more forms of natural disasters. There are two major climate stressed regions in the state (a) the coastal belt and flood plains; the area has higher population density. More than human tragedy, the people in this region suffer most due to the loss of their livestock, crops and agricultural implements. Out of total geographical area of 15.751 lakh hectares; 1.40 lakh hectares are flood prone. There are 516 nos. of vulnerable points in Orissa. In the last 25 years, floods have occurred 12 times with varying severity. Over the years, the people have faced floods and cyclones and are somewhat prepared to save human lives but not the other assets. This leads to high indebtedness and many of them never come out of the poverty traps.

(b) The other region is the drought prone western and south-western part of Orissa, where the indicators of development are comparable to the sub-saharan region. Here the people face perpetual water-stress and a drought like situation. The pattern of drought in the State is of a varied one, sometimes affecting the entire state, sometimes a few regions, and sometimes a few districts. However, the contiguous patch consisting of the Subdivisions of Padampur, Bolangir, Titlagarh, Patnagarh, Nuapada, Khariar, Bhwanipatna and Phulbani comprising 47 blocks have been identified as the drought prone zone. Hilly areas are also prone to flash floods because of its high gradient and poor distributary system and this kind of flood leads to sand casting and permanent damage to top soil. Characterised by high indebtedness, high migration and poor nutrition, this area is highly vulnerable to climate change and large public investments in this region have not been very effective to reduce the poverty (low investment multiplier benefit).



	Coastal	Southern	Northen
1993-94	43.03	25.26	31.71
1999-00	31.44	33.4	35.15
2004-05	24.01	33.6	42.39

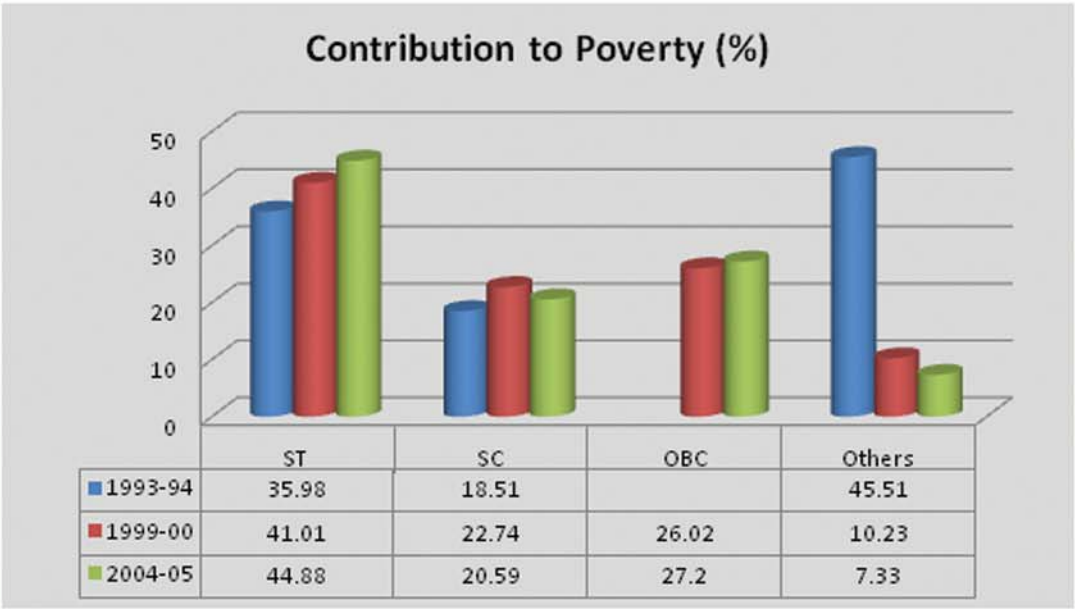
Figure Poverty profile of the state, Source: Economic Survey, Government of Orissa, 2009-10

The above table shows the structure of poverty in the state and confirms the theory that fast depleting resources in northern Orissa is increasing the poverty while southern Orissa structurally remains poor due to adverse climatic conditions apart from other cross-sectoral factors listed below.

3.4.2 Indigenous Community:

Poverty and social grouping are interlinked. Especially the indigenous communities who are embedded in a forest and natural resource based eco-system are highly vulnerable to climate change and Orissa has a high percentage of people depending on natural resource based eco-system, forest, bio-diversity and water resources.

All the districts of Orissa have tribal populations in them. While some regions have large presence of tribals. Koraput, Rayagada, Kalahandi, Nabarangpur and Malkangiri are few districts where more than half of the population is tribal.There are 62 tribal communities residing in Orissa todaywith a total population of 8.14 million (Census of India 2001), about 22% of the state's total population. Almost 44.21 per cent of the total land area in Orissa has been constitutionally declared as Scheduled Area. The major tribes of the state are Kondhs, Koyas, Gadabas, Oraon, Juangs, and Santhals. The tribal life is natural resource dependent and any disturbance in the climate that affect the natural eco-systems where the tribals co-habit is highly detrimental to their survival. Their high poverty and natural resource dependency makes them the most vulnerable stakeholders. The structure of poverty clearly shows the vulnerability of such groups.



	ST	SC	OBC	Others
1993-94	35.98	18.51		45.51
1999-00	41.01	22.74	26.02	10.23
2004-05	44.88	20.59	27.2	7.33

Figure Incidence of Poverty by social groups, Rural Orissa, Source: NSS, rounds

3.4.3 Migrants and Urban Poor:

More than 30 million people in India are seasonal migrant labourers. Orissa's share is 2.5 million and considered a key state for supply of migrant labour. Out migrants from Orissa prefer Gujarat and Maharashtra as the destination even when these states are not border states. Out-migration to these states made up to 34 percent of total out-migrants from Orissa. In migration from the Western and Southern part of Orissa to urban areas and coastal areas are also widely seen and exact estimates are difficult to get. But high growth in the construction sector has drawn such labour force to urban areas and that pushes the resource intensity /congestion in urban areas. On the reverse side, the climate-related in-migration from climate stress regions is becoming more prevalent (popularly termed as climate refugees).

Migration is one of the crucial parameters that depict the development context of the state. According to 2001 census about 937,148 people have migrated to other states of India for variety of reasons many of them are due to climate stress and non-availability of work in their native places in their main occupation i.e. agriculture.. Out of the total migrants about 24% people have almost shifted their residence with the duration of migration of more than 20 years. A large chunk of population falls under the category of migration for less than 10 years. Chhatisgarh has maximum number of immigrants followed by West Bengal, Gujarat, Andhra Pradesh, Maharastra and Jharkhand. Very few people have migrated to other states except for Delhi. The cities like Surat, Kolkata, Mumbai, Delhi and Raipur are having 90135, 80476, 50910, 38456 and 21459 migrants from Orissa respectively. Migration induces resource congestion and related vulnerabilities.

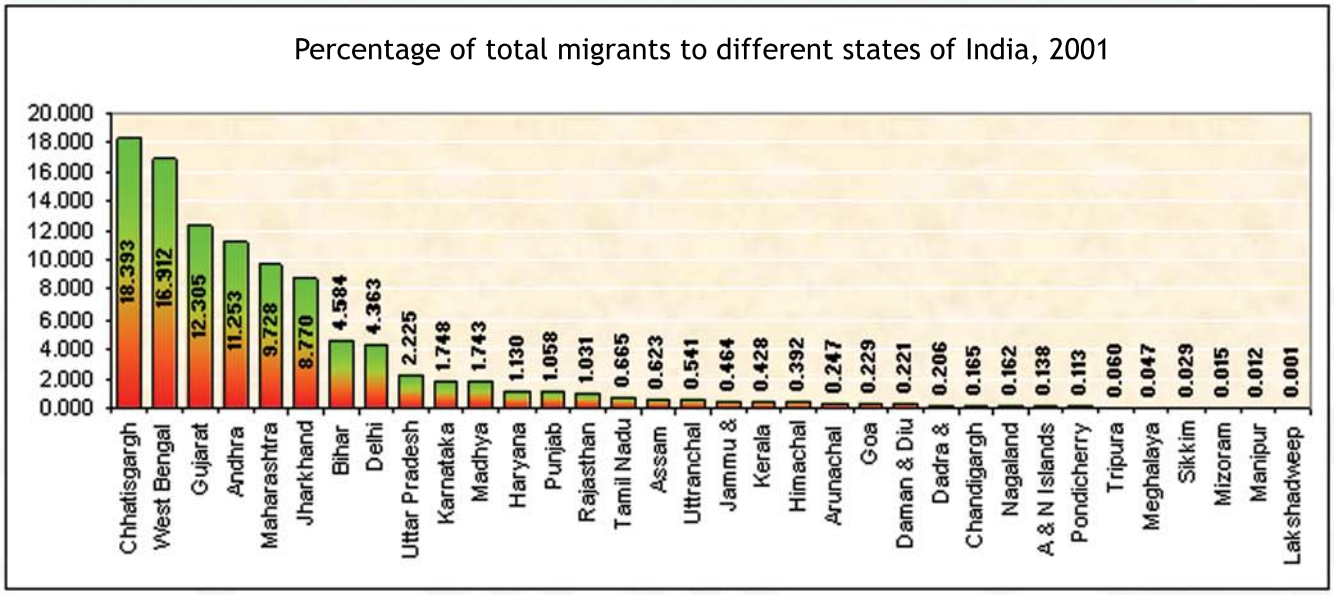


Figure Migration in Orissa, 2001

For work/employment, the most favoured destinations are Gujarat, West Bengal, Maharastra, Chhatisgarh and Andhra Pradesh with migrant population of 76109, 53727, 48138, 34647 and 23939 respectively. Many people from southern and western Orissa are working in and around Raipur as daily wage earners in Brick kilns, rickshaw pullers , Casual labours in spinning mills and diamond industries of Gujarat. In other cities most of the Oriya people are engaged as domestic help, hotel boys, plumbers and security guards. There are also some people who are employed in higher positions in various sectors. More migration is happening to neighbouring states through marriage with chhatisgarh having the highest number of immigration with 81014 people followed by West Bengal, Jharkhad, Bihar and Andhra Pradesh. For Education about 10200 people have migrated to other states and Delhi. Kolkata, Mumbai and Bangalore being the most favoured destinations. The main point is that migration creates unequal pressure on resources such as ground water, habitation, energy usage, etc. This in turn enhances Green House Gas concentration in few pockets.

3.4.4 Gender Dimensions

Gender dimension of climate change is very tricky. Climate change is increasing scarcity of water in several parts of Orissa, in some areas there are reductions in yields of biomass adding to the labour of the women to fetch them for cooking. There is increased risks to human health with children, women (especially the pregnant ones) and the elderly in a household becoming the most vulnerable. The other important issue is that the women's contribution to increasing the social capital and make the community resilient. It has been seen through the work of SHG groups and especially during the post disaster recovery period.

Chapter 4

State GHG Inventory

4.1 Introduction

While finalizing the State Climate Change Action Plan (SCCAP), it was felt necessary that knowledge of baseline emission is necessary to prioritize the action plans. This exercise was taken up to estimate the emission from various activities in the state.

For the purpose of estimation, UNFCCC approved, latest IPCC-2006 methodologies were used for computing the emission from energy and industrial sector. The sectors and sub-sectors were selected exactly as per IPCC-2006 guidelines for GHG emission estimation.

4.2 Methodology

The IPCC-2006 guidelines suggest a three tier approach for estimation of GHG emission, whiletier-1 approach needs less complex data and depends mostly on default emission factors, the higher tier approaches will require data in greater details and specific emission factors. The uncertainties in estimation however are reduced when it moves up the tier ladder. For the purpose of estimation the following six Green House Gases were considered:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Per fluorocarbon (PFC)
- Hydro fluorocarbon (HFC)
- Sulphur Hexafluoride (SF_6)

At the time of estimation little baseline data was available, thus it was decided to prepare a quick estimation using tier 1 methodology and in most cases with default emission factors. The 2006 IPCC Guidelines generally provide advice on estimation methods at three levels of detail, from tier 1 (the default method) to tier 3 (the most detailed method). The advice consists of mathematical specification of the methods, information on emission factors or other parameters to use in generating the estimates, and sources of activity data to estimate the overall level of net emissions (emission by sources minus removals by sinks). Properly implemented, all tiers are intended to provide unbiased estimates, and accuracy and precision should, in general, improve from tier 1 to tier 3.The estimation under tier 1 is considered to be adequate for prioritizing the State Climate Change Action Plan.

This estimation in the energy sector includes production of solid fuel (e.g. coal mining and coke making),and energy generation like thermal power generation. For transport state-wide emission from road transport and railway emission has been covered. Emission from international shipping, inland waterways like fishing boats, trawlers and aviation has been excluded since enough data was not available at the time of preparation of this report. Similarly in the industry, all key sectors in Orissa have been included in this estimation. This initial estimation is done on the basis of average plant availability in that sector and not on the basis of actual production, since actual data collection would require more time for completing the estmate.

The IPCC 2006 guidelines divide the entire activities

which result in anthropogenic GHGemissions into four sectors. They are:

- Energy
- Industrial process and product use (IPPU)
- Agriculture, forest and other land use(AFLOU)
- Waste

The sub-sectors under these sectors as per the IPCC 2006 guidelines are:

- **Energy**
    1. Stationary combustion
    2. Mobile combustion
    3. Fugitive emission
    4. CO2 transport, injection and geological r eserve
- **Industrial Process and Product Use**
    1. Mineral industry emission
    2. Chemical industry emission
    3. Metal industry emission
    4. Non-energy products from fuel and product use
    5. Electronic industry emission
    6. Emissions from fluorinated sub-stitutes from Ozone Depleting Sub-stance
    7. Other product manufacture and use

The key sectors relevant to Orissa were selected and the extent of these activities in the state was determined. The product of activity data and corresponding emission factor is used to determine the emission of GHG. The emissions of the GHGs were then multiplied with the corresponding Global Warming Potential (GWP) to express the emission in terms of CO2 equivalent (CO2-eq). The basic equation involved in estimating the emission is thus; Emission j = Σ ADi·EFij; Where AD is activity data of ith activity and EF is emission factors of ith activity for jth GHG emission.

For urban sector (Municipal Solid Waste and Sewage), the equation as per UNFCCC and IPCC guidance, is as below:

$$LW_{CH4,y} = EQF * \sum_{x=1}^{y} \sum_{j=d}^{D} EQL$$

$$QAFL_{j,x} * DOC_j * (1 - \exp(-k_j)) * \exp(-k_j(y-x)) * NFL * GWP_{CH4}$$

$$\varphi * \frac{16}{12} * F * DOC_f * MCF$$

Emission from Municipal Solid Waste and Sewage

Waste, be it industrial or domestic contributes considerably to the GHG emission in a geographic region. Basically the waste comprising organic components result in emission of methane which has a global warming potential of 21 times that of carbon-di-oxide. For the purpose of estimation of net GHG emission the waste generated from the domestic sector is only considered. For the purpose of estimation solid waste and sewage disposal are taken into consideration.

Emission due to solid waste disposal: Based on the urban population of 5,517,238 and considering solid waste generation at the rate of 0.00045ton/capita/day the net green house gas emission on an annual basis is estimated at 0.45 million tCO2e/annum(considering 10 years of emission and annualised). The estimation is carried out on the basis of the approach outline by UNFCCC and IPCC default value.

Emission due to sewage: Similar as above by considering a population of 5,517,238 and waste water generation potential of 120 litre/capita/day with BOD of 205 and maximum methane production capacity value of 0.8 kg CH4/kg BOD the net green house

gas emission on an annual basis is estimated at 0.112 million tCO2e/annum. The estimation is carried out on the basis of the approach outline by UNFCCC and the value obtained from IPCC.

The total green house gas emission considering the above two aspects is estimated to be around 0.56 million tCO2e/annum.

4.3Result

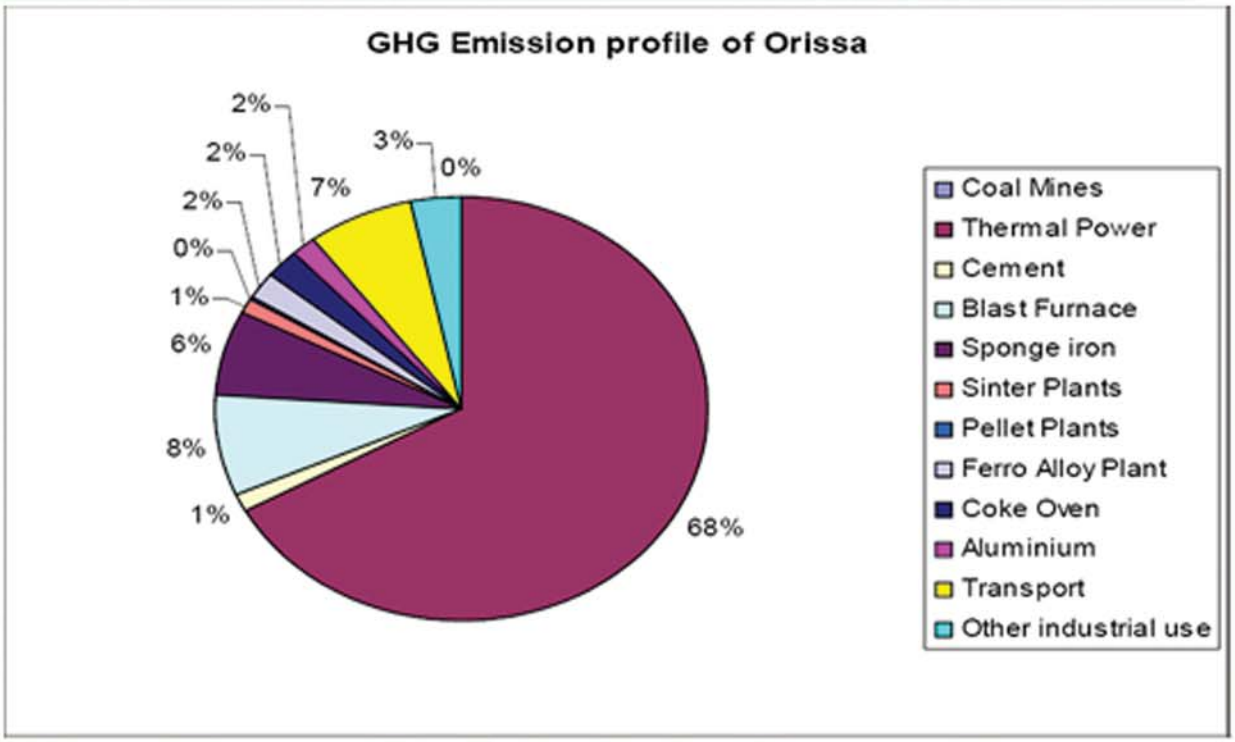
The estimation of major industrial and energy sector are made using Tier 1 methodology as per IPCC-2006 guidelines and available data. The emissions were calculated on the basis of installed capacity of the respective sectors, where credible data on plant utilisation were not available. In iron and steel sector, the overall capacity utilization was taken as 0.7. The transport sector emission was calculated on the basis of actual fuel consumption through retail selling of petroleum products. The

summarized emission details are presented in Table ** and the GHG profile of Orissa is presented at Figure ** below.

The emissions from energy, industry, mining and transport sectors are presented in the table below:

Table 1 Emissions from Industrial, Transport and Energy Sector

Sector	CO2 (Million Tons)	CH4 (Million Tons)
Coal Mines	0	0.0239
Thermal Power	54.9	0
Cement	1.22	0
Blast Furnace	6.475	0
Sponge iron	5.1	0
Sinter Plants	1.048	3.67E-04
Pellet Plants	0.2478	0
Ferro Alloy Plant	1.573	0
Coke Oven	1.799	3.21E-07
Aluminium	1.4124	0
Transport	5.707	6.00E-04
Other industrial energy use	2.683	0
Total	82.1652	0.024867121



Out of the total emission 68% emission takes place in thermal power generation and 14% is generated from iron making process through blast furnace and DRI kilns. Processes associated with iron and steel making, like sintering, pollicisation, coke making contribute 3% of the total emission. Aluminium smelting and ferro-alloy production contribute 2% each. In non-industrial sector transport contributes 7% of the total emission.

Government of India estimation indicates total GHG emission in 2007 was 1727.71 million ton of CO2-eq, of which contribution of energy and industry sector is 58% and 22% respectively. Thus, total estimated emission from these two sectors is 1382 million tonnes. Our estimation indicates that energy and industry sector in Orissa contributes about 6% to the national emission.

Emission from Municipal Solid Waste and Sewage is about 0.56 MT CO2 equivalent per annum (taking 2010-2020 time period). **This makes total emission to be about 83.243 MTCO2 equivalent per annum form Orissa.**

The estimation carried out in this report is on the basis of installed capacities of respective industrial units. Plant availability or production efficiency have been factored into wherever relevant data was available, else full capacity utilization has been assumed and emissions were estimated on that basis. These assumptions might have resulted in slight over-estimation than the actual. It is thus necessary that this estimation process may be carried forward along the IPCC tier ladder for a more accurate GHG estimation. For completeness emissions from other sectors may also be considered to be incorporated.

4.4 Possible Mitigation from Conservation

The COMAP model (Sathaye et al., 2000,Ravindranath et al., 2001 and Ravindranath et al., 2008) has been used for estimating the mitigation potential at the global and national level. Mitigation potential estimated is determined by the following;

- area brought under afforestation /protection/management
- species-mix and density
- carbon pools (aboveground and below ground biomass, soil organic carbon and dead organic matter) considered
- rates of change in the carbon pools: Mean Annual Increments
- transfer and dynamics of different carbon pools
- harvest and extraction of timber, fuel wood etc.
- initial stock of different carbon pools
- Phasing of the activity and area planted in different years.

In the current study, all the carbon pools except dead organic matter are considered. The baseline stocks of aboveground biomass and soil organic carbon as well as growth rates for aboveground biomass and soil organic carbon were obtained from literature and belowground biomass is computed using the IPCC default value of 0.26.

Table 2 provides the estimates of incremental and cumulative mitigation potential for the different interventions proposed under the State Climate Change Action Plan.

Table 2 Incremental and cumulative mitigation potential (MtCO2) of different options

Options	Area ('000 ha)	Incremental annual mitigation potential 2020 ($MtCO_2$)	Incremental cumulative mitigation potential (Million tonnes of CO_2)		
			2010-2020	2010-2030	2010-2050
ANR_sal	1000	3.80	28.47	66.44	138.85
Teak	250	3.80	28.47	66.44	138.85
Conservation_dense	2800	22.55	214.18	439.64	890.55
Conservation_open	2000	18.94	179.96	369.38	716.83
Mangrove conservation	22	0.19	1.81	3.72	7.54
Mangrove_planting	5	0.04	0.32	0.76	1.62
Shelterbelt_casuarina	10	0.21	1.56	1.96	2.51
Roadside-AF/UF	12	0.15	1.14	2.67	5.71
Bald hills	2.5	0.01	0.06	0.14	0.30
Total	**6102**	**50**	**456**	**951**	**1903**

Notes: Carbon pools considered: Aboveground and belowground biomass, soil and litter pools; Area to be planted: 6.1 Mha phased equally over 5 years, starting 2011. Biomass growth rates: ANR_sal: 2.5 t/ha/yr1; Teak: 5.84 t/ha/yr2; Mangrove conservation:3.2 t/ha/yr3; Mangrove_planting: 3.2 t/ha/yr3; Shelterbelt_casuarina: 8.5 t/ha/yr4; Roadside AF_UF: 4.96 t/ha/yr5; Bald hills: 0.84 t/ha/yr1; Conservation_dense: 2.5 t/ha/yr1; Conservation_open: 3.56 t/ha/yr1.

As can be seen from Table 2, the mitigation potential of conservation activities is obviously very high (22.5 MtCO2 for conservation of dense forest and 18.9 MtCO2 for conservation of open forest) as opposed to the other proposed afforestation/reforestation activities. The incremental annual mitigation potential for 2020 considering all the proposed activities is 50 MtCO2. The cumulative incremental mitigation potential of all the activities for the period 2010-2020 is about 456 MtCO2 while it is 951 MtCO2 (52% higher) for the period 2010-2030 and 1,903 MtCO2 for the period 2010-2050.

4.5 Summary of State GHG Emission

The following is the summary of the GHG emission in the state.

Sectoral Emission per annum	Unit	Amount	Remark
Industrial, Transport and Energy Sector	Million tonnes of CO_2	82.68	Annualised adding the CO_2 and CH_4 emissions
Municipal solid waste and sewage	Million tonnes of CO_2	0.56	Annualised CH_4 emissions converted to CO_2 equivalent for 2010-20 period
Mitigation Potential from Conservation	Million tonnes of CO_2	45.6	Annualised CO_2 sequestration for 2010-20 period
Net Emission	Million tonnes of CO_2	37.64	
Per Capita Emission		1.02	With 2001 population estimated at 36.8 million
National Emission per capita		1.40	Estimated for 2007[1]

Theresults have been obtained using the Tier I approach of IPCC and approved methodology of UNFCCC which can serve as a crude estimate of GHG profile of the state.

Thetable above shows that the per capita emission of the state is well below the national average with suitable conservation plan in place.

1 **http://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions_per_capita accessed on 15 December 2010**

Chapter 5

Climate change issues relevant to Orissa

5.1 Introduction

Climate projections for India suggest that impacts are likely to be varied and heterogeneous, with some regions experiencing more intense rainfall and flood risks, while others will encounter less rainfall and prolonged droughts. Among the more substantial effects is a projected spatial shift in the pattern of rainfall towards the already flood-prone coastal areas, while water-scarce regions become even more drought-prone and unproductive. India will also suffer from higher tides, more intense storms fueled by warmer oceans and further erosion along its coastline due to sea level rise. For India, climate variability and climate change pose huge risks to human life and threaten to endanger the sustainability of the country's economic growth. India's immense geographic diversity adds to the complexity of developing and implementing an adaptation strategy. The impacts will vary across States, sectors, locations and populations. Consequently, there can be no one-size-fits-all approach to developing a climate risk management strategy: approaches will need to be tailored to address state and local vulnerabilities and conditions.

Orissa has a 480 km vulnerable coast line, which is a periodic recipient of climate risks such as cyclones and coastal erosion. Orissa is rainfall dependent as its irrigation network does not cover the entire state. With a water-dependent crop, rice, as its main staple, the agriculture sector is vulnerable to the vagaries of climate-induced weather changes. In terms of health, the vector-borne disease - Malaria - is fairly rampant in many parts of the state. Although 38 percent of the state's geographical areas are forests, much these forests are degraded.

Orissa also remains one of India's poorest states. The estimates from the Planning Commission reflected in indices such as the percentage of population below the poverty line both in rural and urban areas, and the overall incidence of poverty in Orissa vis-a-vis rest of India reveal that Orissa remains one of the poorest among all the major states of India. The high poverty in Orissa is closely tied to low productivity in agriculture, which is in turn linked to the prevalence of small and marginal holdings. The GoO has realized that poverty reducing economic growth would need acceleration of progress in both agriculture and non-agricultural sectors.

Climate change is predicted to impede poverty alleviation programmes in Orissa both directly and indirectly compromising the current growth strategy. The direct impacts could include loss of life, livelihoods, assets, infrastructure, etc. from climatic extreme events. The indirect effects could be the effect on economic growth. Continuing climate change variation is predicted to alter the sectoral origins of growth, including the ability of the poor to engage in the non-farm sector. This could nullify the pro-poor potential of macroeconomic policies, trade and private sector investment.

Climatic variations could further multiply the vulnerability of poor people by adversely

affecting their health and livelihoods and jeopardizing growth opportunities vital for poverty reduction. Climate change in Orissa has the potential to tremendously aggravate water stress and enhance food insecurity.

GoO wants to ensure that climate change does not undermine the economic development of the state. Orissa has recently transformed itself in economic and fiscal terms. Double-digit growth for the past five years has had a multiplier effect throughout the economy. A remarkable fiscal turnaround, achieved through the state's own efforts and complemented by performance-linked support from the central government and external donors has released funds for development and greater public investments more generally. The state finances, which were in critical stage have improved. The GSDP during the 10th five year period (2002-2007) has increased by 8.5 percent per annum which is slightly more than the national level. Private investment of funds in the state has increased as a result of this; employment opportunities have increased in private sector leading to Poverty reduction.

The state's 11th Five Year Plan focuses on addressing the challenges in achieving sustainable, shared economic growth and accelerating human development. This includes measures to tackle problems in the agriculture and rural non-farm sectors; enhanced social protection and tribal empowerment; further improvement of the business climate and the regulatory framework for managing environmental and social impacts of resource-intensive investments in the State; greater attention to financial management and modernization of procurement systems for converting outlays to outputs and outcomes; and continuing tax reforms for transition to Goods and Services Tax.

Orissa is endowed with coal and a variety of mineral resources. It has the potential to generate coal-based thermal power not only for the state's needs but also to cater to the neighboring states in the region. The current development trends point to increased emphasis on power, mining, energy-intensive industries and infrastructure. It is anticipated that thermal power generation capacity will increase to 55-60,000 MW in the coming decade from the current 4,000 MW. In view of the pollution effects of the thermal plants,capping of the thermal power generation would be required. While climate adaptation remains a key issue, the state's role in mitigation in the broader national context could not be ignored.

Being mineral-rich, the state has mineral-based industries that are both energy and water intensive. The energy, mining and industry sector also contribute to the local environmental and social problems. Mining projects are threatening forests, livelihood of people dependent on forest based economy and creating conflicts between wild animals and local inhabitants due to loss of forest. All these developments will have a high carbon and environmental footprint. On the other hand, sustained management of the state's forests also offers possibilities in terms of providing for carbon sinks and protection of watersheds.

Given its profile, climate change is a very important subject for the state. It is presently on a carbon-oriented development path and, at the same time, it is vulnerable to climate-mediated risks. We describe below some key issues pertaining to climate change adaptation and mitigation.

5.2 Key Issues

5.2.1 Adaptation

Coastal/disasters

Orissa has long been prone to disasters.Recurring droughts, flood and cyclones are regular features in the state and have had a crippling effect on the economy. In 1999 a severe cyclone followed by a super severe cyclone lashed the entire coast of Orissa causing large scale loss of life. Whilst the extent to which climate change will exacerbate

floods and droughts is not yet fully understood yet it is clear that frequency and intensity of disasters will increase .

Cyclones may further intensify with climate change.

Water Resources

In Orissa, over 80 percent of annual rainfall occurs during the monsoon period with average rainfall of 1400 mm, with an average of 70 rainy days. The state experiences either heavy flood or drought every alternate year due to uneven distribution of rainfall. In recent years, wide fluctuation in climate has been observed and irregular rainfall causing both floods and droughts is a major concern. The impact of drought on farmers has been invariably deleterious . Floods in 1980, 1982, 2001 and 2003 were particularly severe and there have been notable flood events in each of the past 4 years. Saline water ingression has been observed in some coastal districts. With large demand for water coming primarily from the energy, industry and agriculture sectors and rainfall/precipitation levels turning erratic, the state will be confronted with water scarcity in varying degrees in different areas.

Agriculture

Almost 85 percent of the State's population is dependent on agriculture and yet the agriculture sector contributes only about 26 percent of the GSDP. With almost 60 percent of land devoted to rain fed agriculture and with a water-dependent crop, rice, as its main crop, the agriculture sector is vulnerable to the vagaries of climate-induced weather changes.

Health

The prevalence of Malaria, and other vector-borne disease, is already rampant. With the expected erratic nature of rainfall and extending seasons, there is a possibility that the prevalence of these diseases would become more rampant. Climate change has the potential to aggravate malarial as well as other vector-borne, water-borne and food-borne diseases.

5.2.2 Mitigation

Energy

The State of Orissa is poised for rapid industrial development and large use of electricity for industrial purpose for which the demand for electrical power is continuously increasing. Orissa is on the way to becoming an energy supplier to the grid. In the next 10 years, Orissa expects to be generating about 60,000 MW of power, most of which is based on coal (a multiple increase from the current 4,000 MW). On the demand side, there is potential for reducing T&D losses, energy-efficiency promotion / DSM and also tapping the unrealized potential for renewable energy particularly bio-mass and solar.

Mining

Being endowed with mineral resources,mining sector will continue to form an important part of the state's economy. Many of the mineral resources are found on forest land and these also have tribal/indigenous populations. Therefore, mining is already fraught with situations of conflict that are constantly being resolved. In the climate context these forests could serve as carbon sinks. In addition, there are a number of small mining companies that do not adopt sustainable practices. Combined with poor infrastructure, there is a serious concern pertaining to sustainable development issues.

Industry

Industries in Orissa mostly belong to the energy-intensive and highly polluting catagory. However, there is potential for improving energy efficiency through the use of cleaner production technologies, methods and practices. This will contribute towards mitigating green house gases. As most mineral-based industries have their own coal-based captive power plants, there are direct emissions from the industry sector as well. Therefore, making the captive power plants more energy-efficient is also a key issue in the Orissa context.

Transport

The state is solely dependent on petrol and diesel to meet its growing fuel needs. Strengthening legal framework for motor vehicles to regulate emission, introducing mass transport and/or switching to fuel will reduce both local and global emissions in the state.

5.2.3 Cross cutting Issues

Forestry

No assessment of the impact of climate changes on Orissa's forests has yet been undertaken using the latest range of climate scenario. Further there are the uncertainties about the future of the monsoon in all the models. At the national level past studies have indicated that whilst Orissa's forest areas are not the most vulnerable, more recent work indicates that within 50 years, most of India's forest biomass would be highly vulnerable to the change in climate. The forestry community nonetheless needs to evaluate the long-term effects of climate change on forests and determine what the community might do now and in the future to respond to this threat. A large part of these forests in Orissa are degraded and therefore there is scope for increasing forest cover as well as forest density.

Urban

Creation of sustainable habitats is a big challenge in urban areas. This will bring down emission levels substantively. Energy use by the urban local bodies for applications such as water/sewerage pumping and street-lighting is considerable. Large scale energy savings are possible and will contribute towards mitigating carbon emissions. Given the drainage situation in urban areas, a sudden and intense precipitation may cause flooding and water logging which would throw life out of gear. Urban local bodieswill have to be prepared for this.

Chapter 6

Sectoral Issues & Programme of Key Priorities

6.1 Agriculture

6.1.1 Introduction:

Agriculture holds a predominant position in the state's economy. About 80-85 percent of the state's population is rural and virtually depend on agriculture. Rice dominates the crop area (about 75%) and is also the main kharif crop. Predominantly farmers cultivate vegetables and low duty crops in Rabi. Having 10 different agro-climatic zones due to large variations in physiographic and topographic conditions, there are differences in agricultural practices across the state.

About 60 percent of land is devoted to rain fed agriculture, which is characterized by low productivity, low income, low employment with high incidence of poverty. Rainfall pattern in these areas is highly variable leading to moisture stress during critical stage of crop production.

Table 6.1: Agriculture - Key Statistics

S.No.	Title/Description	Particular Data/ Information
1	Agriculture's & Animal Husbandry sectors' contribution to the economy	21.11% of the Net State Domestic Product (NSDP)
2	Employment	70% of state's population
3	Topography, climate and soil types	10 different agroclimatic zones
4	Total rainfall	1,451.20 mm (Monsoon rainfall is 1144.30 mm, i.e. 79% of total rainfall between June & September)
5	Main crop	Paddy (Crop is paddy processed one is rice)
6	Dependence on rainfall	High

Source: Agricultural Statistics, 2006-2007 and 2008-09.

These are hotspots of poverty, malnutrition, food insecurity. Given that the agriculture is largely rain fed, the behavior of the monsoon has the potential to impact the prevailing systems and practices in a negative way. Climate projections indicate that there will be a change in the intensity and frequency of rainfall across the country. This will impact agriculture in Orissa adversely. From the grassroots, there have been reports of problems, e.g. germination, due to the variability in rainfall. Other problems such as pest attack and disease outbreaks are also likely due to climate variability. The agriculture sector needs to adapt and cope to the impending climate change scenario.

Under the NAPCC, there is a separate National Mission on Sustainable Agriculture. This Mission aims at making Indian agriculture more resilient to climate change. The focus is on rain-fed agricultural zones. The suggested approaches include (i) Development of drought and pest resistant crop varieties, (ii) alternative cropping patterns and on specific aspects that include, (iii) Improving methods to conserve soil and water, (iv) capacity building and support to farmers, and (v) safeguarding farmers against increased climate change risks.

The key priorities identified in the Orissa context fall in line with these national policy directions. The rest of this section outlines the various key priorities pertaining to agriculture. Fisheries and Animal Resources are identified as an independent sector and addressed in a separate section.

6.1.2 Rapid screening and strategy assessment of State Agriculture Policy and seed improvement:

Agriculture is one of the key sectors that will be affected due to climate change. While that is clear, there is still a lot of uncertainty regarding the nature of the impacts as these are dependent on different climate scenarios of rainfall and temperature. There should be a cluster approach in the interventions to have appropriate local context and response to climate change. Empicrical weather data will also be used to provide the bottoms-up perspective and that will lead to an appropriate response to the possible climate scenarios in Orissa. It is in this context of these scenarios that a rapid screening and strategic assessment of the State Agriculture Policy and associated implementation approaches will be done. This will lead to identifying modifications that will be required to cope with climate change. Indiscriminate conversion of agricultural land will be discouraged which would be one of the important components of the state policy. Diversion of agricultural land should be adequately compensated.

For enhancing the adaptive capacity of agriculture sector public investment in irrigation, research for adaptive cultivars of main crops & better forecasting model decision support system would be needed & incorporated in the policy. Areas of the state where high climate variability is common (drought prone, flood prone & heat islands) suitable change of cropping mix and revision of crop calander will be essential; suitable training needs to be catagorized e.g. (i) crop/ varietal diversification (ii) shortening or lengthening, growing season planting date etc. (iii) mixed farming (iv)non-farm enterprise (v) better land & water management along with cropping mix (vi) risk transfer through insurance (vii)asessment & promoting climate resilient indigenous farming practises.

Agriculture - Key Priorities

- Rapid screening and strategy assessment of State Agriculture Policy
- Establishing an effective institutional delivery mechanism to promote best practices on climate change
- Undertaking capacity building
- Continuing the livelihood-focused, people-centric integrated watershed development in rain fed areas
- Increasing the area under perennial fruit plantation
- Developing water use-efficient micro irrigation methods and individual / community farm ponds
- Improving monitoring and surveillance techniques
- Developing sustainable soil, water and crop management practices
- Breeding studies on major crops for tolerance /resistance
- Conducting climate-linked research studies

Seed improvement:

Thus screening of germplasm for multiple stress resistance/tolerance becomes one of the fore most adaptation strategies. To supplement the effort of suitable variety development/seed improvement, seed production on commercial scale and its quality control is of paramount importance as well. It is envisaged to strengthen the production and distribution mechanism of quality seeds through establishment/ strengthening of infrastructure for processing, storage and quality control (seed testing and enforcement)

6.1.3 Establishing an effective institutional delivery mechanism to promote best practices on climate change:

In the years to come, the agriculture sector in Orissa needs to constantly cope with implications of climate change. The location, nature and scale of the impacts cannot be accurately predicted. At the same time, when these impacts occur, there is a need to respond. Therefore, an institutional delivery mechanism will be established to promote climate change adaptation measures. This will be in the nature of strengthening existing delivery mechanisms through the different executive wings, i.e. Directorates of Agriculture, Horticulture, Soil Conservation and Watershed Development Mission. The outcomes of the analysis of weather data to identify trends in climate variability and related weather-based knowledge services will reach the farmers through cluster-level climate change resource centers. Farmers will be able to make more informed decisions with the information that reaches through these strengthened delivery mechanisms.

6.1.4 Undertaking capacity-building:

Climate change is a new challenge that is confronting the agriculture sector. Substantive capacity building will be required for primary and secondary stakeholders for better management of land and water in the context of climate risks. Technical and capacity building support to Community-Based Organizations (CBOs), extension officers and farmers will have to be provided on a continuous basis. Information dissemination on climate change – through the use of the Gram Panchayat level Training hubs – will be constantly required. These initiatives will be implemented across the state.

6.1.5 Continuing the people centric livelihood-focused integrated watershed development in rainfed areas:

Climate change is likely to cause high variability of rainfall, drought,dry spells as well as flash floods. At the grassroot implementation level, the integrated watershed approach is the most appropriate way to cope with these changes. The approach has a livelihood focus, is people-centric and is socially inclusive. Both agricultural growth and enhancement of land productivity is ensured in these rain fed areas that are vulnerable to climate variations. Livelihoods interventions are implemented in the form of cropping system strategy, pisciculture,

livestock farming, NTFP marketing and various other land-based income generating activities. As a part of the livelihoods intervention, steps are also to be taken to improve the quality of life through improved sanitation and other health interventions. There is enough evidence of successes in implementing projects under the Orissa Watershed Development Mission (OWDM). There will be a continued investment in integrated watershed development programmes in climate sensitive areas and in furthering their replication across Orissa. 3000 micro watersheds will be taken up for treatment in a phased manner in next five years.

6.1.6 Increasing the area under perennial fruit plantation :

With the predicted increase in the vagaries of climate/weather, the horticulture sector will have to be oriented towards perennial fruit plantation. Promoting of fruit plantation will also lead to enhancing carbon sinks. Based on the implementation experience, plans to replicate across other fruit-growing areas of the state will be made.

6.1.7 Developing water use-efficient micro irrigation methods and individual/ community farm ponds:

Water availability is expected to become uncertain due to climate change. 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 nuttured in the upper catchment area.

6.1.8 Improving monitoring and surveillance techniques:

Climate change is likely to delay the onset of monsoons as well as bring greater pest and disease attacks on crops. Improved monitoring is therefore required. 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 awarness and establishing e-pest Surveillance Syatem in the state as a measure to cope with pest hazard using the latest ICT.

6.1.9 Developing sustainable soil, water and crop management practices:

In the context of adapting to climate change, there will be need to improve soil management through integrated nutrient management, residue incorporation, minimum tillage and other related measures. More efficient water management will also be required as the vagaries of weather will make water availability uncertain. In addition, crop management practices will also have to be strengthened to cope with drought, reduced submergence damage and other climate/weather extremes. Sustainable agriculture will also include suitable crop diversification strategy. Certain areas traditionally stronger on organic farming should be further strengthened. There will be appropriate incentive structure for organic framing.Under this initiative, all of these aspects will be addressed.

6.1.10 Breeding studies on major crops for tolerance /resistance:

Increased temperatures, possible submergence due to floods and occurrence of drought conditions necessitates breeding studies for tolerance resistance. Under this initiative, research will be conducted to identify genotypes of rice, green gram, black gram and other agricultural crops that have specific resistance to multiple stresses. Once these research studies show conclusive results, follow-up initiatives to promote the more tolerant varieties will be undertaken.

6.1.11 Conducting climate-linked research studies:

Given the unknowns and uncertainties associated with climate change, research will be a focus initiative. Research will lead to strengthening preparedness to tackle emerging scenarios of pests, increased production of rice seeds under various weather scenarios and establishing climate risk management services and piloting weather-based crop insurance.

6.2 Coasts and Disasters

6.2.1 Introduction:

The state of Orissa has a long coastline measuring 480 kms, bestowed with rich diversity of mangroves, sea grasses, salt marshes, sand dunes, estuaries, lagoons, and unique marine and coastal flora and fauna. Chilika and Bhitarkanika are two important coastal wetlands and Ramsar sites. Chilika is the largest wintering ground of migratory avian species of the Asian subcontinent. The largest rookery of Olive Ridley Sea turtles is located at Gahirmatha. These sites are full of creeks and swamps that have great ecological and socio-economic significance. The coast is also known for highly diverse mangrove or tidal forests. These are found in the delta areas of the Mahanadi, Brahmani and Baitarani rivers, and their tributaries. This unique coastal biodiversity of Orissa is under severe threat due to various biotic and ecological pressures. Climate change has the potential to further worsen this vulnerability.

Climate-mediated disasters such as cyclones are expected to increase in intensity and frequency. The Orissa State Disaster Management Authority (OSDMA) is the nodal agency for coordinating all disaster management activities. The Authority has the mandate to cover the entire gamut of disaster management that includes risk reduction, relief, restoration, reconstruction and other measures. It also coordinates with the line departments whose support is required in dealing with various aspects of disaster management. This Authority was established after the super cyclone in 1999. Over the last decade, OSDMA has established itself in preparing for planning and tackling a range of disasters.

Table 6.2: Coasts & Disasters - Key Information

S.No.	Description
1	Extensive coast line of 480 km.
2	36% population of the state live in 9 coastal Districts.
3	Two unique coastal wetlands of International importance i.e. Chilika and Bhitrakanika are located along the coast.
4	About one third of cyclonic disturbances in Bay of Bengal hit Orissa coast.
5	Five cyclones in Bay of Bengal each year
6	Tsunami threat from the seismic disturbances at Indo-Australian plate boundary
7	Situated in Zone-3 (Moderate damage risk zone) in Seismic Hazard Map of Vulnerability Atlas of India published by Government of India
8	Floods in 11 major river systems of the State including Mahanadi system
9	The coastal ecosystem is vulnerable to global warming and sea level rise.

Source: OSDMA

Even though the NAPCC does not have a separate National mission on coastal protection and disasters, this is vitally important for Orissa as it has a 480 km coast line that comprises rich biodiversity and is also frequently subject to extreme weather events. Key priorities in this sector have been identified and are covered in the rest of this section.

6.2.2 Coastal Zone Management:

For sustainable management of the coastal zone of the state, a World Bank assisted Integrated Coastal Zone Management Project (2010 – 2015) would be implemented. Orissa Coastal Zone Management Authority addresses CRZ issues.

6.2.3 Flood mapping, flood forecasting and downscaled climate change projections modeling:

With climate change, extreme cyclonic events are expected to increase in frequency and intensity. This can lead to flooding of low laying areas. To prepare for these situations, flood modeling - mapping and forecasting – will be extremely useful. This needs to be done through the scaling down of the global circulation models as pertaining to the Orissa coast. As a part of this initiative, such modeling studies will be undertaken. Once in place, these models will be used to strengthen preparedness. In addition to this, the traditional knowledge of adaptation will be documented and incoporated.

Coasts & Disasters - Key Priorities

- Flood mapping, flood forecasting and downscaled climate change projections modeling
- Assessment of erosion prone areas with the help of Digital Elevation model
- Studying coastal erosion
- Conducting micro-level vulnerability assessment
- Constructing flood shelters in unconventionally vulnerable locations
- Needs assessment and constructing multipurpose cyclone shelters
- Developing a hydrological framework
- Dredging and river mouth widening to improve flood management
- Strengthening coastal protection methods
- Developing a techno-legal regime for construction of disaster resilient housing and public infrastructure
- Integrating climate change risk in the state's disaster management policy
- Setting up an integrated training and capacity building protocol
- Assessment of risks due to lightning and thunderstorm
- Improving flash flood management
- Prediction through appropriate modeling the impact of sea level rise on coastal ecosystem
- Study of impact of global warming on the biodiversity of coastal ecosystem with special emphasis on flagship species

6.2.4 Assessment of erosion prone areas with the help of Digital Elevation model:

Parts of Orissa Coast are vulnerable to erosion. Sea level rise, extreme weather events and storm surges are expected due to climate change. These may worsen the coastal erosion. It is in this context that the assessment of erosion prone areas using the Digital Elevation Model will be done. More precision is required in identifying the erosion-prone areas and also in determining appropriate methods to protect these areas. This assessment will be done in identified erosion-prone areas. Once the assessment is done and appropriate methods are determined, capacity building and awareness generation of the coastal communities will also be undertaken along with appropriate mitigation measures.

6.2.5 Studying coastal erosion:

Increasing coastal erosion due to sea level rise and related sea behaviour is already seen along the coast of Orissa (e.g. Lessons from Satabhaya, Pentha). To gain a better understanding of the micro and meso-level effects, a special study will be done. This will focus on the coastal settlements and public infrastructure (e.g. roads). Based on the outcome of this study, further plans will be made to address coastal erosion problem.

6.2.6 Conducting micro-level vulnerability assessment:

Different assets like housing, public infrastructure, agriculture land and livelihood of people likely to be affected due to extreme weather events that climate change is expected to induce. Also, socio-economic implications for different population groups will have to be considered. In this regard, a micro-level vulnerability assessment will be conducted on a pilot basis. Based on the outcome of such a vulnerability assessment, further planning for the entire state will be initiated.

6.2.7 Constructing flood shelters in unconventionally vulnerable locations:

In general, one would not expect traditionally dry areas to have floods and water logging. However, with climate change, the possibility of such extreme swings in weather conditions is being predicted. In that context, capacity building of the community to face the changing weather patterns is required as a part of climate change adaptation. This will be accomplished under this initiative.

6.2.8 Needs assessment and constructing multipurpose cyclone shelters:

Through projects like World Bank aided National Cyclone Rehabilitation and Management and Integrated Coastal Zone Management Project (Orissa), construction of multipurpose cyclone shelters in the cyclone prone areas of the state is being taken up. Provision of emergency equipment to the cyclone shelters and strengthening of the capacity of local people for disaster management are envisaged in the projects.

6.2.9 Developing a hydrological framework:

Water is a central to climate change adaptation issue. In this regard, developing of a hydrological framework is required. 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. All this would be done under the overall hydrological framework.

6.2.10 Dredging and river mouth widening to improve flood management:

Erratic and intense pattern of rainfall/ precipitation due to climate change is likely to worsen the flood and water logging situation. Dredging and widening of river mouths which is essential to facilitate efficient discharge of floodwater to the sea would address this problem. Under this initiative, locations will be identified for dredging and river mouth widening.

6.2.11 Strengthening coastal protection methods:

The natural vegetation shelterbelt plantation and mangroves act as a bio-shield for protection of coastal area, there is need for further expanding these entities. Changes in cropping

patterns in the coastal districts will also need to be kept in view. Utilization of traditional knowledge and adaptive mechanisms already available with the community, need to be institutionalized in a systematic way to assist in adapting to climate change. Exsiting mangrove area would be expanded within a specified time frame.

6.2.12 Developing a techno-legal regime for construction of disaster resilient housing and public infrastructure:

Occurrence of more frequent and more intense extreme weather events – predicted due to climate change – is bound to have negative impacts on housing and public infrastructure. This can be due to extreme events, flooding of non-flood prone areas and coastal erosion. To manage these impacts on properties, a techno-legal regime is required for disaster-resilient construction. This will be developed under this initiative.

6.2.13 Integrating climate change risk in the state's disaster management policy:

Climate change is expected to induce more frequent and more intense extreme weather events. In this context, the existing disaster management policy needs to be strengthened to deal with them. Under this initiative, a robust framework with a proactive and multi-hazard approach to disaster management will be developed.

6.2.14 Setting up an integrated training and capacity building protocol:

Climate change implications require an integrated response. To enable such a response, integrated training and capacity building will be required for this. An integrated protocol will be necessary. Raising awareness of community and stakeholders on the coping mechanisms would be done under this initiative.

6.2.15 Assessment of risks due to lightning and thunderstorm :

There is a marked increase in frequency iof death due to lightnings and thunderstorms. There is possibility of increase of frequency of lightning and thunderstorm due to climate change. Under this initiative, an elaborate scientific study would be carried out for taking appropriate measures.

6.2.16 Improving flash flood management:

Climate change is expected to bring heavy, intense and unexpected precipitation that will cause flash floods. Under this initiative, 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.

6.2.17 Prediction through appropriate modeling the impact of sea level rise on coastal ecosystem:

The predicted sea level rise due to climate change has the potential to impact adversely on the unique coastal ecosystems. 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. Possible changes in the migration trends through the inlet of Chilika will also be studied as 75 percent fish fauna of Chilika Lake are migratory in nature.

6.2.18 Study of impact of global warming on the biodiversity of coastal ecosystem with special emphasis on flagship species:

There is a likelihood of climate change impacting the unique mangroves – a flagship biodiversity species - of coastal Orissa. With a focus on the Bhitarkanika mangrove system, modeling studies will be done to predict the impact on the mangrove diversity. Using the findings of these studies, further biodiversity conservation measures will be planned to protect the flagship species from climate change impacts.

6.3 Energy

6.3.1 Introduction:

Since the state's economy is growing at a faster pace ,its energy needs will be rising significantly over the coming decade. Presently, the average demand for energy is about 2,500 MW and the peak demand is about 3,200 MW. In the next 2-3 years, the average demand is likely to increase by another 1,500 MW and the total average demand will be 4,000 MW. This additional demand is due to extending grid connectivity to most of non-grid locations. In parallel, the demand from industry - a key component of the rapid development process- will also increase significantly.

To meet the growing needs, GoO is taking steps to generate more power. The installed generation capacity is about 2,965 MW with hydel being about 2,085 MW and thermal (coal) being about 880 MW. In the next 5 years, another 4,000 MW will be added so as to meet the average demand in the same time frame. In the last 2-3 years, as many as 27 MOUs have been signed for an additional 35,000 MW. In addition, NTPC is planning 3 power plants (total of 7720 MW) for their national grid and three ultra-mega power plants (total of 12,000 MW). The state government through its own PSUs is planning to add 3120 MW. As things are proceeding on course, about 58,000 MWs of power are likely to be generated in the next 7-8 years.In the coming decade, the present mix of more hydel power will change significantly to more thermal (coal)-based power. In fact, the hydel power will become a small proportion of the overall mix. This will cause substantive stress on the local environment and natural resources, particularly water. Apart from water, there will also be a huge generation of fly ash, which is already causing a major disposal problem.

Transmission and distribution losses are one of

Table 6.3: Energy–Demand & Supply

Year	Demand of power (MW)	Supply/ Generation of power (MW)	Transmission & Distribution Loss %
2003-04	1422	1815	40.75
2004-05	1488	2025	39.21
2005-06	1631	2261	39.59
2006-07	1792	2154	38.57
2007-08	2064	2390	37.48
2008-09	2256	2289	37.50
2009-10	2550	2260	NA
2010-11 (approx)	2600	2250	NA

Source: Energy Department

the highest in the country. It is estimated that between 600-900 MW of power can be saved. Stoppage of these losses will go a long way in meeting the present demand – supply gap and in establishing sound energy management practices. Also, promoting energy – efficiency and demand side management in the user industries can also bring about a saving of about 500 MW.

Of renewable energy, hydro power is presently the largest contributor of power in the state. About 70 percent of the overall power production in the state and for the state is hydro power. However, further hydro power development has lagged behind. There is potential for more medium scale hydro power (90-150 MW per unit) and also for small hydro (10-25 MW per unit). The potential is about 2,400 MW and 150-200 MW respectively. At present 57 MW is generated from small hydel plants in the state and rest have not yet been harnessed. Solar PV power and wind power also have the potential of 1,40,000 MW and 1,70,000 MW respectively. Only some pilots have been done so far. There is also potential for bio-mass based power, municipal solid & liquid waste –based power. These are estimated to have the potential for 350 MW, 12 MW and 8 MW respectively. There are about 4,000 villages in the State, which need to have power from renewable energy sources as these villages cannot be connected by grid.

The energy sector in Orissa (both state supply and captive power) is going to be a large contributor to the carbon dioxide emissions. Assuming about 60,000 MW of power generation by 2020 and 5 million tons of carbon per 1,000 MW, the local carbon emissions will be 300 million tons of carbon per year. Over a 30-year period, this will be about 9 billion tons of carbon. Recognizing this situation on the one side and realizing that energy is vital to meet the development needs, GoO will proceed on a carbon-conscious development path as well as capping of the thermal power generation within the state after working out the carrying capacity. Key priorities were identified and these constitute the rest of this section.

Energy – Key Priorities

- Generating cleaner energy through clean coal approaches
- Institutional development of the Energy Department
- Reducing transmission and distribution (T & D) losses
- Promoting demand side management (DSM) and energy efficiency
- Encouraging effective fly ash utilization and emission reduction
- Promoting of small and medium hydel plants
- Harnessing the biomass potential
- Promotion of grid based wind power generation
- Maximizing solar power generation
- Developing bio fuels

6.3.2 Generating cleaner energy through clean coal approaches:

Moving to clean coal approaches will reduce carbon emissions and requires a shift in the policy framework. The following policy initiatives will be implemented: (i) Switch over from sub-critical technology to super-critical technology by which coal consumption will reduce from 1 MT to 0.88 MT per MWh and increase in plant efficiency from 37 percent to 42 percent, (ii) Encourage more gas-based Combined Cycle Power Plants where CO2 emission is 0.46 and which can be reduced to 0.25 per MWh, (iii) Washed coal to be used by the Independent Power Producers (IPP) and Captive Power Producers (CPP) for the generation of power if ash content in coal exceed 40 percent, (iv) Use of fluidized bed boiler and coal gasification. This will utilize the mines' rejects and washery rejects for power generation, (v) Improvement of boiler efficiency through combustion optimization by installation of dynamic coal flow balancing system with continuous online residual carbon analyser in the boilers, (vi) Promoting merchant power plants in existing industrial units with variable Power Purchase Agreement option, (vii) Develop state level

energy efficiency standards for various sectors adopting Energy Conservation Building Code (ECBC) and (viii) Existing thermal power plants to conduct Life Cycle Analysis of their plants as per CEA benchmark and implementation of rehabilitation and modernization measures to improve the efficiency.

6.3.3 Institutional development of the Energy Department:

To meet the rising challenges, both capacity building and restructuring of the Energy Department will be required for implementing policies and conducting studies. This will include the following: (i) Functional reorganization and capacity building of the Energy Department including the Energy Conservation Cell, Orissa Electricity Regulation Commission (OERC), Orissa Renewable Energy Development Agency (OREDA), creation of separate cell for small & medium hydel plants to have a coherent road map to achieve efficient functioning and implementation of energy efficiency, energy conservation, promotion of renewable energy, (ii) Integrated super critical (660 MW) IPP Policy (Coal Washeries, Fly Ash based cement and brick plants) with a minimum unit size for the purpose of IPP/MPP, which should not be less than 300 MW to achieve minimum standards of efficiency, (iii) Revised RPO based on the changing load mix and assessment of evacuation Infrastructure, (iv) Conducting a study for determining the state's emission intensity, (v) Develop an operational plan for the Fund that will get revenue for the sale of power that is exported, (vi) It is proposed to introduce green cess @ 1 paise/unit for LT and 5 paise/unit for HT and EHT, (vii) Feasibility study for the establishment of coal-based thermal power plants along coast of Orissa, use of saline water and dedicated rail corridor for coal transportation to be conducted, (viii) Feasibility of implementing emerging clean coal technologies through pilot projects in Orissa and (ix) Training of the members of working group or their representatives of different departments and organizations on sector specific climate change issues. All of these have a direct or indirect bearing on the carbon emissions from this sector.

6.3.4 Reducing Transmission and Distribution (T&D) losses:

The reduction of T & D losses will continue to be a focus for reducing carbon emissions. An operational plan for the targeted reduction of losses (estimated to be 40%) due to pilferage and outdated systems will be developed. This will include the augmentation of T & D infrastructure and investment plan, enhancing present practices for improved load management and feasibility study of evacuation corridors.

6.3.5 Promoting Demand Side Management (DSM) and energy efficiency:

DSM and energy efficiency will reduce the demand for energy and therefore reduce carbon emissions. Under this initiative, a comprehensive policy and plan to save energy use in order to reduce the demand-supply gap and contribute towards climate change abatement will be done. This will include the following activities: (i) Implementation of utility level DSM measures, (ii) Awareness Generation for Energy Conservation, (iii) Promotion and implementation of the National Bureau of Energy Efficiency's adopting the ECBC for widespread adoption in the state to reduce the energy consumption in buildings, and (iv) For proper energy monitoring, capacity building of energy auditors, strengthening of existing Energy Conservation Cell under the Energy Department supported with manpower and infrastructure.

6.3.6 Encouraging effective fly ash utilization and emission reduction:

For effective fly ash utilization and emission reduction (both carbon and particulates) from power plants, there is a necessity of capacity building of State Pollution Control Board. Under this initiative, the following policy actions/studies will be done: (i) Compiling information from the several studies and initiatives that have been done on fly ash and developing an operational plan for effective utilization of fly ash, and (ii) Installing of equipment at the IPPs/CPPs for Nitrous Oxides (NOx) reduction.

6.3.7 Promoting small and medium hydel plants:

Promoting hydel power will reduce dependence on thermal power and therefore bring about carbon emission reduction. This initiative will be mostly location specific, i.e. hydel power plants will be established wherever the resources and conditions are favourable. At present, about 118 micro, mini and small hydro projects (up to 25 MW) have been identified on canal drops and run of the river sites with a total capacity of about 350 MW. Besides there are several locations where off-grid hydel power plants can be located to supply energy to surrounding villages. This initiative will undertake a range of activities that will promote hydel power plants: (i) Identification of sites for both on grid and off grid applications, (ii) Survey and investigation, (iii) Preparation of pre-feasibility reports, (iv) Selection of entrepreneurs, (v) Creating an enabling policy framework for providing clearances, (vi) Building capacity of Government by creating a separate cell under Energy Department and capacity building of stakeholder organizations, (vii) Establishing demonstration/pilot projects if required and (viii) Promoting investment projects.

6.3.8 Harnessing the biomass potential:

Promoting on-grid and off-grid biomass power projects will reduce the use of coal based power and hence lower carbon emissions. Under this initiative, the following will be done to harness the biomass potential to the maximum: (i) Study of the existing policy and develop investment friendly policy to promote additional biomass application, (ii) Conducting a detailed feasibility study for scoping biomass-based project, (iii) Developing a biomass supply chain involving agro, agro industrial and other biomass resources including dedicated energy plantation, (iv) Promoting biomass based gasifiers project in agro based industries, (v) Raising awareness, (vi) creating a conducive scenario for investment and (vii) implement demonstration/pilot projects if required.

6.3.9 Promotion of grid based wind power generation:

Like any other renewable source, carbon emissions will be reduced through the commensurate reduction of conventional power use. Under this initiative, wind resource assessment will be done, areas will be developed as wind farms, a promotional policy framework will be developed, demonstration projects established and hybrid wind-solar plants on degraded hill slopes along with greenbelt development will be explored. The required activities such as pre-investment studies, infrastructure development and promotional awareness generation activities will be done.

6.3.10 Maximizing solar power generation:

To the extent of solar power is used, the use of coal-based power and therefore carbon emissions will be reduced. Hence adequate incentives would be provided for the same. Under this initiative, the state will promote both solar photovoltaic as well as solar thermal. An increase in the market penetration of stand-alone solar systems for use by institutions,

communities and individuals is proposed. All the thermal power plants should be obliged to develop solar power at 1% of their power generation capacity. A range of activities – required promotional policy initiatives, survey and investigation studies to identify appropriate sites, feasibility reports, demonstration projects, awareness and capacity building, and strengthening the manufacturing base will be done. This will also consider generating solar power in the overburden dumps of open cast coal mines. All of these will lead to generating more solar power in the state.

6.3.11 Developing bio fuels:

Blending of conventional fuels with bio-fuels will lead to reduce fuel use and therefore carbon emissions. Capacity of biogas production in the state needs to be enhanced.

To enhance the capacity of generation of bio-fuel, seeds of oil bearing species like Karanja (Pongamia) and Polanga (Canophyllum Inophyllum) without compromising food production to be harvested and oil extracted prior to making them available for blending. Under this initiative, the different activities relevant to promoting establishment of more biogas plants, the supply chain for bio fuels will be done. This will include the identification of land for cultivation, building the capacity of the farmers/entrepreneurs for raising plantations, promoting the establishing of oil extracting units and linking up with the blending infrastructure.

In energy sector total 42 comprehensive list of action points have been prepared and placed at Annexure. For Preparing the climate change action plan which is presently designed to be implemented within next five years, only 10 key priority areas have been chosen. Rest of the action points shall be considered in the next phases in future based on priority level.

6.4 Fisheries and Animal Resources

6.4.1 Introduction:

Animal husbandry provides livelihood support to a large number of people living in rural areas. This promotes rural incomes and does not require much infrastructure and capital for its sustainability. The key climate-related concern is methane emissions due to livestock rearing. The livestock are largely fed through grazing, i.e. natural feeds. Given the paucity of grazing land, there is a trend towards concentrated feeds. The level of methane emissions from livestock living on concentrated feeds is significantly higher than those fed through natural grazing. Given the relatively higher global warming potential, this shift to concentrated feeds could be significant in terms of emissions. In addition, the prevailing livestock practices are such that the generation of methane emissions is not arrested. The other concern of the state is that there is a large population of unproductive livestock. Due to the religious/cultural ethos, the unproductive livestock are retained over their entire life cycle. The methane emissions from the unproductive livestock is also a concern.

Orissa is endowed with water resources in the form of reservoirs with high inland fisheries potential. There is immense potential both in closed water bodies, e.g. ponds and tanks (freshwater and brackish), as well as open water

Table 6.4: Fisheries and Animal Resources - Key Statistics

S.No.	Description / Particulars			
A	Fisheries Sector			
A1	Coastal Fisheries			
1	Coast line	480 kms		
2	Continental shelf area	24,000 Sq.kms		
3	MSY (Continental Shelf area)	160,931 Million T/annum		
4	Marine fishermen	1,73,197		
A2	Inland Fishery			
5	Culture in tank and pond	Water spread area	Production potential	Current production
		1.18 million ha	2.59 million tonnes	1.33 million tonnes
6	Total fish production of the State	2,89,210 M.T.		
7	Import	35,706 M.T.		
8	Export	81,569 M.T.		
9	Inland fishermen	6,61,477		
10	Total fishermen	8,34,674		
B	Animal Resources Sector			
1	Cattle population of Orissa	1,42,80,559		
2	Total Live stock population of Orissa	2,40,22,206		

Source: Fisheries and Animal Resources Sector

bodies like reservoirs, rivers, estuaries, lakes, lagoons, canals and swamps for sustainable and successful aquaculture. In addition, it has a 480 km coast line with potential for brackish and marine water fishery.

Fishery outputs contribute to the food and nutritional security of the coastal community. However, fish production in Orissa is among the lowest in the coastal states even though the state has immense potential. Being water dependent, the fisheries sector will be impacted by climate change.Erratic rainfall is relevant in the context of open reservoirs and ponds / tanks, where as risk in sea level and the climate-mediated hazards is relevant in the context of coastal fishing which will influence the reservoirs and impact fisheries livelihoods. The global warming can affect the spawning and breeding migration of the fish.

Key priorities identified in this sector are covered in this section.

6.4.2 Continuing ongoing programmes - vaccination, green fodder development, training / capacity building and conservation of local animals:

Climate change will have implications to the animal husbandry sector as a whole. Therefore, the ongoing programmes in animal husbandry will incorporate climate change considerations. These include (i) vaccination against contagious diseases, (ii) deworming and early disease warning system, emphasis on Green fodder, pasture development and grazing, (iii) Training on fodder production, fodder conservation, rotational grazing, Rain Water harvest technology, Methane gas harvesting technology, biogas tanks management and (iv) conservation of local hardy animals.

6.4.3 Gobar Gas tanks/packing to cylinders:

Methane from livestock is a greenhouse gas. Having a large greenhouse gas potential, capturing its release and ensuring their use will result in reducing the net emissions. Under this initiative, compressing and packing gobar gas in cylinders like CNG will be piloted and scaled up. This initiative will be taken as a collaborative initiative of the Energy Department and the other relevant agencies like OREDA, KVIC etc.

Fisheries and Animal Resources - Key Priorities

- Vaccination against contagious diseases,
- Deworming and early disease warning system, emphasis on Green fodder, pasture development and grazing,
- Training on fodder production, fodder conservation, rotational grazing, Rain Water harvest technology, Methane gas harvesting technology, biogas tanks management
- Conservation of local hardy animals.
- Gobar Gas tanks/packing to cylinders
- Easy and handy Methane Harvest at farmers point
- Enhancing Disease Early Warning Systems with climate change considerations
- Application of biotechnology and skilled animal breeding for development of better adopted species
- Capacity building of livestock keepers
- Research on disease early warning system relevant to livestock
- Impact of climate change on inland and coastal aquaculture
- Development of infrastructure for early warning systems in coastal areas for fishermen

6.4.4 Easy and handy Methane Harvest at farmers point:

Capturing methane at the point of its generation and introducing harvesting technologies involve revamping the operational practices. This needs to be done across the state. As a part of this initiative, easy and handy methane harvesting technologies and practices will be introduced on a pilot basis in selected farmer locations. Based on the experiences, plans for statewide replication would be formulated.

6.4.5 Climate linkd disease surveillance system:

Changes in climate can lead to the occurrence of new diseases for which greater vigil is required. Under this initiative, an enhanced disease early warning system will be put in place. There are several ongoing research prgrams for diseases and climate cause-effect relationship. This will be studied and examined in the context of Orissa.

6.4.6 Application of biotechnology and skilled animal breeding for development of better adapted species:

To adapt to climate-induced concerns such as disease outbreaks, there is a need develop more hardy species. Conservation of genetic pool of local hardy animals will form a part of the approach towards breeding management. Mapping and documentation of local hardy animals will form the basis for formulating the breeding strategies. Application of biotechnology and skilled animal breeding practices will also be done. All of these will constitute this initiative, which will be done in targeted areas to begin with. Based on the results, this will be expanded to other areas within the state.

6.4.7 Capacity building of livestock keepers:

In the context of climate change, a range of capacity development training would be required to re-orient livestock keepers to more responsible practices. This can be extended to other para professionals identified as critical

link in fishery and poultry sectors. The training will need to cover fodder production, fodder conservation, rotational grazing, rainwater harvest technology, methane gas harvesting technology and biogas tank management. This will be hands-on training that will also include self-execution. About 2,000 farmers will be trained every year and about 10,000 farmers over a 5-year period.

6.4.8 Research on disease early warning system relevant to livestock:

Climate change may have implications for livestock development in the state through the outbreak of diseases. To reduce the magnitude of casualties, there is a need to better understand the inter-linkage between weather / climate variations and diseases. Data will be collected, models will be developed and analysis will be made to determine the linkage. Under this initiative, a particular area will be selected for closer study / research. Based on the outcomes, the relevance of the findings will be extrapolated to across the state.

6.4.9 Impact of climate change on inland and coastal aquaculture:

State-wide management methods of marine fishery resources will have to be reviewed through a climate change lens. There is likelihood of changes in fishing grounds and migratory habits due to climate change. The hatchery would be affected due to rise in ambient temperature. Management methods need to be adapted to suit the climate- induced scenarios. Under this initiative, such a study will be done to modify and strengthen management methods.

6.4.10 Development of infrastructure for early warning systems in coastal areas for fishers:

Climate change is expected to result in more frequent and more intense coastal hazards. For the coastal fisherman, there is a need to receive information so that they can plan their fishing activities better and also take measures to protect their properties. Under this initiative, the early warning systems will be improved to safeguard their lives and properties.

6.4.11 Welfare Scheme for Coastal Fishermen:

The coastal fishermen are covered under welfare schemes like savings cum relief scheme, group insurance, housing, etc. The costal fishermen are specially covered under the Centrally Sponsored " National Scheme of Welfare of Fishermen."Awareness about existing insurance products are low and this should be addressed in a campiagn mode and new risk transfer products can be lunched in vulnerable areas.

6.5 Forestry

6.5.1 Introduction:

The State has a total recorded forest area of 58,140 sq km. Out of this, there is forest cover (above 10% canopy density) over 48,855 sq km, which is about 31 percent of the state's geographical area. It has dense forest (canopy cover more than 40%) of 28,467 sq km and open forest (canopy cover 10 to 40%) of 20,388 sq km. As is true across India, there is tremendous pressure on the forests. On the one hand, addressing climate change will add to these pressures and forest management will become a greater challenge. On the other hand, addressing climate change could also serve as an excellent opportunity to arrest forest degradation and develop more forest cover (and carbon stocks/ sinks) through protection, afforestation and reforestation measures.

Forestry sector is particularly important both from mitigation as well as adaptation perspectives. Reducing emissions from deforestation, building larger carbon stocks/ sinks through afforestation and reforestation pertain to mitigation. Planting mangroves along the coastal belts, and doing forest plantations as part of soil and water conservation in watersheds pertain to climate adaptation. Irrigation catchment area treatment including plantation, should be a priority.

Availability of funds from CAMPA has enhanced the allocation in the forest sector, which has enabled substantially larger programmes on afforestation and protection measures.

Under the NAPCC, there is a separate National Mission for a Green India. This mission recognizes that forests constitute one of the most effective carbon sinks, and also that they

Table 6.5: Forests Cover in Orissa (Area in Sq kms)

Year	Very Dense	Dense	Moderately Dense	Open	Mangrove	Total	Scrub	Tree Cover
1997		26101		20629	211	46941	5461	
1999		26073		20745	215	47033	5489	
2001		27972		20866	219	48838	5782	
2003	288		27882	20196	203	48366	5346	6381
2005	7077		21421	20257	217	48755	4797	4589
2007	7073		21394	20388	221	48855	4852	4435

Source: State of Forests Report

play an indispensable role in the preservation of ecological balance and maintenance of biodiversity. Orissa's key priorities are in line with this National Mission. The rest of this section focuses on these key priorities.

6.5.2 Increasing reforestation/ afforestation activities in degraded forest areas:

There is tremendous potential to increase the carbon stock within the state. The canopy density of open and degraded forest of about 20, 000 sq km can be increased through assisted natural regeneration. In addition, there is about 10,000 sq km of forest land devoid of any forest growth. Such land can be identified and brought under forest cover. In total, there will be reforestation/ afforestation over 30,000 sq km. In 2010, it is targeted to cover 2,500 sq km under this programme and 12,500 sq km will be covered in the next 5 years.

6.5.3 Protecting existing forest stocks to act as carbon sink with stronger conservation:

Protecting existing forest cover/carbon stocks is as important as undertaking reforestation/ afforestation. Recent Forest Survey of India (FSI) statistics revealed an increase of 100 sq km of forest cover in two years' period from 2005 to 2007. This is the result of stronger protection measures and people participation in forest conservation. These activities are to be continued with renewed vigor. All the current working plans will be revisited with a climate change lens.Emphasis will be on

Forestry - Key Priorities

- Increasing reforestation / afforestation activities in degraded forest areas
- Protecting existing forest stocks to act as carbon sink with stronger conservation
- 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
- Covering bald-hills with suitable species mix
- Increasing and protecting existing mangrove cover along the coast
- Assessing fire management strategies
- Improving tree planting and forest management to integrate with watersheds and water resources management
- Working to establish new systems to support for community users.
- Undertaking studies on indigenous trees species to assess their vulnerability to climate change
- Assessing additional threats to biodiversity and wildlife
- 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
- Monitoring carbon stock and biodiversity at regular intervals

mixed and qualitative forest, so that it will be a carbon sink and not a carbon source. Carbon accounting at the beginning and end of the plan period will be integrated. Prescriptions for increased carbon stock will be formulated with stronger protection measures and community participation.

6.5.4 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:

There is vast scope for increasing the carbon stock by increasing planting on non-forest land such as orchards, trees on farm lands, roadside plantation, canal bank and irrigation projects. In addition, there is a 480 km coast line and shelterbelt plantations can protect against storms, cyclone and shifting sand dunes along the coast. Under this initiative, tree planting on these non-forest lands will be undertaken.

6.5.5 Covering bald-hills with suitable species mix:

Scrub lands across Orissa are mostly bald-hills devoid of any appreciable forest growth. Such lands are available in Ganjam district, Koraput, Rayagada, Kalahandi, Kandhamal, Gajapati, Nayagarh, Bolangir, Khurda and others. These are very difficult sites to raise plantations. Under this initiative, 5 sq km of bald-hills will be covered each year and 25 sq. km in 5 years. However, care should be taken to discourage monoculture of species during normal and compensatory plantations.

6.5.6 Increasing and protecting existing mangrove cover along the coast:

Mangroves act as excellent barriers against climate-induced extreme weather events such as cyclonic storms. Its protective role was evident in the super cyclone of 1999. While serving as a protection to humans, this unique coastal ecosystem in itself is the most threatened because of climate change. It also acts as a carbon stock. Orissa has 221 sq km of mangrove in the districts of Kendrapada, Bhadrak, Jagatsinghpur, Balasore and Puri. Under this initiative, the area under plantation will be increased and potential mangrove areas will be protected. Mangrove seebanks will also be developed. 42 sq km of open and degraded mangrove areas will be restocked with

planting and assisted natural regeneration. With change in climate and sea salinity, there will be changes in species mix of mangroves in its habitats and it will affect the marine and terrestrial biodiversity. Undert this initiative, 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.

6.5.7 Assessing fire management strategies:

Forest fires are recognized to be a major cause of degradation of Orissa's forests even though statistical data on fire loss are weak. With the change in climate there will be increased forest fires as warmer climate means more fires, and more fires mean more greenhouse gases. It is therefore necessary to assess fire management strategies of Orissa in the face of climate change. Under this initiative, a strategy of fire forecasting, fire prevention and fire fighting will be developed. Modern technologies will be increasingly used to locate fire and in fire forecasting. Based on satellite imageries fire risk zones will be prioritized and monitored. Incentive-based community participation will be introduced.

6.5.8 Improving tree planting and forest management to integrate with watersheds and water resources management:

Climate change will make weather less predictable, rains more uncertain and heavy storm rainfalls more likely. Soil and water conservation measures in watersheds will be taken up to control runoff, to conserve water and to harvest (excess) water. Some of the measures indicated here are drainage line treatment, contour trenches, check dams, percolation tanks, planting pits, etc. in the forested areas of the State. Improved tree planting will be taken up to conserve soil and moisture.

6.5.9 Working to establish new systems to support for user community:

Climate change will be exacerbating the pressures on forest. In that context, it is required to reduce the pressures those caused communities dependance on Non -Timber Forest Produce (NTFP). Under this initiative, it is proposed to enhance capacity of communities to manage, to store under ambient conditions,

to provide institutional credit and to create alternative market options (based on market information). It is important to analyze the risk to NTFP due to climate change and sustainable risk transfer mechanism through the sustainable forest management plan.

6.5.10 Undertaking studies on indigenous tree species to assess their vulnerability to climate change:

Climate change is expected to have significant impacts on forest ecosystems. It is necessary to evaluate the long-term effects of climate change on forests and determine what to do now and in the future to respond to this threat. A high priority will be coping with and adapting to forest disturbance while maintaining the genetic diversity and resilience of forest ecosystems. Research studies to address the issues of adaptation concerning tree genotypes particularly indigenous tree species suitable to Orissa will be undertaken.

6.5.11 Assessing additional threats to biodiversity and wildlife:

Climate change poses a threat to wildlife because many species may be unable to tolerate the weather changes. Due to extreme weather conditions, there will be increased disturbance through fire and insects, reduced regeneration success and increased competition from exotics (vegetation, insects, and diseases). 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. As elephants require much larger areas of natural forest range than many other terrestrial mammals, they are often the first species to suffer the consequences of climate change. It is, therefore, proposed to maintain connectivity by linking forest fragmentations in a varied and dynamic landscape. There will be continuous monitoring of the ecosystem to determine when and what changes are occurring so as to take steps suitable for the conservation of biodiversity.

6.5.12 Obtaining access to updated knowledge on climate change science and policy developments:

Climate change is likely to impact significantly forests and forest-dependent communities. In this context, a number of management questions must be addressed, e.g., (1) What research must be done now to aid development of strategies for adapting to climate change? (2) What are the educational needs of the

forestry community to increase awareness on climate change, and to facilitate adaptation? (3) What do we need to know to evaluate forest response to climate change? (4) What forest management actions could be taken now that does not compromise future responses? (5) What barriers exist to implementing adaptation in forest management? (6) What kind of forest policies need to be in place to facilitate adaptation? (7) Are current monitoring systems adequate to spot problems induced by climate change soon enough to allow implementation of an acceptable response? (8) Which forest ecosystems and species will have to adapt autonomously and where can we intervene to assist adaptation?

To deliberate on these questions and strive to determine appropriate answers, it is necessary to sensitize the front line managers, policy makers and essentially staff at all levels of the Forest Department. This capacity building will be done to develop strategy to adapt to climate change as part of a sustainable forest management plan. This initiative will be integrated with the proposed Orissa State Forest Academy.

6.5.13 Capacity building of JFM & CFM Committees and Panchayati Raj Institutions to adapt to climate change:

The Vana Samrakhsyana Samitis and Eco-Development Committees have been empowered through Joint Forest Management Resolutions to protect forests adjoining the villages . Many of the protection, conservation and regeneration activities are being taken up through active participation of the JFM committees. The control of Non Timber Forest Produce (NTFP) has been transferred to the Panchayats. They are expected to play a larger role in value addition, marketing and employment generation in this sector. To integrate climate change considerations, it is required to sensitize and build capacity of JFM committees and Panchayati Raj Institutions. Under this initiative, a series of trainings and awareness generation programmes will be undertaken. Whereever voluntary initiatives to protect forests exists those would be recognised and strengthened.

6.5.14 Monitoring carbon stock and biodiversity at regular intervals:

Monitoring of carbon stock and biodiversity at regular intervals is necessary to gauge the success of the various programmes implemented. 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.

6.6 Health

6.6.1 Introduction:

Climate change will cause a range of adverse impact on human health .These include morbidity and mortality due to increased heat, air pollution effects, impacts of post-extreme events, malnutrition, water-borne diseases such as diarrhoea, cholera, typhoid and gastroenteritis, and vector-borne diseases such as malaria and dengue. Orissa has already a combination of all of these human health-related issues. And, climate change is likely to exacerbate them. Changes in temperature and rainfall are likely to change disease patterns of the vector borne diseases such as malaria and dengue fever. Food production may be adversely affected and create pockets of hunger and malnutrition. With the likely increase in the intensity and frequency of extreme weather events, there may be significant post-event human health issues to reckon. Though the NAPCC does not identify human health as a separate National Mission, GoO will focus on climate change implications on human health. Key priorities have been identified and are briefly described in this section.

Table 6.6: Health Sector in Orissa - Vital Statistics

S.No.	Indicator description	Data
1	Crude Birth Rate (2004-SRS)	22.7 per 1000 population
2	Crude Death Rate (2004-RS)	9.6 per 1000 population
3	Infant Mortality rate (NFHS-3)	65 per 1000 live birth
4	Infant Mortality Rate (Urban)	40 per 1000 live birth
5	Infant Mortality Rate (Rural)	69 per 1000 live birth
6	Natural Growth Rate (2004-SRS)	13.1%
7	Total Fertility Rate (NFHS-3)	2.4
8	Couple Protection Rate (NFHS-3)	50.7%
9	Life Expectancy at Birth (1996-2001)	61.64 years
10	Maternal Mortality Rate (2004-SRS)	358 per 1,00,000 live births
11	Perinatal Mortality Rate (1997-SRS)	65.3 per 1000 live & still births
12	Crude Birth Rate (2004-SRS)	22.7 per 1000 population

Source: Department of Health & Family Welfare, Government of Orissa Website, 2010

6.6.2 Capacity Building to meet the challenges of climate change on both adaptation and mitigation aspects:

Climate change interlelationship in health sector is a new area. There is a need to build capacity within the health sector institutions on both mitigation and adaptation aspects. As the implications of climate change on health is expected to be widespread, strengthening awareness, knowledge and skills at all levels across the state will be required. This capacity building initiative will work towards this goal.

Advocacy and sensitization of policy makers, massive general awareness campaigns, sensitization of the health service providers (ANMs, ASHA, AYUSH, Doctors, AWW), strengthening the curriculum of ANMs, Health workers & Paramedic staff, recognizing gender issues, promoting health insurance for vulnerable groups, strengthening community resilience and enhancing psychological aid to disaster victims would be part of this exercise.

6.6.3 Integrating climate change considerations in the State Health Policy:

Health impacts due to climate change are presently not included in the State Health Policy. This policy should include climate change implications on health such as occupational health and vector biology. Once the integration is done at the policy level, it will be easier to integrate those at the programmatic and other operating levels.

6.6.4 Strengthening approaches to manage vector borne disease that have worsened due to climate change impacts:

Under the Dept. of Health and Family Welfare, a

Health - Key Priorities

- Capacity Building of the health sector on climate change
- Integrating climate change considerations in the State Health policy
- Strengthening approaches to manage vector borne disease that have worsened due to climate change impacts
- Strengthening approaches to deal with heat wave conditions exacerbated due to climate change
- Strengthening approaches to deal with the physical and psychological impacts due to extreme weather conditions caused by climate change
- Addressing drought, nutrition & food security due to increased risk of drought, consequent decline in agriculture and increased malnutrition & food security
- Undertaking measures to manage water borne disease that have worsened due to climate change impacts
- Research & studies on climate change and health impacts
- Addressing food safety that is undermined as a result of increased ambient temperatures and extreme events
- Studying the interlinkages between air quality and climate change, and implications on health

network has been established for the control of vector borne diseases. Due to climate change, incidents of vector borne diseases are likely to increase and so is the spread. Therefore, the present set-up is required to be strengthened with better surveillance, better diagnosis and control of vectors with a particular focus on vulnerable groups.

6.6.5 Strengthening approaches to deal with heat wave conditions exacerbated due to climate change:

The rise in temperature due to climate change is likely to make more intense the heat wave conditions during the summers. Heat waves pose risk of deaths, disease and injury. The risk to vulnerable groups such as infants, elderly, pregnant women, disabled, farm labourers and industrial & construction workers are expected to be very high. There has to be an organized approach for sensitization and awareness. Strengthening the existing facilities and infrastructure for managing health impacts due to heat waves is also required. Under this initiative, all of these will be implemented.

6.6.6 Strengthening approaches to deal with the physical and psychological impacts due to extreme weather conditions caused by climate change:

The extreme weather events are becoming more frequent, intense and widespread, resulting in physical and mental health impacts. At present, Orissa State Disaster Management Authority (OSDMA) is the nodal agency to respond to the situation. The present infrastructure needs to be strengthened. A medical wing will be established and strengthened to demonstrate an integrated approach for responding to natural disasters. Actions such as community resilience and disaster preparedness, strengthening psychological aid to victims, strengthening surveillance including traditional knowledge and cultural norms will be undertaken.

6.6.7 Addressing increased drought, malnutrition & food security issues due to climate change:

Climate variations are expected to create drought conditions. This may lead to the consequent decline in agriculture and increased malnutrition & food security. With the increased impacts due to climate change, it will be required to develop strategies to improve nutritional status of vulnerable population. Monitoring and managing migration and psychological impacts of food security on vulnerable rural population will also be required. These will be done under this initiative.

6.6.8 Undertaking measures to manage water borne disease that have worsened due to climate change impacts:

Water borne diseases such as diarrhea, cholera and leptospirosis are likely to increase due

to climate change. Further institutional strengthening is required through prevention, better management and improved surveillance. This initiative will lead to reduce the incidents of water-borne diseases.

6.6.9 Research & studies on climate change and health impacts:

To strengthen the understanding of the health impacts due to climate change, further inter disciplinary research is required. Collaborative research studies are required for linking vector biology, agriculture, air quality, etc. with human health. Research studies will be undertaken on a variety of subjects that include links between heat waves and health, compilation of best practices in a disaster context, using traditional knowledge and cultural norms, and reducing the burden of vector-borne diseases in the context of climate change. A research centre will be established under this initiative.

6.6.10 Addressing food safety due to climate-induced changes:

Food safety is another challenge related to climate change that needs to be addressed. Clear guidelines available in the state on food safety is required to be revisited. Under this initiative, a mechanism to strengthen food safety including safe drinking water will be undertaken.

6.6.11 Studying the interlinkages between air quality and climate change, and implications on health:

There is a strong linkage among air quality, human health and climate change. Strengthening the monitoring and evaluation of health impacts of air quality will be done under this initiative.

6.7 Industry

6.7.1 Introduction:

Being a mineral rich state, industrial development is oriented towards metallurgical and other metal-based industries. As these are energy-intensive, coal-based thermal power generation tends to be an integral part of industrial development. Given climate change, industrial development is required to explore ways of reducing greenhouse gas/ carbon emissions (mitigation) and, at the same time, be equipped to cope with climate change impacts (adaptation). In its current stage of industrial development, Orissa will work towards achieving both carbon-conscious and climate-resilient industrial development. The transition to address these climate change concerns will be made in a smooth and effective manner. As climate change is a relatively new challenge, substantive capacity building and institutional re-alignment will be required. In developing the key priorities, these three broader goals :(i) reducing emissions/mitigation without compromising industrial growth, (ii)developing climate-resilient industrial systems and (iii)building capacity as well as realigning institutions – were kept in view. In addition, consistency with the various missions under the NAPCC was also ensured. Key priorities of this sector constitute the rest of this section.

Table 6.7: Profile of Industry in Orissa

S.No.	Sector	No. of Industries			
		Large	Medium	Small	Total
1.	Iron & Steel	99	69	25	193
2.	Aluminum	2	-	-	2
3.	Pulp & Paper	4	2	-	6
4.	Sugar	4	1	-	5
5.	Fertilizer	2	1	-	3
6.	Thermal Power	10	-	-	10
7.	Cement	7	2	1	10
8.	Fermentation Industries	4	7	1	12
9.	Chemical Industries	1	2	3	6
10.	Mineral Processing and Crushers	15	116	1042	1,173
11.	Food Processing and Allied Industries	1	83	273	357
12.	Refractory/ Bricks/Tiles	2	22	254	278
13.	Other Industries	17	74	493	584
	Total:	167	471	2116	2754

Source: State of the Environment Report, 2006

6.7.2 Integrating climate concerns in policies and plans:

To achieve climate-friendly industrial development, institutional re-alignment is required. As a first step, the two key industrial polices – Industrial Policy Resolution and the

MSME Framework Development Policy have to integrate climate change considerations. Under this initiative, policies will be reviewed to determine how emission reduction can be achieved and climate-resilience be emphasized. Following the usual GoO processes, these policies will be revised and finalized. Scarcity value should be reflected in water allocation and water charge that will prompt water use efficiency. Water allocation between large industries and MSME should take into consideration, employment generation potential by these two sectors.Environmental clearance condition should be in the public domain that will be not generic but in clear terms. Assessment of land and water should be made by an expert agency while granting clearance.

There are other policies and frameworks like SEZ policy, PCPIR framework which are also required to be looked through the lens of climate change policies and thus need reorientation. The first step in integrating climate concerns is preparation of state level baselines and policy goals. This is a critical activity and many cross-cutting issues will emerge particularly with mines, energy, water, forest and general administration.

6.7.3 Assessing GHG profiles of major industrial clusters:

Reducing carbon emissions requires a good baseline data/information about current level of emission. For this purpose, carbon inventories or GHG profiling is the first step. Under this initiative, particular industrial clusters will be selected, an appropriate institute will be identified and GHG profile reports will be prepared in line with the best international practices. Based on this profiling, a system of GHG auditing will also be introduced. This GHG profile reports will assist in understanding industrial performance on carbon emission intensities vis-à-vis international best practices. The GHG profile will be an important input for policy making and monitoring performance of the industrial clusters with respect to carbon efficiency. The next logical step will be to institute a system of continuous carbon audit procedure to track the carbon footprint of industrial system in the state.

Industry - Key Priorities

- Integrating climate concerns in policies and plans
- Assessing GHG profiles of major industrial clusters
- Conducting heat-island study for Talcher and Jharsuguda area
- Training various stakeholders on climate change issues
- Implementing a system of compensatory water harvesting
- Streamlining institutional arrangement and strengthen OSDMA to tackle extreme climate events in coastal area
- Carrying out energy efficiency studies
- Promoting recovery, recycle and reuse of waste material
- Setting emission standards for thermal power plants

6.7.4 Conducting heat-island study for Talcher-Angul and Jharsuguda area:

There is a perception that Talcher-Angul and Jharsuguda area are becoming hotter every passing year. It is also believed that since large coal mines, thermal power plants and metallurgical industries are in operation a good amount of heat is generated causing a heat island. Climate change and the associated temperature increase are likely to worsen the situation. In this context, a research study will be undertaken to identify the cause of the high temperatures, the various contributing factors and what measures can be taken to reduce the prevailing heat levels. The study can also suggest various location specific adaptive measures.

6.7.5 Training various stakeholders on climate change issues:

Capacity building on climate change is of paramount importance. This needs to cover both general as well as specific climate change concerns. This should also include how carbon emissions can be cut without compromising on industrial outputs and how climate proofing or building resilience can be achieved. Training on climate change issues needs to reach all organizations involved with promoting industrial development and industrial enterprises in the large, medium and small-scale sectors. The activity includes identifying training needs of

various stakeholders, designing the training modules, networking with local institutions.

6.7.6 Implementing a system of compensatory water harvesting:

Climate change is expected to induce uncertain monsoons and therefore water availability will become an issue. With the rapid industrial development, water has already become a constraint in certain industrial areas. Due to climate change, this may worsen.Creation of water bodies will be insisted upon while giving clearances to industries and mines. In consultation with stakeholders, a mechanism will be devised to encourage compensatory water harvesting and storage around industries/ industrial clusters. This mechanism will look for investment coming from industrial sectors to create rainwater harvesting & storage, ground water recharging & storage facilities and associated infrastructure within and around plants. This adaptation measure will benefit the industries as well as the surrounding areas by providing water security.

6.7.7 Streamlining institutional arrangement and strengthen OSDMA to tackle extreme climate events in coastal area:

Coastal industrial infrastructure, assets and people need to be protected from climate-induced extreme weather events. In addition, these extreme weather events could also lead to industrial disasters for which better preparedness is required within the state. This is particularly relevant for Paradeep, Dhamra and Gopalpur. OSDMA is the nodal agency, which coordinates disaster management. However, managing industrial disaster requires different kinds of skill and equipment. Thus, capacity building and skill up-gradation in OSDMA for addressing industrial disasters is an important activity. Under this initiative, streamlining of institutional arrangements and strengthening OSDMA to tackle these issues will be undertaken.

6.7.8 Carrying out energy efficiency studies:

Reducing carbon emissions by promoting energy efficiency is a viable proposition for industrial enterprises as reduced energy consumption implies financial savings. The major industrial activities in the state are highly energy intensive; iron and steel, aluminum, ferro-alloys, cement and paper are the sectors, which have been identified by IPCC as some of the most energy intensive sectors. Even though this is the case, industrial enterprises do not often strive to ensure high levels of energy efficiency. There seem to be a lot of potential for augmenting energy efficiency in these sectors. Under this initiative, studies will be undertaken to encourage energy intensive industries such as; aluminum, ferro-alloys, cement, pulp and paper, integrated steel plants and sponge iron plants to adopt energy efficient practices. In particular, the recovery and use of waste heat will be explored. Through these studies, it is envisaged that best practices will be implemented in the iron and steel, aluminum and cement industries in Orissa.

6.7.9 Promoting recovery, recycle and reuse of waste material:

Coal-based thermal power plants generate ash and sponge iron plants generate char. The reuse of this bulk material offers a win-win solution. The waste that pollutes is fixed into an application and the energy required to produce the alternative material is saved. In addition relieves the land which otherwise would have been used for dumping causing environmental pollution in the locality. Under this initiative, a range of activities that include enabling policies, conducting studies, carrying out demonstration projects and promoting investments will be done.

6.7.10 Setting emission targets for thermal power plants:

Coal-based thermal power plants are the largest contributor of carbon dioxide emissions. Establishing emission targets for thermal power plants and directing these plants to meet these targets will be done under this initiative. With the focus on thermal power plants, this initiative will also have a bearing on major source of particulate emissions, which create serious local environmental impacts. Care shall be taken that the process of setting targets will be in line with the national policy in this respect.

6.8 Mining

6.8.1 Introduction:

Mining is a major activity in some of the districts of Orissa and contributes significantly (8-10 % of GDP) to the state's economic development. The state has rich deposits of coal, bauxite, chromite, iron ore, manganese ore, dolomite, limestone and mineral sands. These deposits of certain minerals constitute a significant portion of the total deposits of the country. While mining activities commenced more than a 100 years back, there has been unprecedented growth in recent times, particularly in bauxite, chromite, iron ore and coal. Mining in Orissa has serious local environmental impacts. This includes the air pollution impacts (particulates), water pollution (mine water discharges), social impacts (displacement and rehabilitation) and forest impacts (part of the mining area is in the forests or in the vicinity). Therefore, mining is highly regulated sector on environmental front but enforcement of the regulations is an important issue. Mining is also a contributor to global greenhouse gas emissions. There are various initiatives planned to mitigate as well as to adapt to climate change. All these initiatives pertain to three goals: (i)emission reduction, (ii)capacity-building and (iii) adaptation measures. The key priorities in this sector constitute the rest of this section.

Table 6.8: Mineral Resources of Orissa

Sl.No.	Mineral	Resources (Metric Tonnes)
1.	Bauxite	1,819.7
2.	China Clay	313.9
3.	Chromite	173.8
4.	Coal	65,226.7
5.	Dolomite	330.9
6.	Fireclay	175.5
7.	Base Metal	4.9
8.	Graphite	4.4
9.	Iron Ore	5,153.3
10.	Limestone	1,007.2
11.	Managanese	119.8
12.	Mineral Sand	226.2
13.	Pyrophylite	8.3
14.	Quartz	70.3
15.	Vanadium	2.5

Source: Department of Steel & Mines, 2009

6.8.2 Incorporating climate concerns in the State Mineral Policy:

The State Mineral Policy provides the guidance and direction to realizing the enormous mineral development potential. Augmenting the mineral resource and using the identified

resources in a sustainable manner are a part of the policy. Given the nature and scale of the climate change threat, it is required to review the Mineral policy in the context of climate change concerns. The state Mineral policy will be revised to incorporate and integrate climate change considerations. In line with the Green India Missions and environmental regulations under EP Act, 1986. Enrichment of environment should be the 1st priority for the funds availability under schemes like CAMPA. Forest diversion and plantation area shall be put in public domain to ensure transparency and accountability.The implementation of the revised policy will ensure tracking of the greenhouse gas emissions from this sector.

6.8.3 Analyzing appropriate policies to promote energy-efficiency:

Mining processes and mineral transportation require energy. Its use can be made more efficient. In order to move this sector into an energy-efficiency path, new economic / policy instruments are required to encourage efficient energy use. A research study will be carried out to determine what kind of economic/policy instruments will be appropriate in the Orissa context.

Mining - Key Priorities

- Incorporating climate concerns in State Mineral Policy
- Analyzing appropriate policies to promote energy-efficiency
- Realizing the potential of low-grade mineral beneficiation
- Strengthening environmental monitoring
- Protecting water bodies
- Expanding and maintaining green zones
- Building capacity and generating awareness
- Realizing energy-savings potential in mining

6.8.4 Realizing the potential of low-grade mineral beneficiation:

There is a lot of potential in the beneficiation of low grade iron ore, manganese, graphite and chrome ore, which is currently not being utilized. A research study will be carried to identify the potential across the various minerals and to propose methods/approaches to realize this potential.

6.8.5 Strengthening environmental monitoring:

Mining is confronted with serious local environmental challenges. Monitoring of environmental parameters - both local and global pollutants – is required. Presently, the monitoring systems are not robust enough. To improve environmental monitoring, particular mining clusters will be identified and a robust environmental monitoring system will be established. Based on the monitoring results, appropriate modifications will be made in these clusters and climate change abatement measures will be initiated.The Goverment may even allocate areas under CAMPA scheme on a pilot basis to mining companies with adequate monitoring mechanisms to hold them accountable for results. State can also scrutinize EIA's through independent experts/ agencies.

6.8.6 Protecting water bodies:

Water resources will be affected due to climate change. Mining causes substantive silting that affects water bodies such as water harvesting structures, reservoirs and weirs. These need to be protected. Particular water bodies in the mining intensive areas will be identified and protection measures will be taken up. Water pollution and capacity reduction will be arrested. These water bodies will be restored as a climate change adaptation measure.

6.8.7 Expanding and maintaining green zones:

Creation and maintenance of green zones in major mining clusters is a regular activity that will be further enhanced. These green zones will serve as additional carbon sinks and also contribute towards building local environmental benefits.

6.8.8 Building capacity and generating awareness:

This will be given paramount importance. Integration of climate change in mining can only be achieved through substantive capacity building. Training on the Clean Development Mechanism, cleaner production/low carbon/ efficient technologies and climate abatement measures will be organized both within the GoO (Steel & Mines, Directorate of Mines and State Pollution Control Board) and with the associated stakeholders (Indian Bureau of Mines and Mining lease holders). Constant vigil should be there to prevent overstepping by vested interests.

6.8.9 Realizing energy-savings potential in mining operations:

There are different processes within the mining operations. Some of these are energy-intensive processes. In these processes, the energy savings potential is large. As a first step, a research study will be conducted to determine the particular processes within mining operations that should be targeted for realizing the energy-savings potential.

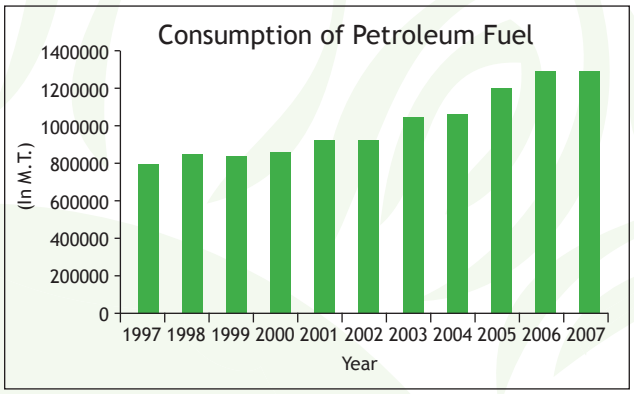
6.9 Transport

6.9.1 Introduction:

The transport sector contributes about 7% of the total Green House Gas Emission in the country (Natcom 2007).With greater economic growth and rapid urbanization, there is a constant increase in the number of transport vehicles, which leads to greater use of fossil fuel and more GHG emissions. If current rate of urbanization and motorization continues, GHG emissions could grow to about 8 times the current level by 2030.

Similar situation prevails in the Orissa context. The public transport system is inadequate. The increasing middle income population is resorting to private motorized transport. With greater availability of low cost vehicles, the numbers are growing – growth is highest in Cuttack - and so is the fuel consumption. And, there is a commensurate increase in the emissions from the transport sector. Apart from inadequate public transport, Orissa is largely dependent on the road network that is comparatively less GHG or carbon friendly among the different modes of transport. About 18,000 km of national highways, state highways, major district roads and other district roads cater to the transportation needs of the state. The railways network within the state is below the national average, i.e. an average railway route length of 15.03 km per

Table 6.9: Transport - Consumption of Petroleum Fuel in Orissa



1000 sq km as against National average of 19.0 km per 1000 sq km. Less railway network implies more pressure on the road infrastructure. Being on the coast, Orissa handles materials through its ports. The largest is the Paradip port, which handles about 57 MT annually. Substantial part of export/import cargo move by road. In addition, the people of Orissa tend to assign a poor social image/status for using public transport and non-motorized transport, both of which are vitally important in the context of responding to climate change.

At the national level, there are policies that encourage the move towards a more climate responsible transport sector. The Auto Fuel Policy (2003) encourages the use of CNG/LNG in cities affected by high motor vehicle pollution. The Integrated Transport Policy (2001) promotes

Transport - Key Priorities

- Revising state transport policies
- Integrating urban and transport planning
- Enhancing the use of rail
- Moving towards low carbon fuel
- Piloting low carbon, green highways
- Encouraging fuel use efficiency and tightening enforcement
- Promoting non-motorized transport
- Sequestering carbon through avenue plantations
- Estimating carbon emissions from the sector
- Developing inland waterways

the use of ethanol-blended petrol and bio-diesel as long as the later does not compete with food chain. Under the NAPCC, the National Mission on Sustainable Habitat suggests a future focus on strengthening the enforcement of vehicle fuel economy standards, and using pricing measures to encourage the purchase of efficient vehicles and incentives for the use of public transportation. Also, better urban planning like densification of central business districts and modal shift to public transport have been emphasized. The National Urban Transport Policy emphasizes the development and usage of extensive public transport facilities (including non-motorized modes) over personal vehicles. All of these were considered in formulating the key priorities in the transport sector in Orissa.

6.9.2 Revising state transport policies:

State Transport Policy of Orissa 2007 is the guiding policy document that aims at efficient, transparent and modernized transport administration and management system for both freight and passenger movement in the state. In addition, Orissa has the Boat policy that addresses inland waterways transport. Incorporating climate change considerations in these policies is essential in order to have a tangible, consistent and sustainable response. Better management of transport demand, increased public transportation, encouraging cleaner technology and promoting non-motorized transport are elements that need to be incorporated in these policies. Further initiatives to reduce emissions will be taken for phasing out old commercial vehicles of more than 15 years. This will be undertaken as a policy initiative.

6.9.3 Integrating urban and transport planning:

Effective transport planning requires better transport demand management. And, the integration of urban development and land use planning with transport planning is the first step. Making this integrated approach operational is a challenge that will be addressed as part of the integrated transport policy.

6.9.4 Enhancing the use of rail:

From a climate perspective, the use of rail more rewarding. Freight transport through rail requires to be encouraged further. Specific geographical areas within the state will be identified, the feasibility of using rail more effectively will be explored, policies will be formulated and implemented. Movement of bulk and dirty cargo like ores and minerals should only be done by rail. In addition, the introduction of Mass Rapid Transport Systems (MRTS) in suburban areas will be a priority. The preparation of DPR for the identified stretch between Greater Bhubaneswar and Cuttack will be initiated.

6.9.5 Moving towards low carbon fuels:

Switching to alternate fuel such as Compressed Natural Gas (CNG) from the conventional fuel requires close coordination and interactions with the Central Government. Background studies will be conducted to prepare a case for

greater access to alternate fuels. In addition, blending of conventional fuel with bio-fuels will also be explored through research studies and demonstration projects. Plantation options will be considered and blended fuel shall be first introduced in the State Corporation buses.

6.9.6 Piloting low carbon, green highways:

At present, Orissa is largely dependent on its road network to meet its transportation needs. This scenario is unlikely to change in the near future. In this context, constructing and maintaining its roads in a more climate responsible way will be piloted to determine its viability and potential for replication. Selected road stretches will be identified, even pilot parties who provide adequate bank guarantee to carry out such pilots in PPP mode can be encouraged. Feasibility studies conducted for the use of cleaner technologies, detailed designs and approaches planned and implemented. Throughout the pilot implementation, carbon emissions will be monitored and tracked. Using this implementation experience, plans will be made for its further expansion.

6.9.7 Encouraging fuel use efficiency and tightening enforcement:

There is potential for improving fuel use efficiency through better driver training. Though the public road transportation is limited within the state, adoption of better practices will be first introduced, tested and monitored here. Based on the experience, plans will be made to advise and influence the private operators to improve their practices as well. Drivers Training Institutes and Heavy Vehicle Training Institute can take the lead in this regard. Given that it is a win-win situation, there will be a strong buy-in from the private operators as well. This will be supplemented by building the capacity of the enforcement wing for emission level check up. Training modules will be developed and enforcement officers will be trained as a part of this capacity building initiative. In addition, a survey of ambient air quality in selected locations in particular towns and cities will be undertaken. This will focus not only on determining the linkages between the increase in road transportation and deteriorating urban air quality but also improvements in air quality due to ameliorative activities. Phasing out of old commercial vehicles may be expedited.

6.9.8 Promoting non-motorized transport:

With greater focus on motorized transport, pedestrians in urban areas are getting more sidelined. This is particularly true in crowded local areas in the cities of Bhubaneswar and Cuttack. As a demonstration initiative, a particular area in Bhubaneswar will be selected and a pilot scheme will be implemented to promote non-motorized transport(especially pedestrain walkway and cycle paths are to be taken up with all seriousness). Using the experience gained, plans to promote and expand the concept of non-motorized transport will be made.

6.9.9 Sequestering carbon through avenue plantations:

Roadside avenue plantations can be gainfully used to sequester carbon. These also provide tremendous local benefits by protecting road users from the oppressive heat particularly in the summer months. Particular road stretches will be identified, plantation species will be selected that bring both local and sequestration benefits, and plantations will be undertaken. Based on this demonstration initiative, a plantation plan for the entire state will be developed.

6.9.10 Assessment of carbon emissions from the sector:

Presently, there is no overall assessment of the carbon emissions from the transport sector in Orissa. It is only extrapolated that the growing

increase of vehicle population is resulting in greater fossil fuel use and therefore more carbon emissions. A study will be commissioned in order to better assess and establish a baseline. Also, this study will include the potential of modal shifts and other transport options to reduce the carbon emissions.

4.9.11 Developing Inland waterways:

Presently inland water transport system in Orissa is confined to passenger lunch services operating in sectors like Chandabali (47 km), Chilika (33 km) and Astaranga (20 km). The inland water transport system will reduce carbon emission while providing transport services to the inhabitants of inaccessible riverine areas. Major river stretches in the State having potential for expansion of inland water transport systems can be identified. Like the National Waterways 5 (NW5), the GoO shall undertake studies to identify State Waterways to develop an inland water transport corridor in order to increase their cargo transportation potential.

6.10 Urban Planning

6.10.1 Introduction:

Urbanization is recognized as one of the engines of economic growth and is seen as an indicator of development. On the other side, urbanization has its own challenges particularly the local environmental concerns / issues. Typical urban locations comprise relatively small geographical units that are highly energy intensive, generate large quantities of waste (both liquid and solid) and tend to become heat islands.

As is true for the rest of India, there has been a constant need to keep pace with the growing demands of the urban sector in Orissa as well. Effective and adequate steps are required for efficient management & delivery of basic urban services like provision of safe drinking water, sanitation, roads, solid waste management and housing. In terms of reform and its implementation, the 74th Constitutional Amendment of the 1990s empowered the Urban Local Bodies (ULBs) to function as local self-government. Building the capacity of these ULBs is also one of the challenges being presently dealt with.

In percentage terms, the population living in urban areas in Orissa is significantly lower than the national averages. Therefore, Orissa is in a unique position to chart out an urban development path that learns from the mistakes/ experiences of other Indian cities (particularly the metropolitan cities) and also other international cities that are confronted with similar urban challenges. Given the climate change dimension, Orissa can go further by defining a climate-responsible urban development path. Such a path will include initiatives such as (i) promoting energy-efficiency in urban living/lifestyles, (ii)

Table 6.10: Urban Profile of Orissa

S.No.	Title / Description	Particular Data / Information	
1	Urban Local Bodies - Profile	Notified Area Councils (NACs): 63 Municipalities: 37 Municipal Corporations: 3	
2	Urban share of the population	Previous (1941) 3%	Last Census (2001) 14.95%
3	Urban centres - Growth	Previous (1951) 39 nos.	Last Census (2001) 138 nos.
4	Most Urbanized districts (% Urban Population)	Khordha (42.93%) Jharsuguda (36.40%) Sundargarh (34.38%)	
5	Least Urbanized Districts	Nayagarh (4.29%) Jajpur (4.49%) Boudh (4.82%) Nuapada (5.66%)	

Source: Housing & Urban Development Department

Urban - Key Priorities

- Building capacity on climate change
- Incorporate climate considerations in water supply and sewerage design
- Working towards greater water-efficiency
- Preparing a climate-friendly MSW management plan
- Orienting towards energy-efficient street lighting through CDM
- Developing a climate-responsible master plans
- Strengthening infrastructure for promoting non-motorized transport
- Improvements to water harvesting in urban areas with restoration of water tanks and artificial recharge
- Developing models of urban storm water flows and capacities of existing drainage systems with climate change

maintaining natural drainage channels, banning land use along riversides and wetlands, (iii) protecting urban wetlands and water bodies, (iv) block plantation to act as cities lungs,(v) roof top water harvesting, (vi) forming of green and energy efficient buildings has to be ensured by Devlopment Authorities during approval of plans. The key priorities of urban sector are covered in the rest of this section.

6.10.2 Building capacity on climate change:

Climate change is a new challenge confronting the urban sector. There is a need to orient and sensitize the stakeholders at all levels of the Urban Local Bodies. Building their capacity is vital to take the initiatives that lead to climate change abatement. At the outset, a training need assessment will be done and different training modules will be designed based on the outcomes. These training programmes will be conducted and all of these will have a practical orientation with field / exposure visits. This capacity-building initiative will set the foundation for further initiatives in the urban sector.

6.10.3 Incorporating climate considerations in water supply and sewerage design:

One of the key activities in the urban sector is the provision of water supply and sewerage services. It is required to better understand and appreciate how the planning, design and implementation of these services will modify due to climate change. These could include the use of more energy-efficient technologies and better provision for dealing with climate impacts such as flash floods. A research study will be done to develop a model climate-friendly water supply and sewerage design, plan and scheme.

6.10.4 Working towards greater water-efficiency:

Variations in water availability are likely to be single largest impact due to climate change. The urban sector is a large water consumer. There is potential to reduce water losses and to promote water conservation measures. A study will be undertaken to determine the extent of these losses within cities / towns and also to identify particular actions that needs to be promoted to reduce these losses. Installation of water meters will be initiated in a phased manner to promote better monitoring and use.

6.10.5 Preparing a climate-friendly MSW management plan:

Yet another key activity in the urban sector is the provision of MSW management services. Here again, it is required to better understand and appreciate how the planning, design and implementation of these services will modify due to climate change. On the one hand, municipal solid waste generates methane emissions, a greenhouse gas. On the other hand, municipal solid waste treatment can be used to generate methane as a non-conventional energy source.

All of these aspects will need to be considered and an ideal climate-friendly MSW management plan will be developed. This plan will also include a pre-investment study and lead to a demonstration project in a selected city / town where the climate-friendly plan will be piloted. Based on the implementation experience of the pilot, scaling-up to a state-level will be done.

6.10.6 Orienting towards energy-efficient street lighting through CDM:

Initiatives to promote energy-efficient street lights undertaken across the country. Many of these initiatives are also taken up using the Clean Development Mechanism (CDM) as a financing option. In Orissa as well, this will be promoted as a public-private partnership on a pilot basis in selected urban areas. CDM as a financing option will be explored. Once established and proven, a plan to scale-up the public-private partnership and CDM approach to energy-efficient street lighting across the state will be developed.

6.10.7 Developing a climate-responsible master plan:

Master Plans and Comprehensive Development Plans (CDPs) need to incorporate climate change considerations. Being a new area, there is a need to prepare and implement such a climate-responsible plan for a selected city. Based on the experience, the approach of preparing climate-responsible plans will be made standard across the state. The plan should contain city compensatory plantation ensuring at least 30% of the area with green cover with suitable tree species. Wetlands and discharge areas to be protected in the city from encroachment.

6.10.8 Strengthening infrastructure for promoting non-motorized transport:

Promotion of non-motorized transport is a climate-friendly initiative that requires urban infrastructure development. Whereas the Transport sector will work on the traffic management aspects pertaining to non-motorized transport, this initiative will focus on (i) policies required to promote non-motorized transport including how this can be incentivized, and (ii) building the infrastructure in a particular area in Bhubaneswar to test how non-motorized transport can be promoted in practice.

6.10.9 Improvements to water harvesting in urban areas with restoration of water tanks and artificial recharge:

Variability of the rainfall/monsoons due to climate change is likely to bring about water supply shortages. These will lead to urban areas not having enough water. Under this initiative, conservation of water will be undertaken improving water harvesting mechanisms in the cities/towns. Existing water reservoirs/tanks will be surveyed, few of these will be selected, plans for their renovations with improved water harvesting will be prepared and implementation of these plans will be undertaken.

6.10.10 Developing models of urban storm water flows and capacities of existing drainage systems with climate change:

Climate change can cause sudden and heavy precipitation that will result in flash floods and flooding of low lying areas. In this context, it is required to be better prepared through modeling of storm water flows in a climate-induced scenario and assessing the capacities of existing drainage systems to cope with this change. As a pilot, the city of Cuttack will be chosen, as this city has always been encountering frequent flash floods and water logging. Storm water flows will be projected and the capacity of the existing drainage system will be assessed. Based on the outcome, a model for a long-term sustainable drainage system will be developed and implemented.

6.11 Water Resources

6.11.1 Introduction:

Impact of climate change on water resources is likely to be due to erratic monsoons creating variability in river flows and increased frequency / intensity in extreme events such as floods, droughts and cyclones. Further research and studies are required for a realistic assessment of climate change impacts. This will have to be done at the state level and basin level. However, at the same time, conservation of water resources, adoption of better management practices with emphasis on optimal utilization and increase in water use efficiency requires to be implemented. Apart from being climate change adaptation measures, these will constitute good water resource management. River basin approach at short intervals and assessment of water balances in every river basin should be integral part of IWRM.

Under the NAPCC, a National Water Mission was established. This Mission will ensure integrated water resource management to conserve water, minimize wastage and ensure more equitable distribution both across and within states. Basin level management strategies will be reconsidered to deal with variability in rainfall and water flows. The Mission will seek to optimize the efficiency of existing irrigation systems, including rehabilitation of systems that have been run down and also expand irrigation, where feasible, with a special effort to increase storage capacity. The Mission will also establish a framework to increase water use efficiency by about 20 percent. There will be initiatives to reduce fresh water use in urban areas and work towards providing alternative sources to meet the water requirements for coastal cities. Most of the initiatives under the National Water Mission fall under the purview of the State Governments. Therefore, it is important that the key priorities undertaken by the State are consistent with those included in the National Water Mission.

The key priorities in the Water Resources sector constitute the rest of this section.

Table 6.11: Water - Key Statistics

S.No.	Description	India	Orissa
1	Annual precipitation	4,000 BCM	230.76 BCM
2	Average annual water resources	1,869 BCM	141.41 BCM
3	Utilizable water resources (surface & ground)	1,122 BCM	108.15 BCM
4	Utilizable resources (% of precipitation)	28%	46.7%
5	Per capita water availability	1,820 cu.m	3,359 cu.m.

Source: Department of Water Resources, Annual Activities Report, 2008-2009

6.11.2 Expansion of hydrometry network:

Data pertaining to water resources becomes even more important as variations in availability are caused due to climate change. This will provide a better assessment of water availability and extreme events and information for effective water resource planning. The state's Hydrometry Directorate functions as the data centre for surface water. Under this capacity building initiative, selected locations will be identified and hydromet stations installed to expand the hydrometry network. This network will process raw data received from its own and other sources to provide for analysis by different users. It is envisaged that the expanded hydrometry network will be made functional in the next 5 years. There will be efforts to encourage community participation in this exercise to enhance awareness level.

6.11.3 Development of flood forecasting models:

One of the climate change impacts is floods. For flood forecasting, models are required to assist in preparedness and response actions. Under this research initiative, a prototype information system will be developed, demonstrated and validated for effective near-real time flood forecasting, warning and management.

6.11.4 Scaling down of Global Circulation Model:

Realistic assessments of climate change impacts require the downscaling of the global circulation models to the regional scale and then to the river basins. This will require a close co-ordination between the Government departments and the academic institutions. As a part of this initiative, climate change impact models on the Mahanadi, Brahmani and Baitarani basins will be undertaken. Subsequently, this will be extended to the other basins as well.

6.11.5 Increasing the water use efficiency in irrigation:

Conservation of water resources is generally a good management practice, which becomes more important as it is also a climate change adaptation measure. Under this capacity building initiative, sectoral use of water will be identified, wastage will be monitored, technologies/approaches to reduce wastage will be explored and implemented. This will be first undertaken in critical areas and then expanded across the state. The need for new regulatory structures with appropriate entitlements and pricing to adopt water-neutral and water-positive technologies will also be explored.

Water Resources - Key Priorities

- Expansion of hydrometry network
- Development of flood forecasting models
- Downscaling of Global Circulation Model
- Increasing the water use efficiency in irrigation
- Constructing and protecting water harvesting structures
- Improving drainage systems
- River health monitoring and eco-systems environmental flow demand studies
- Raising awareness raising with Pani Panchayat through Farmers' Training Programme and creating agro-climatic stations
- Integrated Water Resources Management

6.11.6 Constructing and protecting water harvesting structures:

In water scarce areas, there is a potential for climate change to make water availability even worse. This issue can be addressed by new water harvesting structure i.e. check dam for retention of run-off water as necessary which shall take care of (i) drinking water facility in villages on both sides of the river (ii) irrigation during late kharif and rabi through lifting by beneficiaries (iii) recharging of ground water which will help indirectly to provide drinking water facilities to nearby villages (iv) industrial requirements wherever necessary and constructed through self funding (v) ecological balance. Existing water bodies will be protected.

6.11.7 Improving drainage systems:

With the possibility of increase in flooding due to climate change, the improvement of drainage systems will be required to overcome this problem. Improvements will be done through the reuse of drainage water in irrigation and in reclaiming the water-logged areas. Drainage and water logging problems are mostly in the coastal belt of Mahanadi Delta System and coastal belt of Ganjam, Bhadrak and Balasore. Nearly 30 percent of GCA of these areas, i.e. 2.18 Lakh Ha out of 6.83 Lakh Ha are affected due to poor drainage condition and 1.9 Lakh of Ha can be retrieved by improving drainage systems. The total area is divided into 17 doabs by the rivers and their branches. Out of which, 8 doabs are in Mahanadi Delta System. A master plan for drainage development in coastal belt of Orissa covers all the 17 doabs.

6.11.8 River health monitoring and eco-systems environmental flow demand studies:

With climate change and the associated vagaries of rainfall/precipitation, maintenance of the river health and its ecosystems becomes vitally important. Under this initiative, a research study will be done in different river basins to determine the environmental flow that will be required to sustain the health and the aquatic ecosystems. As far as possible community monitoring will be encouraged to reduce water thefts.Based on the outcomes of this research study, the thrust actions will be identified, planned and implemented.Efforts should be made to develop a plan to catch the water where it falls.

6.11.9 Raising awareness of Pani Panchayat through Farmers' Training Programme and creating agro-climatic stations:

With water availability becoming an increasingly important focus under a climate change regime, it is required to build awareness on the optimal use of water and on conservation of water resources. It is also required to build the farmer awareness of scientific crop management to be adopted in the context of varying water availability. These will be done with the Pani Panchayats through the Farmers's Training Programme. Apart from sensitization, agro-climatic stations will also be created with a view to provide weather-based information for decision-making to the farmers on a periodic basis.

6.11.10 Integrated Water Resources Management:

As indicated in the National Water Mission, promotion of integrated water resources management will get an additional focus for ensuring equitable distribution across various uses. This is already being practiced within the state. Further capacity building will be done to make operational integrated water resources management practices across the different river basins in Orissa. An autonomous Water Regulatory Commission may be constituted in the line of OERC.

6.12 Cross cutting issues

6.12.1 Activities with cross cutting relevance:

In each sector, the Working Group deliberated on the relevance of climate change concerns and identified key priorities. In identifying the key priorities, a multi-departmental approach was taken by having different department representatives in each Working Group. In doing so, it was realized that implementing many of the activities pertaining to the key priorities have cross cutting relevance. For instance, promoting green buildings in urban areas is relevant in terms of reducing energy use as well as in reusing fly ash, a by-product from coal-based thermal power generation. The various activities having such cross cutting relevance are listed and briefly described in the table 6.12.

Table 6.12.a: Activities having cross cutting relevance

S.No.	Title	Description
1	Promoting water use efficiency	Requires technologies, methods and mindset change in practices. Important both from a climate change adaptation as well as a mitigation (e.g. energy-efficient water supply) perspective. Water resources, agriculture, urban and rural are main sectors that are concerned with water.
2	Institutionalizing Energy-use efficiency	Requires technologies, methods and mindset change. Important from a climate change mitigation perspective as it leads to reduced carbon emissions. Energy-use efficiency needs to be promoted across all sectors that include energy, urban, agriculture, rural and transport.
3	Promoting Green Buildings	Requires the use of energy-efficient, water-efficient approaches and also using alternative building materials such as fly ash. Important from a climate change mitigation perspective. Involves the following sectors - energy, water and urban.
4	Improved fly ash management	Has linkages with energy, works, urban and environment
5	Transport and urban planning	Reducing transport emissions is best achieved by addressing the source, i.e. the need for transportation. Through integrated urban and transport planning, this can be achieved involving transport, urban and works.
6	Rural development planning	Water is an important factor in rural development planning. With climate change induced variability to water availability, rural development planning will need to be suitably strengthened. Involves different sectors - agriculture, water, rural development, energy and industry.
6	Coastal planning	With climate change-induced changes - more extreme events, sea water rise and coastal intrusion, the emphasis on integrated approach to coastal planning increases even further. Involves - disaster management, agriculture, urban, and water.
7	Biodiversity - forests, agriculture, fishery	Biodiversity conservation will need to adapt itself to climate change. This pertains to biodiversity relevant to forests, fisheries and agriculture.
8	Basin management/flood plain management	Basin-level water resource planning is an integrated approach to determine how the water available should get apportioned to various applications. Flood plain management is a part of this basin-level planning. With the climate change inducing precipitation variability, the basin level planning will need to be further strengthened. Involves all sectors that need and use water, primarily agriculture, energy, industry, rural and urban.

S.No.	Title	Description
9	Watershed management	By its very nature, watershed management approaches are cross cutting. Soil and moisture conservation practices will now need to address climate concerns. Involves the following sectors – agriculture, forests, water and rural development.
10	Livelihoods support	Climate change impacts are likely to be borne by the most vulnerable, i.e. the poor. All community livelihoods support programme in the different sectors, e.g. watershed management (agriculture) and rural development programmes, will have consider climate change dimensions as this has the potential to aggravate an existing problem.

In conducting activities pertaining to these cross cutting issues, GoO will ensure that there is inter-department co-ordination so that the effectiveness of outcome.

6.12.2 Common cross cutting needs/ requirements:

Apart from the cross cutting relevance, there are also cross cutting needs. In other words, these are required across all the individual sectors. The following table lists these requirements/ needs.

GoO recognizes these cross cutting common needs and requirements, and will consider them in more effective planning and implementation of its overall response towards climate change.

Table 6.12.b: Common Cross cutting needs/requirements

S.No.	Title	Description
1	Awareness	Climate change is a relatively new issue. Awareness within the GoO, businesses and civil society associated with the different sectors needs to be strengthened.
2	Capacity building	Awareness is the first step. The next is to build the capacity – knowledge, skills and resources – to be able to address climate change concerns. This is again a need across all the individual sectors.
3	Information needs	Information on the climate change impacts/implications of different sectors are not readily available. Both top-down (from climate projections) as well as bottoms-up (from collecting empirical data / information) approach is required for all sectors that are impacted due to climate change, e.g. water resources, agriculture and coasts & disasters.
4	Estimation of extent of emissions and impacts	While all individual sectors recognize the climate change relevance, there is no data / information to the extent to their sector contributes to the overall emissions. There is also no data / information to the extent the sector has to adapt to climate change impacts. Such an estimation is a common need.
5	Integration with state planning processes	Climate change is relevant across a number of activities within each individual sector. As these activities are planned as a part of the overall annual state planning, it is required for each sector to integrate climate change concerns into their respective planning. Development planning needs to integrate climate change concerns.

Chapter 7

Analysis and Synthesis

7.1 Introduction

This chapter outlines the findings from the analysis and synthesis of the previous chapter. The analysis in each sector provided a set of key priorities. Certain cross cutting areas were also identified. These were synthesized to arrive at findings, which describe what the CAP will achieve. The case is made for new institutional arrangements that will be required in the context of the proposed initiatives. This is introduced and described. The independent monitoring and evaluation required to ensure effective implementation is then described. Finally, the chapter concludes with the financial budget for the CAP.

7.2 Findings

Changes in policies, organizations and practices:

Analyzing the key priorities revealed that climate change orientation needs to be provided at policy, organizational and practice levels in different sectors. Policies need to integrate climate change considerations. At an organizational level, awareness, skills and capacity has to be built. In certain sectors, new organizations, e.g. the Forest Monitoring Agency, have to be established. And, at a practice level, implementation initiatives will be required to shift towards a more climate-friendly development path. There are significant actions - Marginal/incremental actions will not suffice and there are significant actions required at all these levels to move on a climate-friendly development path.

Awareness generation and capacity building - a focus:

Considering that climate change is a relatively new challenge, the focus of this CAP will be on generating awareness and building capacity. This will be done across all levels of the GoO and external stakeholders involved in the different sectors. This strong drive towards building capacity will result in empowering people and organizations to be able to address, manage and respond to climate change concerns.

Action implemented across the economy:

Given the all-pervading nature of climate change, action will be taken across the state economy. The inter-connectedness of issues pertaining to climate change necessitates this approach. Selecting and initiating work only in some of the sectors will undermine the effectiveness in an overall sense. Therefore, progress will be made across all the identified sectors in a parallel and simultaneous manner.

Climate-intrinsic sectors distinguished:

Broadly, the different sectors can be classified as climate-intrinsic and climate add-on sectors. Climate-intrinsic are sectors that are so heavily associated with climate change that every action within these sectors have a strong bearing or related to climate change. These include energy, forest, water, agriculture and coastal disasters. Climate add-on sectors are those wherein the climate dimension is additional, e.g. fisheries, health, industry, mining, transport and urban. While the key priorities across all these sectors will be met, GoO will recognize that every activity

– particularly any new policies, organizations and initiatives - in the climate-intrinsic sectors will have a strong association with climate change.

Integrated perspective imperative:
To be effective in implementing initiatives pertaining to the key priorities, it is vitally important to have an integrated outlook and not work in isolation. This will be required to ensure maximum returns to the efforts being made.

Carbon-conscious development:
The various mitigation initiatives being planned across the 11 sectors will ensure that Orissa proceeds on a carbon-conscious development path.

Green Jobs:
The different adaptation and mitigation initiatives will ensure a transition to environmentally sustainable forms of production and consumption, which include designing energy efficient buildings, practice of sustainable farming, installing water recycling systems, promoting renewable energy technology, maintaining energy efficiency & balance in sustainable transport, water supply, sanitation and waste management etc. All these efforts to tackle climate change will result in millions of "green jobs" thus redefining business as usual in favour of more sustainable practices.

Biodiversity in addressing livelihoods:
The key adoptive strategy being envisaged in the climate change action plan will facilitate conservation of biodiversity including restoration and rehabilitation which will help vulnerable people, mostly the tribal communities and economically most backward strata, to cope with climate change. Biodiversity plays a central role in ensuring livelihoods especially amongst rural populations and indigenous communities. The climate change adaptation so planned will aim at integrated management of biodiversity, thus immensely facilitating the poverty reduction and food security planning in the state.

Building climate resilience:
The different adaptation initiatives being planned will ensure better preparedness to climate-induced changes, including extreme events. For a climate sensitive state such as Orissa, climate change adaptation is an integral part of good development.

7.3 Institutional Arrangements

In initiating the preparation of the Climate Change Action Plan, a scoping study was done. The findings of the scoping study revealed the inter-sectoral and inter-departmental nature of climate change response action. In preparing the Climate Change Action Plan, 11 different working groups have been constituted. These working groups comprised representation from various departments. These deliberations revealed that implementation also requires strong inter-sectoral and inter-department co-ordination.

To meet this need, a Orissa Climate Change Agency will be put in place during the first year of implementation. This will have an advisory, supervisory and co-ordinating role on climate change issues. This Agency will be a single-window contact for dealing with the GoI and other external funding agencies in issues pertaining to climate change. The responsibility for establishing this Agency will be with the Forests & Environment Department. However, the Agency's role will include and involve all sectors and all departments. It is envisaged that this Agency will function in an independent and autonomous manner so that it can execute its various roles, responsibilities and duties in a smooth, quick and effective manner.. The Agency will be equipped with appropriate quality manpower,resources and infrastructure that are commensurate with the requirements and challenges faced. The Agency's functioning style will be collaborative and inclusive, not only within Departments of the Government but also with the different external stakeholders.

7.4 Financial budgets

Each working group put together a budget for the initiatives proposed to meet the key priorities in each sector. There are a number of ongoing initiatives, which are also relevant to climate change, these budgets have also been included in determining the overall budget for the CAP. The additional resources required in each sector has also been estimated and resources for these will be sourced from the GoI or external funding agencies. The following table provides the rough budget estimate for the first CAP.

Table 7.4: Budget for CAP, 2010-15

S. No.	Particulars	Approx. Amount Rs. Crore
A	**Sectors**	
1	Agriculture	1,500
2	Coasts & Disasters	1,300
3	Energy	6,500
4	Fisheries & Animal Resources	217
5	Forests	4,650
6	Health	500
7	Industry	325
8	Mining	55
9	Transport	60
10	Urban	1,200
11	Water	725
	Sub-total:	17,032
B	**Institutional Arrangements**	
1	Establishing new Orissa Climate Change Agency	TBD
2	Independent external Monitoring & Evaluation	TBD
	Sub-total:	TBD
	Grand Total:	Approx 17,000

(N.B: Emphasis is not on computing the exact requirements of funds, but on the road map)

7.5 Monitoring and Evaluation Framework

A key part of a climate change action plan has to be:

- The monitoring of impacts of climate change and of progress in achieving key targets
- The evaluation of programs undertaken to mitigate climate change as well as to adapt to its consequences.

Both the monitoring and evaluation have to be done regularly and a feedback loop should be established so that corrective action can be taken in the case of:

- Impacts being more or less severe than originally anticipated,
- Key targets not being attained in a timely manner and
- Programs underperforming.

In the case of Orissa CAP, the main areas where monitoring will be required and where there are risks of underachieving key targets and programs are presented in the framework table.

The following points should be noted:

- Baseline data will be required and will be collected urgently. This is essential so that targets can be set for the key programs.
- Where impacts can be expected as a result of climate change, these should be monitored and the programs that have been set up modified where major deviations from expected impacts are found. Since this is a relatively long term exercise one can expect to make changes only to future programs, i.e. after 5 years as a minimum and more likely after ten years.
- Progress on actual programs implemented now, however, can be monitored on a shorter time frame and changes enacted following reviews undertaken every 3-5 years, depending on the program.

Table 7.5: Orissa Climate Change Action Plan – Monitoring & Evaluation Framework

Area	Key Impacts to Monitor	Targets to Monitor	Key Programs to Evaluate	Frequency	Feedback Loop (if any)
Agriculture	Changes in yields for key crops Frequency of crop failures	Increases in yields in watershed development program areas Addition to areas under perennial plantation. Adoption of improved seed varieties	Integrated watershed development program Micro irrigation and farm ponds Perennial plantation program	3 years	Adjust budgets. Modify programs.
Coasts & Disasters	Frequency of extreme events Losses per event Loss rates for flagship species Rates of erosion in sensitive areas	Building targets to provide protection measures Investment programs to protect ecologically sensitive areas.	Effectiveness of implemented protection measures Program to control erosion losses Program to protect ecologically sensitive areas	3-5 years depending on program	Adjust budgets. Modify programs.
Energy	Emissions of CO2. Emissions intensity	Emissions per Mwh from coal Emissions per Mwh from gas Amount of coal that is washed No of fluidized bed plants Average boiler efficiency No of PPAs signed Losses in T&D in state systems Installation of solar power Installation of wind power Generation of energy from biogas	Adoption of clean coal technologies program Promotion of gas CC plants Coal washing program Fluidized bed program Boiler efficiency program Wind and solar programs Biogas promotion program Promotion of merchant power program Energy department capacity building program Operations of special CESS fund T&D Loss Program Energy saving/demand management program.	3-5 years depending on program	Adjust programs if not successful. Tighten or loosen targets based on experience.
Fisheries/ Animal Resources	Yields in aquaculture Fish catch rates adjusted for effort Animal weight and output	Targets for livestock protection. Targets for fish catch per year.	Skilled animal breeding program Early warning system for diseases	3 years	
Forests	Loss rates for forest biomass Loss rates for mangroves	Reforestation rates Reduction in loss of forests Coverage of bald hills with forest Mangrove expansion rates Watershed plantation rates Losses from fires	Reforestation/afforestation program Forest conservation program Bald Hill coverage program Mangrove program Fire management program Capacity building in Panchayati Raj.	5 years	If programs do not meet targets modify allocation of budgets

Area	Key Impacts to Monitor	Targets to Monitor	Key Programs to Evaluate	Frequency	Feedback Loop (if any)
Health	Incidence of vector borne diseases Incidence of water borne diseases Frequency of heat wave losses	Vector borne disease impacts relative to baseline Water borne disease impacts relative to baseline Nos. affected by heat waves Cases of food poisoning	Vector borne disease program Water borne disease program Heat wave impacts program	3 years	Modify programs according to evaluation
Industry	Losses to industry from extreme events in coastal areas.	Targets for climate proofing industrial infrastructure.	Coastal zones extreme events program Promotion of bulk waste program Compensatory water harvesting program.	3 years	Modify programs according to evaluation
Mining		Mining waste output reduction targets Targets for expansion of green zones Targets for water harvesting damage Energy savings targets	Protection of water harvesting structures program Creation of green zones program Energy savings program	3 years	
Transport		Bulk transport using rail Use of biofuels Kilometers of low carbon highway Trees planted on highways No of electric operated vehicles	Bulk transport promotion program Biofuels program Low carbon highway program Tree plantation program Emission check up program	3 years	Modify funding for programs failing to meet targets.
Urban		No of water meters installed Waste collection rates % of HH connected to water supply No of energy efficient street light installed Average energy efficiency in buildings	Water metering program Waste collection program Water supply connection program Energy efficient lighting program Promotion of energy efficiency in buildings Promotion of non-motorized transport program		Modify funding for programs failing to meet targets.
Water	Frequency of rainfall in different seasons	Accuracy of flood forecasting Water use efficiency rates No of harvesting structures built Drainage of water indicator	Flood forecasting program Water use efficiency program Water harvesting structures investment program Improvement of drainage program Environmental flow in wetlands program	3-5 years depending on program	Modify funding for programs failing to meet targets.

Chapter 8

Conclusions and Recommendations

8.1 Introduction

This chapter draws the conclusions from the different key priorities, their analysis and synthesis. This chapter also includes recommendations for preparing future Climate Change Action Plans.

8.2 Conclusions

The CAP will lead Orissa to move towards a carbon-conscious, climate resilient development path. The following are the key conclusions of this CAP:

Significance of climate change:

The nature, scale and magnitude of the climate change impacts is likely to be of high significance given that the state's agriculture is largely rain fed and is periodically exposed to climate-induced extreme events. In addition, Orissa has substantive coal reserves and its development plans include harnessing the potential of thermal power. Therefore, Orissa will be a focus of both national and international attention in the context of climate change.

Addressing both adaptation and mitigation:

The state CAP will address both mitigation and adaptation issues in a holistic manner by implementing all the activities in the action plan. It has been recognised that adaptation is of much greater significance.

Information on climate change implications:

In terms of assessing the climate change implications for the state, GoO will adopt a dual approach, i.e. top-down approach through the downscaling of global models as well as a bottom-up approach through collecting empirical evidences of climate change at a grassroots level.

Awareness and capacity-building:

Awareness and capacity building to face this new challenge will be the primary focus; this will be undertaken across the different sectors and the state economy as a whole

Overall approach:

A multidisciplinary, integrated and co-ordinated convergence approach is required and will be adopted in implementing this CAP. GoO will adopt a proactive, preventive and preparedness-oriented approach rather than a reactive approach.

Different sectors have different key priorities to be addressed through different initiatives over different timeframe. Each sector will implement its initiatives relevant to their key priorities within themselves and in close integration with different departments and stakeholders involved.

During this CAP implementation, GoO will demonstrate, promote and encourage different initiatives through policy changes and implementation actions as a response to climate change.

Involve stakeholders:

GoO will involve stakeholders, particularly community, in a more proactive way in the CAP implementation. This involvement will relate to (i) promoting much greater climate change awareness within community, (ii) identifying problematic issues relevant to climate change, (iii) support in monitoring of climate-induced problems and (iv) ensuring greater accountability to the people on climate change issues. Stakeholder involvement will be an effective tool with stakeholders, who play an important part in bringing out the solutions. If stakeholder involvement as described here is not initiated, then stakeholders are bound to look at GoO as an adversary and not as a partner.

Orissa Climate Change Agency:

To ensure the effective implementation of the above approach, a Climate Change Agency will be put in place to provide advisory, supervisory and co-ordination services to the state. This Agency will facilitate dealing with the GoI and the various external funding agencies in the context of climate change.

Once the Orissa Climate Change Agency is established, GoO will ensure transparency by sharing information on all its climate change related activities on a public website.

Going beyond environmental & climate change professionals:

From the range of issues / concerns, it is quite clear that even though climate change is an environmental challenge, the response requires non-environmental professionals. Resolving climate change issues cannot be done in isolation by the environmental or climate change fraternity alone. The issues/problems are so fundamental and deep in the sectoral context that the respective sector professionals have to address these problems. Policy-makers, economists, planners, engineers, scientists, development programme specialists and others have to be encouraged to contribute towards resolving climate change problems in a structured way.

Dynamic document:

Approaches to responding to climate change are fast changing based on research being done across the world. Given this situation, this 5-year CAP should be seen as a dynamic document rather than a fixed in time or static one. The key priorities provide the guidance and direction that GoO wishes to take. Keeping these key priorities, flexibility will have to be exercised in implementing the proposed initiatives so that these are in line with the latest and uptodate developments in this fast-changing discipline.

Integrate climate change in new initiatives:

This CAP was prepared taking into account the current development activities and how climate change considerations need to be integrated in all those. As there will be new development activities in each of these sector, it will also be ensured that climate change considerations are integrated with these as well.

Monitoring of CAP:

Climate change is relevant to most sectors and departments within the GoO. As activities across all sectors and departments are identified and planned through state planning processes, the monitoring and evaluation of this CAP will be done in close co-ordination with the monitoring of the state planning activities. Over a period 1-2 years, the process of monitoring the CAP will be streamlined with the monitoring of activities under the state planning framework with half yearly monitoring of priority actions in respective sector. Those would be compiled and reported to the highest levels of Goverment.

Budget:

Any estimation for implementation of Climate Change Action Plan will only be a rough estimate. However the budget for climate change response actions has been estimated to be Rs. 17,000 Crore for a 5-year period between 2010 and 2015. This estimate includes both existing / already earmarked resources and additional resources required to shift Orissa towards a carbon-conscious, climate-resilient

development path. Energy, forests, coasts & disasters, agriculture, water resources and urban are the sectors that constitute about 80 percent of the overall budget. Parts of the Action Plan can be implemented with the available resources of the departments and additional funds may have to be provided for certain activities. As the implementation proceeds, the picture will be clearer.

8.3 Recommendations for future CAPs

The preparation of this CAP was undertaken over approximately a 6-month period from the commencement of the climate change scoping study. Being the first CAP of its kind, the next steps of the preparation process / methodology was developed as progress was made. From the experience of preparing this CAP, the following are the recommendations for preparing future CAPs in the state:

- Following the implementation of this first CAP, awareness and knowledge on climate change issues / concerns would have developed across the state. Therefore, the overall capacity of both Government staff across all levels as well as those of the external stakeholders will be considerably higher. Once built, this capacity should be collectively and gainfully used in a consultative, participatory and inclusive manner in determining the focus areas of attention in the next version of the CAP.
- As was done in the first CAP, a set of sector working groups – 11 working groups were established - should be created within the GoO to prepare subsequent CAPs as well. The ownership and commitment of the GoO in implementing this CAP gets a substantive boost if there is an active involvement and engagement of the GoO staff in preparing these plans. A similar multi-sector and integrated approach should therefore be adopted for future CAP preparations.
- While all sectors were directly or indirectly covered in preparing the first CAP, there were some departments of the GoO that were not actively engaged, e.g. Education department. The overall focus on capacity building addresses an educational goal / target but this is not implemented through the formal systems of the Education department. In the next version of the CAP, those GoO departments that have not been directly engaged should be encouraged to be involved so that new perspectives and approaches emerge.
- As climate change has an all-pervading influence, it is relevant to most sectors and departments within the Government. Activities across all sectors and departments are identified through state planning processes and budgets are prepared on an annual basis. With the implementation of this first CAP, the move towards climate-friendly sectoral development will be achieved. Subsequent CAPs should aim to identify only the additional activities and budgets required to further move the sector development plans towards being more climate-responsible. There should be a monitoring and advisory group comprising Chief Secretary as its chair, representatives of line departments, 2 experts from the state and 2 NGO representatives.They should meet at least twice in a year and take stock.

Annexure 1

List of Working Groups Chairpersons, Convenors and Members

Name	Designation	Department
Agriculture		
Shri U P Singh, Chairman	Secretary	Agriculture
Shri G.B. Reddy, Convenor	Director	Orissa Watershed Development Mission
	Secretary/Additional Secretary	Water Resources Department
Shri B J Sharma	Ex-Director	Agriculture
Shri B. Giri	I/C Director, Agriculture	Agriculture
Shri G N Mohanty	Joint Director, Agriculture	Agriculture
Dr K C Das	I/C Director, Horticulture	Agriculture
Shri P.K. Sahu	I/C Director, Soil Conservation	Agriculture
Shri N.K. Mohapatra	Director, Hydrology	Water Resources Department
ShriPrasant Ku Satapathy	Agril Economist	Agriculture
Prof S S Nanda	Dean, Extension	Orissa University of Agriculture and Technology
Dr Madan Mohan Panda	Dean, Research	Orissa University of Agriculture and Technology
Mr. S N Pasupalak	Agro-meteorologist	Orissa University of Agricultural and Technology
Shri Niranjan Sahu	PSU Coordinator	Orissa Watershed Development Mission
Coasts & Disasters		
Shri. Raj Kumar Sharma Chairperson	Commissioner-cum-Secretary	Revenue & Disaster Management Department
Shri Ajit Kumar Patnaik, Convenor	Chief Executive	Chilika Development Authority
Shri Nikunja K Sundaray	Managing Director	Orissa State Disaster Management Authority
Shri Khagendranath Jena	Additional Secretary	Fisheries and Animal Resources Department
Shri N.K.Mohapatra	Director, Hydrology	Water Resources
Shri Guru Ch. Ray	Special Secretary	Commerce & Transport
Shri S. S. Srivastava	Chief Conservator of Forests (CCF), Wildlife	Forests
Miss Shenhalata Bhuiyan	Joint Secretary	Revenue & Disaster Management Department
Shri S. Kabi	Executive Director	Orissa State Disaster Management Authority (OSDMA)
Dr.C.S.Kar	Senior Research Officer	Wildlife Wing of Forest Department

Name	Designation	Department
Energy		
Shri Pradeep Kumar Jena, Chairperson	Commissioner cum Secretary	Energy Department, Government of Orissa (GoO)
Shri B.P. Singh, Member	Special Secretary	Forest & Environment Department, GoO
Smt. Debadutta Saranjita Jena, Member	Under Secretary	Steel & Mines
Shri D.P. Mohanty, Member	Additional Secretary	Industries
Shri Y. Sethi, Member	Additional Secretary	Commerce & Transport
Shri R.P. Panda, Member	General Manager	IPICOL
Dr. Akhila Kumar Swar, Convenor	Senior Environmental Engineer	State Pollution Control Board, Orissa
Shri Bhabagrahi Mohapatra, Nodal Officer	Additional Secretary	Energy Department, GoO
Fisheries		
Shri G. Mohan Kumar, Chairperson	Principal Secretary	Fisheries & Animal Resources
Shri Ajit Kumar Patnaik, Convenor	Chief Executive	Chilika Development Authority
Shri Sibanarayan Mishra	Director, Fisheries	Fisheries & ARD Department
	Director	Animal Husbandry and Veterinary Sciences
Shri Khagendranath Jena	Additional Secretary	Fisheries & ARD Department
Shri Balaram Sahu	Research Associate OBPI	Directorate of Animal Resources & Veterinary Services
Forests		
Shri U.N. Behera, Chairperson	Principal Secretary	Forests & Environment
Shri A.K. Bansal, Member	Project Director	Orissa Forestry Sector Development Project (OFSDP)
Shri P.N.Padhi, Member	Principal Chief Conservator of Forests, Wildlife	Forests
Shri U.P. Singh, Member	Secretary/Additional Secretary	Agriculture
Shri S.N. Tripathy, Member	Secretary	Panchayati Raj Department
Shri B.Behera, Member	Director, Environment	Forests & Environment
Shri S.S. Srivastava, Member	CCF(WL)	Forests & Environment
	Secretary/Director	Tourism
Shri G.B.Reddy, Member	Project Director	Orissa Watershed Development Mission
Shri R. Kumar, Member	Joint Project Director	Orissa Forests State Development Project (OFSDP)
Shri S.K.Lohani, Member	Director (SP)	
Shri B.N. Mishra, Member	Dy Director (Tourism)	Tourism
Shri B.B. Rath, Member	Tourism Officer	Tourism
Shri Debabrata Swain, Convenor	CCF (PP&A)	Forests

Name	Designation	Department
Health		
Working Group:		
Smt Anu Garg, Chairperson	Commissioner-cum-Secretary	Health & Family Welfare
Shri Dilip K. Behera, Convenor	Senior Environmental Scientist	State Pollution Control Board
Dr. G. N. Mahalik	Director	Health Services
Shri P. K. Das	Director	Directorate of Medical Education & Training
Shri P. K. Panigrahi	Chief Engineer	Rural Water Supply & Sanitation
Shri Dillip Singh	Chief Engineer	Public Health
Shri Siddhanta Das	Member Secretary	State Pollution Control Board
Dr. D. Muduli, Nodal Officer	Special Secretary	Health & Family Welfare
Other key contributors:		
Dr. Alison Dembo Rath	Team Leader	Technical & Management Support Team (TMST) - OHSP
Shri Amalin Pattnaik	Programme Manager	OHSP
Dr. P. K. B. Pattnaik	State Leprosy Officer	
Dr. Bikas Pattnaik		Integrated Disease Surveillance Project
Dr. Madan Mohan Pradhan	Dy. Director	Malaria
Shri Suvendu Mendali	Waste Manager	
Shri Jyoti Kanungo		F & CW
Shri Devjit Mittra		TMST & DMD
Dr. S. Kar	Additional Director	Health
Industry		
Shri Saurabh Garg, Chairperson	Commissioner-cum Secretary	Industries
Shri Nihar Ranjan Sahoo, Convenor	Senior Environmental Engineer	State Pollution Control Board
Shri Siddhanta Das	Member Secretary	State Pollution Control Board
Shri H. Sharma	Director of Industries	Industries
Shri D. P. Mohanty	Additional Secretary	Industries
Shri B. Mohapatra	Additional Secretary	Energy
Shri R. P. Panda	General Manager	IPICOL
Shri P. Pradhan	Joint Director of Industries	Industries
Mining		
Shri Ashok Mahadeo Rao Dalwai	Principal Secretary	Steel & Mines
Shri Manoj Ahuja	Commissioner-Cum- Secretary	Steel & Mines
Shri Rama Nagaraja Reddy, Convenor	Chief Conservator of Forests, Forest Diversion, FC Act	Forests
Shri Harihar Panigrahi	Special Secretary	Steel and Mines
Shri Bhanu Pratap Singh	Special Secretary	Forests & Environment
Shrimati Devidutta. Suranjana Jena	Under Secretary	
Shri B. C. Pattanaik	Director	Mines
Shri M. R Pattanaik.	Additional Director	Steel and Mines
Shri Nihar Ranjan Sahoo	Senior Environmental Engineer	State Pollution Control Board
Shri Singa Tiu,	Chairman, Regional Controller of Mines	IBM Bhubaneswar

Name	Designation	Department
Transport		
Shri Satyabrata Sahu, Chairperson	Commissioner-cum Secretary	Commerce & Transport
Shri P.K. Prusty, Convenor	Senior Scientist	Forests & Environment
Shri G C Ray	Special Secretary	Commerce & Transport
Shri P Dash	Special Secretary,	Industry
Shri Deepak Mohanty	Additional Secretary	Housing & Urban Development
Shri Yudhishtir Sethi	Additional Secretary	Commerce & Transport
Shri B K Sahu	EE, Asst to Chief Engineer, Roads	Works
Urban		
Shri Arun Kumar Panda, Chairperson	Principal Secretary	Housing & Urban Development
Shri Deepak Mohanty, Convenor	Additional Secretary	Housing & Urban Development
Shri G.C. Ray	Commissioner, Rail Coordination and Spl. Secy	Commerce & Transport
Shri Siddhanta Das	Member Secretary	State Pollution Control Board
Shri B.B. Mohanty	Additional Secretary	Energy
Er. B. Tripathy	Executive Engineer	Works (World Bank Project)
Shri P.K. Pattnaik	Asst. Town Planner	
Shri P.B. Rout	Coordinator, S.E.(P&M), O/o C.E.	Public Health (Urban)
Water Resources		
Shri Suresh Chandra Mohapatra, Chairperson	Principal Secretary	Water Resources
Shri B.N. Bhol, Convenor	Senior Environment Scientist	State Pollution Control Board
Shri Phani Bhusan Rout	Superintending Engineer	Housing & Urban Development
Shri Siddhanta Das	Member Secretary	State Pollution Control Board
Shri N.K. Mohapatra	Director, Hydrology	Water Resources Department
Shri P.K. Sathpathi	Chief Statistician	Directorate of Agriculture & Food Production
Shri B.K. Soren	Asst Chief Engineer	Public Health Urban
Shri Prabhat Kumar Behera	Executive Engineer	Public Health Urban
Shri Harish Chandra Behera	Engineer-in-Chief	Water Resources

Annexure 2

List of templates used in preparation

Template 1

Department: Date:

A. List of activities identified in the scoping report

Type[1]	Response Activity Title[2]	Organizations[3]	Ref. No.[4]

B. List of additional activities to be considered[5]

Type	Response Activity Title	Organizations	Ref. No.

1 Indicate whether it is Mitigation or Adaptation or Both.
2 Describe the Response activity
3 List the organizations to be involved with the response activity.
4 Provide a department reference number, e.g. FOR/CAP/1 for Forest Department's Activity 1.
5 Consider policies and schemes under planning & implementation by the respective departments. Consider both the Central and State 6 Government schemes. Also, consider the prevailing practices in the associated sector.

Template 2

Department: Date:

[Note: To be completed for all identified activities included in Template 1]

A.	Reference No.
B.	Response Activity Title
C.	Objective of the Response Activity
D.	Type of Activity (Mitigation or Adaptation)
E.	Scale of Activity (State-wide or district-wide or particular area)
F.	Nature of Activity (Research Study/Policy Action/Pre-investment Study/Demonstration Project/Investment Project/Capacity Building/Regular Operation & Maintenance)
G.	Importance of Activity (High/Medium/Low)
H.	Constraints (None/Minimal/Large) [Consider technology, operational and financial constraints]
I.	Overall Priority Level (High/Medium/Low)[6]

[6] Priority Level is determined as follows:
(i) High if Importance is High and constraints are none or minimal.
(ii) Medium if Importance is High and constraints are large.
(iii) Medium if Importance is Medium.
(iv) Low if Importance is Low

Template 3

Department: Date:

[Note: To be completed only for High Priority Activities]

A. Reference No.

B. Objective and Proposed Action

C. Type of Activity (Mitigation or Adaptation)

D. Scale of Activity (State-wide or district or particular area)

E. Nature of Activity (Research Study/Policy Action/Pre-investment Study/Demonstration Project/Investment Project/Capacity Building)

F. Organizations involved

G. Description of stages/sub-activities

G1.

G2.

G3.

H. Monitoring & Evaluation

H1. Process indicators

H2. Results/Outcome Indicators

I. Timeframe (Short –term, i.e. 1-2 years/Medium-term, i.e. 3-5 years)

J. Indicative Budget

K. Source of funding, if identified

Annexure 3

Summary of Stakeholder Consultations

Government of Orissa is one of the pioneering states that have started developing its own action plan modeled in line with the National Action Plan on Climate Change. The sense of urgency was quite perceptible, as Orissa is more vulnerable to climate change. The 480 kms. long stretched coastline exposes many parts of the states toward calamities like cyclone and disasters relating to sea level rise. The frequently experienced extreme weathers conditions like drought and flood depicts the states susceptibility. More than 2/3rd of its population depends on agriculture and out of this more than 75 percent depends on paddy which is highly sensitive to vagaries of monsoon. High growth in metal and mineral sectors has put pressure on the environment both due to land use change and degradation of forest area. Rapid urbanisation and industrialisation have resulted in high congestion in transport and scarcity of water and electricity. To consider these issues in a holistic manner, a high level committee was formed under the chairmanship of Chief Secretary and with Principal Secretary Forest and Environment acting as its convenor. Eleven working groups were formed drawn from departments to deliberate on various actions that would help in reducing the impact of climate change in the state.

The main purpose of the workshop was to share the draft Climate Change Action Plan with the

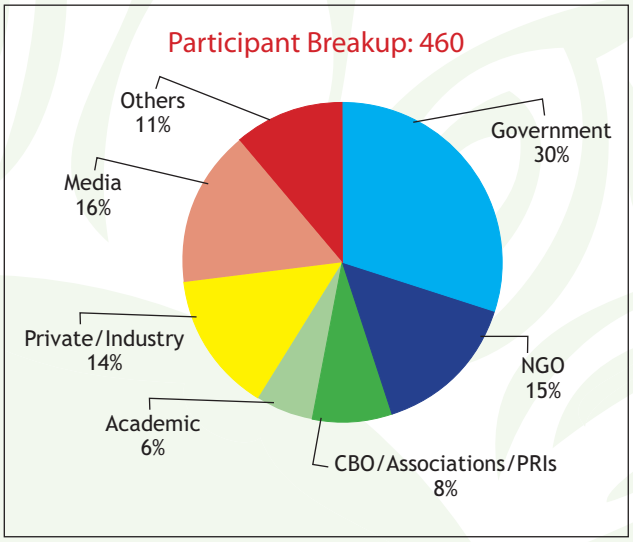
Location	Date	Chaired by	No of Participants	Sectors Covered
Bhubaneswar (Central/East)	13th May 2010	Sri Pradeep Jena, IAS, Commissioner-cum-secretary, Energy	128	Urban, Transport, Industry, Energy, Mining and Health
Berhampur (South)	19th May 2010	Dr CS Kumar, IAS, Revenue Divisional Commissioner, South	71	Urban, Water, Agriculture, Fisheries and Health, Coasts & Disasters
Angul (Central/ West)	20th May 2010	Sri R Raghuprasad, IFS, DFO-Wild Life	61	Industry, Mining, Forests, Water, Energy
Balasore (North/ East)	22nd May 2010	Sri Ajit Bharthuar, IFS, Regional Chief Conservator of Forest, Simlipal	47	Industry, Forest, Water and Agriculture, Coasts & Disasters, Fishery
Bhubaneswar (State Level)	24th May 2010	Sri R N Senapati, IAS, Agricultural Production Commissioner cum Additional Development Commissioner, Orissa	153	Agriculture, Coasts & Disasters, Energy, Fisheries, Forests, Health, Industry, Mining, Transport, Urban and Water

other stakeholders like Civil Society, Grassroots Agencies, industries and academic bodies in order to get their feedback and to make the plan more inclusive.

As part of that process five stakeholder consultation workshops were planned. The following table shows the locations, sectors covered and the total number of participants. Subsequent charts show the breakup of the participants, the breakup of the priority actions debated in the workshops.

About 460 participants registered who acted as knowledge partner in the workshop besides CTRAN staff, support staff and some of the invited speakers (who did not sign the registration sheet). So the total number was about 500.

Effort was made to invite almost double the number of persons to ensure that all sections are represented and the consultations were well attended covering all priority sectors. The following chart shows the breakup.



The NGOs included national level NGOs as well like CEE, RCDC, PRADAN, BASIX and bi-lateral and multilateral agencies. CSOs are combination of grassroots organisations, associations and unions like Matsyajibi Mahasangh (Federation of Fisherfolks), Jangal Adhikar Manch, SHG federations, etc. Industry associations like CII and Utkal Chambers of Commerce who participated are not included in this category and classified as industries. Others category included retired experts, research students, activists, etc.

The **workshop format** for the regional consultation was as follows.

Session Plan	Content
Inaugural session	Introduction to workshop objective, context and process of CCAP formation
Technical sessions	Presentation on priority sectors and priority actions
Discussion	Feed back about the sectors and the action plan: this was done sometimes in small groups and sometimes after the technical presentation of a particular sector.

In total the Draft Climate Change Action plan validated the **303 priority actions** in 11 sectors.

Sectors	No. of priority actions deliberated
Agriculture	37
Coastal Disaster	24
Energy	42
Fishery	14
Forestry	14
Health	10
Industry	60
Mining	42
Transport	19
Urban	21
Water	20
Total	**303**

In terms of spatial break up; 136 related to adaptation, 123 related to mitigation and 28 could not be classified either way. Similarly, 190 actions had state-wide repercussions and 66 actions were related to specific area/ clusters; and 30 fell in other category.

The statekholder feedback revealed that all the identified priority actions were considered appropriate. Additional issues were raised and suggestions made by the stakeholders in different consultations. The following sections capture this feedback as cross cutting issues and sector-specific issues. It also captures how the panels fielded for the consultation responded to some of these issues. The suggestions arising out of these consultations have been forwarded to the convenors to discuss in their respective

Cross cutting issues

Key Processes	Observations/Issues	Remark
CAP formulation process	The process is well coordinated; but seems to be moving very fast; many regional level experts and activists did not get a chance There should be definite time frame for CAP finalisation World Bank Influence on the process	The workshops are meant for this after the workshop due process will be followed through web-hosting for wider consultation. State Climate Change Action Plan is modeled as per the National Climate Change Action Plan and World Bank is only providing help of experts and supporting the public consultation to get wider views. State is the ultimate owner and implementer and would seek support where such expertise is available.
Exclusion	CAP does not have enough focus on tribal groups and impact of Climate in their life; Education department can play an active role in disseminating the Environmental concerns but have been left out Panchayati Raj department has been left out though they play an active role Senior officials (technical experts are ignoring districts; policies ignoring certain regions and favouring only certain sectors so balance is needed) District level planning needed which is eco-system specific should be the process to build up state plan; should be in local language and easily understandable	Jangal adhikar Manch who participated felt strongly about this Some representation from PRIs and department was there but need consideration

Key Processes	Observations/Issues	Remark
Implementation Process	First a baseline for the state in different sectors need to be established so that the impact can be measured; the plan does not have any clear indicators and budget; Focus should be on livelihood creation and restoration and risk management; there seems to be more thrust on policy making. Inter-departmental coordination is crucial; but there should be accountability. Past experience of external agencies and international consultants has not helped the state (e.g. power sector reform); involvement of multiple stake-holders, local agencies and local research institutions in implementation would make it successful. Climate change cells should be formed at the district level Perception survey should follow capacity building. Information, education and communication on various aspects of the climate change should be a major component. Existing polices/programmes need to be examined before attempting to build a new one; actions to be monitorable. Larger administrative reform will be necessary to mainstream the climate change agenda, technology transfer and dissemination. There is very little focus on investment budget and the indicative figures show high variance (in one sector budget for mainstreaming climate change cost in lakh in other in crore); details are missing or not explained in the plan.	Modalities of the institutional arrangement will factor in these views. Budget will be rationalised and currently the budget is only indicative.

working group before the draft version gets finalised.

Sector Specific Issues

Agriculture:

- Main-stay of our state, worst affected because of climate change and maximum investment should be in this sector.
- Promote traditional, organic and sustainable agriculture
- Preservation and management of germ-plasm, traditional varieties and seeds
- Reduce chemical fertiliser for NO2 reduction and also encourage efficiency in irrigation to reduce CO2 emission
- Crop diversifications
- Use varieties that can withstand weather stress and also varieties that can sequester carbon and other GHG; introduction of bio-technology
- Prevent diversion of agricultural land for non-agricultural use and ensure groundwater management
- Weather insurance for risk transfer

Coastal and Disaster Management:

- Detailing of the research studies/ conservation measures and how this is going to help in planning needs to be outlined
- Investment measures missing (in drainage, dredging and mangrove management)
- Need thrust on climate resilient infrastructure planning (e.g. Sea Water Guard/Wall for Coastal Cities) in coastal region with a long term perspective to prevent storm surge, flood plain damage

Energy:

- Focus and promote renewable energy and a clear policy to incentivise them and fast track them (include renewable policy, RPO, technology transfer)
- Promote hydro power : dedicated cell for hydro power
- Reorganise the energy department to tackle the emerging challenge
- Concrete action plan for T&D loss reduction (Orissa is not getting APDRP support despite being a pioneer in reform)
- Promoting energy efficiency in all sectors industry, irrigation, housing, etc and ensuring regular M&V through energy audit
- Advance technology (super-critical) for fossil fuel plant
- Integrated policy taking into account all energy sources (Biogas, bio-mass, energy conservation, reuse and rehabilitation of the old plants)

Fisheries:

- Livelihood planning for the fishermen and capacity building to adapt to climate change
- Modern technology for forecast at the local level and early warning
- Protection of fishery infrastructure and catch
- Investment in habitat and estuary management and protection of endangered species like horse shoe crab, Olive Ridley turtles and mangroves and managing the conflict with fishing through a compensation formula
- Research needed on impact of climate change on inland and coastal aquaculture and balance

Forestry:

- Focus on sustainable timber harvest plan along with forestation and reforestation and revenue plantations
- Focus on forest based livelihood and their protection
- No diversion of forest land/plantations for construction and ensuring g plantations in hilly areas
- Streamlining the usage of CAMPA and preparation of a plan that is convergent with agriculture, watershed, mining, industry and tribal development

Health:

- Bio-medical waste management
- Assessment of health impact due to climate stressed areas
- More research and capacity building to tackle vector borne diseases
- Food security should not come under health department. Agriculture and public distribution departments should be involved with it
- Disease forecasting system like weather forecast
- Health and climate impact of appliances like ACs
- Legal measures to check polluters and recover the health hazrd costs through regulatory measure at local level

Industry:

- Focus on clean production (industrial waste management, recycling and reuse: creation of waste bank): fly ash, waste water, chemicals etc.
- Finding innovative partnership and incentive mechanism like CSR and PPP in carbon market operations like CDM and VCM
- Spreading out of industrial clusters based on carrying capacity, carbon foot print
- Water management, effluent management and energy management plan
- Capacity building and awareness creation

on clean technology and processes and emission profile monitoring especially for the MSME sector

Mining:

- Monitoring of socio-economic and Environment in the mining clusters in intervals
- Investment plan for green zones leveraging funds from different sources
- Cleaner extraction and creating incentives for such processes through policy
- Investment plan for creation of dedicated corridors for transportation dirty cargo

Transport:

- Green transport system and low carbon high way pilot is fine but upscaling plan in other areas
- Improvement of public transportation system and policy disincentive for private carriage (MRTS and BRTS)
- Traffic planning and forecast system for avoiding congestion
- Scrappage system for old vehicles (>15 years)
- Investment in infrastructure for clean fuel and check for fuel adulterations (steeper penalty: law exists)

Urban:

- Action on land use planning, tackling encroachment in urban CPRs/like wetlands and avenue plantations
- Regulatory measure to prevent land use changes that encroach river catchment, flood plains and discharge areas, and creation of urban forests and avenue plantation
- Attitudinal change of ULBs on energy efficiency measures
- Efficiency in water supply, water management (storm water) and rainwater harvesting
- Promotion of green building and manage essential regulatory aspects
- Specific plans for migrants and their livelihoods focussing on the pressure they exert on urban resources

Water:

- Management of wetland to have a cooling effect
- Management of groundwater and mechanism to monitor the theft
- Management of storm water
- Sustainable basin management for proper flow
- Investment in minor and sub-minors to reduce impact of flash flood in non-costal hilly areas
- Cleaning of encroachment in the discharge areas and flood plains around Bhubaneswar and prevent land use

Overall summary:

- Mainstream climate issues into the sectoral policies before that it is impraynt to assess what we have already
- Finding the realistic budget should be based on clear norms and indicators and it should see the current availability from existing sources and estimate what is the short fall
- Building Capacities is not enough using the capacity is key
- Capacity of the implementing institutions should be assessed and enhanced

Way Forward:

- The feedback obtained so far though various discussions, consultations, emails have been made available to the convenors;
- The convenors will deliberate this and revise the action plan by the week ending 29th May 2010;
- Secretary Forest and Environment has assembled a team that will read this whole document and plan and provide feedback;
- A web version will be hosted on 5th June 2010;
- This will be available for public inputs for a fortnight;
- The finalised plan will be released during the Vana Mahotsav week during July 2010.

Annexure 4

Sectorwise table of key priorities

Agriculture - Key Priorities

Sl. No.	Title	Orgns.	Budget			
			Exist.	Addl.	Total	Source of funding
AG/KP/1	Rapid screening and strategy assessment of state Agriculture policy in the context of climate change	DOA/OUAT			Rs. 143 Crore	Central sector & State Plan Schemes
AG/KP/2	Establishing institutional delivery mechanisms to promote best practices on climate change adaptation	OWDM			Rs. 100 Crore	GoI/Externally Aided Projects
AG/KP/3	Capacity Building on adapting to climate change					
(a)	Capacity Building and Technical Support to CBOs for better management of land & water to adapt to climatic risks	OWDM			Rs. 100 Crore	EAP
(b)	Capacity Building of Extension Personnel & Farmers	DOA IMAGE/ RITES			Rs. 54 Crore	Central sector plans and state plan
(c)	Use of GP training Hubs for dissemination of information on climate change	DOH			Rs. 4 Crore	DFID
AG/KP/4	Continuing the livelihood-focused, people-centric integrated watershed development programmes in rainfed areas vulnerable to climate variations	OWDM			Rs. 1000 Crore	GoI/GoO/Externally Aided Projects
AG/KP/5	Increasing the area under perennial fruit plantation to help cope with uncertain weather patterns	DOH			Rs. 50 Crore	State Govt. & Central Govt

Sl. No.	Title	Orgns.	Budget			
			Exist.	Addl.	Total	Source of funding
AG/KP/6	Developing water-efficient micro irrigation methods and individual/community farm ponds	DOH			Rs. 12 Crore	State Govt. & Central Govt
AG/KP/7	Improving monitoring and surveillance techniques in the context of climate change	DOA			Rs. 24 Crore	Central sector & State Plan Schemes
AG/KP/8	Developing sustainable soil, water and crop management practices	OUAT			Rs. 2.5 Crore	ICAR/GoI/GoO/EAP
AG/KP/9	Breeding studies on major crops for tolerance/resistance to high temperature, submergence and drought under elevated carbon dioxide	OUAT			Rs. 2.5 Crore	ICAR/GoI/GoO/EAP
AG/KP/10. Research						
(a)	Preparedness to tackle emerging scenarios of pests	OUAT			Rs. 2 Crore	ICAR/GoI/GoO/EAP
(b)	Increased production of rice seeds to meet requirement under various weather scenarios	OUAT			Rs. 2 Crore	ICAR/GoI/GoO/EAP
(c)	Climate risk management services	OUAT			Rs. 2 Crore	ICAR/GoI/GoO/EAP
	Total				**Rs. 1498 Crore (approx Rs. 1,500 Crore)**	

Coasts & Disasters - Key Priorities

Sl. No.	Title	Departments/ Organisations	Budget (Rs. Crore)			Source of funding
			Exist	Addl.	Total	
CD/KP/1	Flood mapping, flood forecasting, downscaled climate change projection modeling, preparation of improved flood management plans.	OSDMA, Water Resources, GoO (Institution to be identified for carrying out modeling)	0	50	50	GoI/ External funding agency
CD/KP/2	Assessment of erosion prone areas with the help of Digital Elevation Model	Housing and Urban Development, Works, Industry, Energy, Agriculture ,Rural Development and Transport Department with the help of ICMAM, Chennai, ORSAC	0	3	3	GoI
CD/KP/3	Special study on micro and meso level effects of coastal erosion along the coast of Orissa with special reference to coastal roads and settlement	OSDMA, Rural Development Department, Works Department, H & U.D. Department	0	200	200	GoI, GoO, External Aid
CD/KP/4	Micro level vulnerability assessment of different state resources like housing, public infrastructure, agriculture land, livelihood issues and socio-economic aspects of different levels of population due to effects of climate change resulting in extreme weather events.	OSDMA, Housing & Urban Development, Works, Agriculture, Panchayati Raj	0	50	50	GoI, GoO, External Aid
CD/KP/5	Construction of flood shelters in unconventionally vulnerable locations (i.e. traditionally dry areas facing flooding and water logging due to climate change) and strengthening the community to face the changing patterns of adaptation.	OSDMA, Rural Development	28	72	100	GoI, GoO, External Aid 50 shelters are under construction with Rs. 28 crore from CMRF
CD/KP/6	Need assessment and construction of multipurpose cyclone shelters in the cyclone prone areas of the state along with provision of emergency equipment to the cyclone shelters and strengthening the capacity of the local people for disaster management	OSDMA, Rural Development	180	220	400	Rs. 165 crore provided by World Bank under NCRMP for construction of 155 multipurpose cyclone shelters and godowns 14 cyclone shelters have been taken up at a cost of Rs.15 Crore under ICZM project

Sl. No.	Title	Departments/ Organisations	Budget (Rs. Crore)			Source of funding
			Exist	Addl.	Total	
CD/ KP/7	Developing a hydrological framework with legally binding connotations for ground water conservation/ replenishment through development of watershed both in semi-arid and rain fed areas, identification, protection and rejuvenation of traditional water bodies, natural drainage channels and moribund river channels.	OSDMA, Geological Survey of India, Water Resources, Public Health Department	0	100	100	GoI, GoO, External Aid
CD/ KP/8	Dredging and widening of river mouths to facilitate speedy discharge of flood water which otherwise aggravate the flood situation by lengthening the duration and depth of flooding arising out of erratic and intense pattern of rainfall due to effects of climate change.	Water Resources Department, Forest and Environment	0	150	150	GoI, GoO, External Aid
CD/KP/9	Sustainable shelter belt plantation, natural vegetation, mangrove generation and cropping patterns in view of the changing climate and weather conditions. Utilization of traditional knowledge and adaptive mechanism available with the community in a systematic way through an organized institutional mechanism	Forest & Environment Department, Agriculture, OSDMA, Corporate sector working in coastal areas,	0	40	40	GoI, GoO, External Aid
CD/ KP/10	Developing a techno-legal regime for construction of disaster resilient housing and public infrastructure with respect to changing climate conditions such as extreme heat events, flooding of traditionally non flood prone areas and in the areas of coastal erosion and land subsidence.	OSDMA, Rural Development, Housing and Urban Development	Nil	1	1	GoI, GoO, External Funding Agency
CD/ KP/11	Integration and strengthening of climate change risk issues in the state Disaster management policy with robust framework for dealing with extreme events associated with climate change with its pro active and multi hazard approach to disaster management.	Revenue & Disaster Management, OSDMA	Nil	0.5	0.5	GoI, GoO, External Funding Agency
CD/ KP/12	Setting up an integrated training and capacity building protocol for raising the level of awareness of the community and major stakeholders with respect to the mitigation and adaptation mechanism arising due to effects of climate change on agriculture and livelihood support systems and disaster preparedness.	Revenue & Disaster Management, Agriculture, F&ARD, OSDMA	Nil	100	100	GoI, GoO, External Funding Agency

Sl. No.	Title	Departments/ Organisations	Budget (Rs. Crore)			Source of funding
			Exist	Addl.	Total	
CD/ KP/13	Assessment of risks due to lighting and thunder storm. Increase of such climate hazards may have climate change connotations which need to be explored through elaborate scientific study and mitigation measures.	Revenue & Disaster Management, OSDMA,	Nil	20	20	GoI, GoO, External Funding Agency
CD/ KP/14	Identification of potential location and construction of check-dams to contain flash flooding in high gradient river basins due to extreme rain events possibly owing to changing climate conditions.	Water Resources , OSDMA	Nil	300	300	GoI, GoO, External agency funding
CD/ KP/15	Prediction through appropriate modeling the impact of sea level rise on coastal ecosystem	CDA, Wildlife Wing Forest Department (for carrying out the modeling study appropriate international organisition to be identified.	Nil	1.5	1.5	I C Z M project(World Bank)
CD/ KP/16	Study of impact of global warming on the biodiversity of coastal ecosystem with special emphasis on flagship species.	CDA, Wildlife Wing of Forest Department	Nil	5	5	GoI/ External funding agency
	Total		208	1,105	**1,313** Approx 1,300 Crore	

Energy - Key Priorities

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
ENERGY/KP/1	For generating cleaner energy through **clean coal approaches** the following policies need to be implemented by the Energy Department: • Switch over from Sub critical Technology to Super critical Technology by which coal consumption will reduce from 1 MT to 0.88 MT per MWh and increase in plant efficiency from 37% to 42%. • Encourage more Gas based Combined Cycle Power Plants where CO2 emission is 0.46 and which can be reduced to 0.25 per MWh • Washed coal to be used by the IPPs/CPPs for generation of power if ash content in coal exceed 40% • Use of Fluidised Bed Boiler and coal gasification. This will utilize the mines' rejects and washery rejects for power generation. • Improvement of Boiler Efficiency through combustion Optimization by installation of dynamic coal flow balancing system with continuous Online residual carbon analyser in the boilers. • Promoting Merchant Power Plant in Existing Industrial unit with variable PPA (Power Purchase Agreement) option • Develop state-level energy efficiency standards for the various sectors adopting ECBC. • Existing Thermal power plant to conduct Life Cycle Analysis of their plants as per CEA Benchmark and implementation of R&M measures to improve the efficiency	Energy Department	Nil	Nil	Nil	Not Applicable

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
ENERGY/KP/2	**Institutional development** (Capacity building/restructuring) of Energy Department for implementing policies and conducting studies consisting of following activities. • Functional Reorganization And Capacity Building Of The Energy Department, OERC & OREDA To Have A Coherent Road Map to achieve efficient functioning and implementation of energy efficiency, energy conservation, promotion of renewable energy. • Integrated Super critical (660 MW) IPP Policy (Coal Washeries, Fly Ash based cement and brick plants) Minimum unit size for the purpose of IPP/MPP should not be less than 300 MW to achieve minimum standards of efficiency. • Revised RPO based on the Changing Load mix and Assessment of Evacuation Infrastructure • To conduct a study for determination of State Emission intensity • Develop an operational plan for the Fund that will get revenue for the sale of power that is exported. • Feasibility study of establishment of coal based thermal power plants along coast of Orissa, use of saline water and dedicated rail corridor for coal transportation to be conducted. • Feasibility of Implementation of emerging Clean Coal Technologies through pilot projects in Orissa • Training of the Members of working group or their representatives of different departments and organisations on sector specific climate change issues	Energy Department	Rs. 10 Crore	Rs. 30 Crore	Rs. 40 Crore	GoO/GoI/EFA

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
ENERGY/KP/3	**Reduction of T & D losses:** Develop an operational plan for a targeted reduction of losses due to pilferage and outdated systems (estimated to be about 40%). The activity includes augmentation of T & D infrastructure and investment plan, enhancing present practices for improved load management & feasibility study of evacuation corridors	Energy department & DISCOMS	Rs.2,000 Crore	Rs.3,500 Crore	Rs.5,500 Crore	GoI, APDRP, RGGVY Funding from R&M resources/EFA
ENERGY/KP/4	**DSM/EE:** Develop a comprehensive policy and plan to save energy use in order to reduce the demand – supply gap and contribute towards climate change abatement including the following measures: • Implementation of utility level DSM measures – Policy action • Awareness Generation for Energy Conservation • Promotion and implementation of the National BEE's ECBC code for widespread adoption in the state to reduce the energy consumption in buildings. • For proper energy monitoring, capacity building of energy auditors, strengthening of existing energy conservation Cell supported with manpower and infrastructure.	Energy Department, DISCOMS & ESCO	Rs. 75 Crore	Rs. 385 Crore	Rs. 460 Crore	GoO/External Funding Agencies
ENERGY/KP/5	For effective **fly ash utilization and emission reduction from power plants** there is necessity of capacity building of State Pollution Control Board including the following policy actions/studies. • Compile information from the several studies and initiatives that have been done on fly ash and develop an operational plan for effective utilization of fly ash - Study • Installation of equipments at IPPs/ CPPs for NOx reduction - Policy action	State Pollution Control Board	Nil	Rs. 60 Crore	Rs. 60 Crore	GoO/External Funding Agencies
ENERGY/ KP/06	Promotion of Small and Medium **Hydel plants**	EIC/Energy Department	Rs. 5 Crore	Rs. 36 Crore	Rs. 41 Crore	GoO/GoI/ External Funding Agencies

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
ENERGY/ KP/07	Maximize harnessing **biomass** potential in the state through co-generation/thermal/ power plant/gasification to feed the grid as green power. Increase in application of CPP both in grid and stand alone mode	OREDA	Nil	Rs. 50 Crore	Rs. 50 Crore	Central Financial Assistance of MNRE/IREDA on different biomass projects/ Green cess/ Users' contribution/CDM revenue/EFA
Energy/KP/08	Promotion of Grid based **Wind power** generation	OREDA	Nil	Rs. 50 Crore	Rs. 50 Crore	Central Financial Assistance of MNRE/IREDA/ CDM revenue/EFA
Energy/KP/09	Maximize **solar power** generation in the state in both PV and thermal routes and increase the penetration of stand alone solar systems for use by institutions, communities and individuals	OREDA	Nil	Rs. 100 Crore	Rs. 100 Crore	Central Financial Assistance of MNRE/IREDA/ Users' contribution/CDM revenue
Energy/ CAP/10	Development of **Biogas and** manure management including examining the bio fuel policy in the state and linkage with blending infrastructure	OREDA	Nil	Rs. 4 Crore	Rs. 4 Crore	GoO/EFA
		Total:	**Rs. 2,285 Crore**	**Rs. 4,215 Crore**	**Approx. Rs. 6,500 Crore**	

Fisheries & Animal Resources - Key Priorities

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
FARD/ KP/1	Vaccination against contagious diseases, Deworming, early disease warning system	Department of AH&VS	Rs. 34.00 Crore	Nil	Rs. 34.00 Crore	GoO - Ongoing programme
FARD/ KP/2	Emphasis on Green fodder, pasture development and grazing	Department of AH&VS	Rs. 144.00 Crore	Nil	Rs. 144.00 Crore	GoO - Ongoing programme
FARD/ KP/3	Training on fodder production, fodder conservation, rotational grazing, Rain Water harvest technology, Methane gas harvesting technology, biogas tanks management	Department of AH&VS	Rs. 0.50 Crore	Nil	Rs. 0.50 Crore	GoO - Ongoing training on fodder
FARD/KP/4	Conservation of local hardy animals	Department of AH&VS	Nil	Rs. 1.00 Crore	Rs. 1.00 Crore	GoO - Ongoing programme
FARD/KP/5	Gober Gas tanks/packing to cylinders by compression like CNG	OREDA, Khadi & Village Industries	Nil	Rs. 0.50 Crore	Rs. 0.50 Crore	GoI/Donor Agency/ External aid
FARD/KP/6	Easy and handy Methane Harvest Technology at farmers point	Energy Department, Khadi & Village Industries	Nil	Rs. 0.50 Crore	Rs. 0.50 Crore	GoI/Donor Agency/ External aid
FARD/KP/7	Disease Early Warning System	Veterinary Research Institute/ Research Organisations	Nil	Rs. 2 Crore	Rs. 2 Crore	GoI/Donor Agency/ External aid
FARD/KP/7	Impact of climate change on animal husbandry Application of biotechnology and skilled animal breeding for development of better adopted species	FARD, OUAT	Nil	Rs. 2 Crore	Rs. 2 Crore	GoI/External Funding Agency
FARD/KP/7	Capacity building of livestock keepers	FARD	Nil	Rs. 2.5 Crore	Rs. 2.5 Crore	GoI/GoO
FARD/KP/7	Impact of climate change on inland and coastal aquaculture	FARD with national ICAR institutes.	Nil	Rs. 3.0 Crore	Rs. 3.0 Crore	GoI/External Funding Agency
FARD/KP/7	Development of infrastructure for early warning systems in coastal areas for fishers	FARD, OSDMA	Nil	Rs. 5.0 Crore	Rs. 5.0 Crore	GoI/External Funding Agency
FARD/ KP/11	Welfare activities like saving cum relief, group accident insurance scheme and provision of low cost house to the coastal fishermen communities.	FARD	Rs 24.00 cr	Nil	Rs 24.00 cr	GoI/GoO
	Total		**Rs. 200.50** Crore	Rs.16.50 Crore	**Rs. 217.00 Crore**	

Forests - Key Priorities

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
FOR/KP/1	Increasing reforestation/ afforestation activities in degraded forest areas	Forests Department	Rs. 1,100 Crore	Rs. 1,400 Crore	Rs. 2,400 Crore	Rs 1100 crore from State and Central budget, CAMPA, Finance Commission Grant; Remaining Rs 1400 Crore is to be funded externally
FOR/KP/2	Protecting existing forest stocks to act as carbon sink with stronger conservation	Forests Department	Rs. 100 Crore	Rs. 400 Crore	Rs. 500 Crore	Rs. 100 Crore from State and central budget, CAMPA, Finance Commission Grant; Rest Rs 400 crore has to be funded externally.
FOR/KP/3	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	Forests Department	Rs. 10 Crore	Rs. 40 Crore	Rs. 50 Crore	Rs. 10 Crore from State and central budget, CAMPA, OFSDP; Rest Rs 40 crore has to be funded externally.
FOR/KP/4	Covering bald-hills with suitable species mix	Forests Department	Rs. 10 Crore	Rs. 10 Crore	Rs. 20 Crore	Rs10 crore from State budget, CAMPA; Rest Rs 10 crore has to be funded externally
FOR/KP/5	Increasing and protecting existing mangrove cover along the coast	Forests Department	Rs. 50 Crore	Rs. 50 Crore	Rs. 100 Crore	Rs 50 crore from State and central budget, OFSDP, CAMPA; Rest Rs 50 crore has to be funded externally.
FOR/KP/6	Assessing fire management strategies	Forests Department	Rs.10 Crore	Rs. 90 Crore	Rs. 100 Crore	Rs 10 crore from the state and central budget, OFSDP, Finance Commission grant; Rest Rs 90 crore has to be funded externally.
FOR/KP/7	Improving tree planting and forest management to integrate with watersheds and water resources management	Forests Department, Orissa Watershed Development Mission and Water Resources Department	Nil	Rs. 1,200 Crore	Rs. 1,200 Crore	External Funding Agencies

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
FOR/KP/8	Working to establish new systems to support for community users	Forests Department	Rs. 10 Crore	Rs. 40 Crore	Rs. 50 Crore	Rs 10 crore may be funded from State budget, Finance Commission Grant, CAMPA and OFSDP; Rest of Rs 40 crore has to be funded from External Agency.
FOR/KP/9	Undertaking studies on indigenous trees species to assess their vulnerability to climate change	Forests Department	Nil	Rs. 10 Crore	Rs. 10 Crore	External Funding Agencies
FOR/ KP/10	Assessing additional threats to biodiversity and wildlife	Forests Department	Rs. 20 Crore	Rs. 80 Crore	Rs. 100 Crore	Rs 20 crore may be funded from State and Central budget, Finance Commission Grant, CAMPA and OFSDP; Rest of Rs 80 crore has to be funded from External Agency
FOR/ KP/11	Obtaining access to updated knowledge on climate change science and policy developments	Forests Department	Rs. 5 Crore	Rs. 5 Crore	Rs. 10 Crore	Rs 5 crore may be funded from State budget, Finance Commission Grant, CAMPA and OFSDP; Rest of Rs 5 crore has to be funded from External Agency.
FOR/ KP/12	Capacity building of Panchayati Raj institutions/communities/ JFM institutions to adapt to climate change	Forests Department	Nil	Rs. 5 Crore	Rs. 5 Crore	External Funding Agencies
FOR/ KP/13	Monitoring carbon stock and biodiversity at regular intervals	Forests Department	Nil	Rs. 5 Crore	Rs. 5 Crore	External Funding Agencies
	Total		**Rs. 1315 Crore**	**Rs. 3,335 Crore**	**Approx. Rs. 4,650 Crore**	

Health - Key Priorities

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
HEALTH/KP/1	**Capacity Building** of the health sector on climate change on both adaptation and mitigation aspects	DoHFW/WCD/Lab. & Employment/ Revenue			Rs. 110 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/2	Integrating climate change considerations in the State Health **policy**	DoHFW			Rs. 1.5 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/3	Strengthening approaches to manage **vector borne disease** that have worsened due to climate change impacts	DoHFW/NVBDCP			Rs. 75 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/4	Strengthening approaches to deal with **heat wave conditions** exacerbated due to climate change.	DoHFW/Revenue			Rs. 165 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/5	Strengthening approaches to deal with the physical and psychological impacts due to **extreme weather conditions** caused by climate change	DoHFW/OSDMA			Rs. 15 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/6	Addressing **drought, nutrition & food security** due to increased risk of drought, consequent decline in agriculture and increased malnutrition & food security	DoHFW/WCD/ Agric.			Rs. 35 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/7	Undertaking measures to manage **water borne disease** that have worsened due to climate change impacts	DoHFW/PHED			Rs. 30 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/8	**Research & studies** on climate change and health impacts	DoHFW/Agric./ WCD			Rs. 65 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/KP/9	Addressing **food safety** that is undermined as a result of increased ambient temperatures and extreme events	DoHFW/Agric.			Rs. 5 Crore	GoI/External Funding Agencies/CSR budgets
HEALTH/ KP/10	Studying the interlinkages between **air quality** and climate change, and implications on health	SPCB/DoHFW			Rs. 1 crore	GoI/External Funding Agencies/CSR budgets
	Total				**Rs. 502.5 Crore or Approx Rs. 500 Crore**	

Industry - Key Priorities

No.	Title	Organisation	Budget			Source of funding
			Exist.	Addl.	Total	
IND/KP/1	Integrate climate concerns in policies and plans for industrial development and related areas	Industries Department	Nil	Rs. 30 Crore	Rs. 30 Crore	External Funding Agencies
IND/KP/2	Prepare GHG profile of major industrial cluster	Industries Department and State Pollution Control Board	Nil	Rs. 10 Crore	Rs. 10 Crore	GoI
IND/KP/3	Heat-island study for Talcher and Jharsuguda area	State Pollution Control Board	Nil	Rs. 10 Crore	Rs. 10 Crore	GoI
IND/KP/4	Training various stakeholders on climate change issues	Forests & Environment Department	Nil	Rs. 62 Crore	Rs. 62 Crore	GoI / External Funding Agencies
IND/KP/5	Implement a system of compensatory water harvesting	Water Resources Department	Nil	Rs. 100 Crore	Rs. 100 Crore	GoI / External Funding Agencies
IND/KP/6	Streamline institutional arrangement and strengthen OSDMA to tackle extreme climate events in coastal area	OSDMA	Nil	Rs. 110 Crore	Rs. 110 Crore	External Funding Agencies
IND/KP/7	Carry out energy efficiency study for iron & steel, thermal power, cement and aluminum sector	State Pollution Control Board	Nil	Rs. 10 Crore	Rs. 10 Crore	GoI / External Funding Agencies
IND/KP/8	Promote use of bulk waste material like fly ash, dolo-char, slag etc.	Industries Department and State Pollution Control Board	Nil	Rs. 10 Crore	Rs. 10 Crore	GoI / External Funding Agencies
IND/KP/9	Setting emission targets for thermal power plants	Industries Department and State Pollution Control Board	Nil	Rs. 10 Crore	Rs. 10 Crore	GoI
	Total		Nil	Rs. 322 Crore	Rs. 322 Crore (Approx Rs. 325 Crore)	

Mining - Key Priorities

No.	Title	Organisation	Budget			Source of funding
			Exist.	Addl.	Total	
MIN/KP/1	Draft State Mineral Policy incorporating climate concerns	Steel & Mines Department	Nil	Rs. 10 Lakh	Rs. 10 Lakh	GoO
MIN/KP/2	Carry out a study to determine appropriate policy instruments to promote energy efficiency in mining clusters and mineral transport.	Steel & Mines Department	Nil	Rs. 200 Lakh	Rs. 200 Lakh	GoO
MIN/KP/3	Conduct a study to identify the potential of beneficiation of low grade iron ore, manganese, graphite and chrome ore.	Steel & Mines Department	Nil	Rs. 100 Lakh	Rs. 100 Lakh	GoO / IBM
MIN/KP/4	Establish a robust system of environmental monitoring in major mining clusters	State Pollution Control Board	Nil	Rs. 30 Lakh	Rs. 30 Lakh	GoO
MIN/KP/5	Protection of water harvesting structures, reservoirs, weirs etc. from pollution and capacity reduction in catchments in mining intensive areas and restoration	Steel & Mines Department and Water Resources Department	Rs. 1000 Lakh	Rs. 1000 Lakh	Rs. 2,000 Lakh	GoO
MIN/KP/6	Creation and maintenance of green zones in major mining clusters	Forests & Environment Department	Rs. 2,000 Lakh	Nil	Rs. 2,000 Lakh	GoI (Campa Funds)/GoO
MIN/KP/7	Imparting training on CDM to the officials of Steel and Mines Department, Directorate of Mines, IBM and SPCB	Steel & Mines Department	Nil	Rs. 20 Lakh	Rs. 20 Lakh	External Funding Agency
MIN/KP/8	Training of officials of S&M department, Directorate of Mines, SPCB, IBM etc on various aspects of climate change	Steel & Mines Department	Nil	Rs. 1,000 Lakh	Rs. 1,000 Lakh	GoI/GoO
MIN/KP/9	Generate awareness, create capacity and train the mining personnel/ lease holders on benefit of cleaner production	Directorate of Mines, IBM	Nil	Rs. 10 Lakh	Rs. 10 Lakh	GoI/GoO
MIN/KP/10	Identify areas in mining process where energy savings and emission reduction can be achieved	Directorate of Mines, IBM	Nil	Rs. 10 Lakh	Rs. 10 Lakh	GoO
	Total				Rs. 5,380 Lakh (Approx Rs. 55 Crore)	

Transport - Key Priorities

No.	Title	Organisation	Budget			Source of funding
			Exist.	Addl.	Total	
TRANSPORT/KP/1	Revising State Transport Policy & Boat Policy.	Commerce and Transport Department	Nil	Rs. 20 Lakh	Rs. 20 Lakh	External Funding Agency
TRANSPORT/KP/2	Integration of Urban Development and land use planning with transport planning.	Commerce and Transport Department	Nil	Rs. 50 Lakh	Rs. 50 Lakh	External Funding Agency
TRANSPORT/KP/3	Introduction of MRTS in suburban areas - including electric operated vehicles, Preparation of DPR	Housing and Urban Development Department and ULBs	Nil	Rs. 400 Lakh	Rs. 400 Lakh	External Funding Agency
TRANSPORT/KP/4	Encouraging transportation of bulk dirty cargo through rail network	Commerce and Transport Department	Nil	Rs. 50 Lakh	Rs. 50 Lakh	External Funding Agency
TRANSPORT/KP/5	Use of alternate fuel to conventional fuel	Commerce and Transport Department	Nil	Rs. 150 Lakh	Rs. 150 Lakh	External Funding Agency
TRANSPORT/KP/6	Blending of bio fuel in automobiles	Commerce and Transport Department	Nil	Rs. 50 Lakh	Rs. 50 Lakh	External Funding Agency
TRANSPORT/KP/7	Green low carbon foot-print highway	CE (Roads and NH)	Nil	Rs. 4000 Lakh	Rs. 4,000 Lakh	External Funding Agency
TRANSPORT/KP/8	Ensuring Fuel Efficiency (Drivers Training)	Commerce and Transport Department	Nil	Rs. 50 Lakh	Rs. 50 Lakh	External Funding Agency
TRANSPORT/KP/9	Strengthening Enforcement wing for emission level check up (Burning fuels more efficiently.)	Commerce and Transport Department	Nil	Rs. 50 Lakh	Rs. 50 Lakh	External Funding Agency
TRANSPORT/KP/10	Survey of ambient air quality of Towns/ Cities	Commerce and Transport Department and State Pollution Control Board	Nil	Rs. 30 Lakh	Rs. 30 Lakh	External Funding Agency
TRANSPORT/KP/11	Promoting and incentivizing use of non-motorized vehcles	Housing and Urban Development Department and ULBs	Nil	Rs. 50 Lakh	Rs. 50 Lakh	External Funding Agency
TRANSPORT/KP/12	Avenue tree plantation for carbon sequestration.	Forests & Environment Dept. and CE (Roads & NH)	Nil	Rs. 500 Lakh	Rs. 500 Lakh	External Funding Agency
TRANSPORT/KP/13	Commissioning study of Estimation of carbon emission From Transport sector	Commerce and Transport Department	Nil	Rs. 25 Lakh	Rs. 25 Lakh	External Funding Agency
TRANSPORT/KP/14	Developing Inland Waterways	Commerce and Transport Department	Nil	Rs. 500 Lakh	Rs. 500 Lakh	External Funding Agency
	Total				Rs. 5,925 Lakh or approx. Rs. 60 Crore	

Urban - Key Priorities

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
HUD/KP/1	To orient and sensitise the stakeholders at all levels of ULBs towards issues related to climate change and capacitate them for carrying out the planning and execution of different activities	H&UD Department and State Pollution Control Board	Nil	Rs. 20 Crore	Rs. 20 Crore	GoI/Externally Aided Projects
HUD/KP/2	To develop a model design for urban water supply and sewerage projects thereby bringing in a shift in planning and designing of such projects keeping in view the climate change issues.	H&UD Department, OWSSB and consultants	Nil	Rs. 5 Crore	Rs. 5 Crore	GoI
HUD/KP/3	To sensitise city dwellers on non-revenue water loss and orient them towards water conservation measures. To introduce water metering system and ensure Water assessment and audit	H&UD Department and C.E.PH (Urban)	Nil	Rs. 5 Crore	Rs. 5 Crore	GoO/GoI
HUD/KP/4	To develop and implement an ideal MSW management plan in a selected city and prepare such plans for state wide implementation	H&UD Department, ULBs and Consultants	Nil	Rs. 300 Crore	Rs. 300 Crore	GoI/Externally Aided Projects
HUD/KP/5	To orient the city dwellers on energy efficient street lighting and piloting the same through a CDM proposal.	ULB and Private partners	Nil	Rs. 20 Crore	Rs. 20 Crore	GoI/Externally Aided Projects
HUD/KP/6	To strengthen the existing guidelines for preparation of Master Plan/CDP by incorporating measures to combat climate change and prepare & implement such a Master Plan/CDP for a selected city. The activity will be outsourced through a technical organization.	H&UD Department, Town Planning, Dev. Authorities, ULBs	Nil	Rs. 50 Crore	Rs. 50 Crore	GoI/Externally Aided Projects
HUD/KP/7	To improve urban infrastructure by making non motorized transport feasible throughout the city. The activity will involve survey of the transport network of the city and development of a plan for improvement along with policy level decisions for incentivising.	H&UD Department, Commerce & Transport Department, Works and ULBs	Nil	Rs. 500 Crore	Rs. 500 Crore	GoI/Externally Aided Projects
HUD/KP/8	Improvements to water harvesting in urban areas with restoration of water tanks and artificial recharge	H&UD Department,	Nil	Rs. 200 Crore	Rs. 200 Crore	GoI/Externally Aided Projects
HUD/KP/9	Developing models of urban storm water flows and capacities of existing drainage systems with climate change	H&UD Department	Nil	Rs. 100 Crore	Rs. 100 Crore	GoI/Externally Aided Projects
	Total		**Nil**	**Rs. 100 Crore**	**Rs. 1200 Crore**	

Water - Key Priorities

No.	Title	Orgns.	Budget			Source of funding
			Exist.	Addl.	Total	
WATER/KP/1	Expansion of Hydrometry network	WR, CWC, CGWB, SRC/OSDMA, F & E			Rs. 15 Crore	GoI/GoO/ External Funding Agencies
WATER/KP/2	Development of flood forecasting models	WR, DST, OSDMA, IMD			Rs. 2 crore	GoI/GoO/ External Funding Agencies
WATER/KP/3	Downscaling of Global Circulation Model	WR, IMD, Research Organisations, Academia, F & E			Rs. 2 crore	GoI/GoO/ External Funding Agencies
WATER/KP/4	Increasing the water use efficiency, Bench Marking & Water Audit in irrigation projects.	WR, H & UD, Industry, RD, Energy, Agrl.			Rs. 20 Crore	GoI/GoO/ External Funding Agencies
WATER/KP/5	Construction of Water Harvesting Structures i.e., Check-dam to adapt to the climate change scenario	WR			Rs. 470 Crore	GoO/GoI/ External Funding Agencies
WATER/KP/6	Improvement of drainage system	WR			Rs. 200 Crore	GoO/GoI/ External Funding Agencies
WATER/KP/7	River Health Monitooring, Ecosytem Environmental Flow demand studies	WR, IMD Research Org., F & E			Rs. 2 Crore	GoO/GoI/ External Funding Agencies
WATER/KP/8	Awareness raising with Pani Panchayat through Farmers' Training Programme & creation of Agro-climatic stations	WR, Agrl.			Rs. 5 Crore	GoO/GoI/ External Funding Agencies
WATER/KP/9	Integrated Water Resources Management	WR/Stakeholders			Rs. 10 Crore	GoO/GoI/ External Funding Agencies
	Total				**Rs. 726 Crore (Approx. Rs. 725 Crore)**	

Annexure 5

Comprehensive List of Activities Considered

Agriculture

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
AG/CAP/1	Continued Investment in Integrated watershed development programmes in climate sensitive area and ensuring replication across Orissa (Livelihoods based)	Orissa Watershed Development Mission (OWDM)	H	AD/MI	S	IP	LT
AG/CAP/2	Rapid screening and strategy assessment & seed improvement	DOA/OUAT	H	AD	S	PA/RS/ OM	MT
AG/CAP/3	Increase knowledge & Capacity	DOA/OUAT	M	AD	S	CB	MT
AG/CAP/4	Capacity Building of Extension Personnel & Farmers.	DOA/IMAGE/ RITES	H	AD	S	CB	MT
AG/CAP/5	Improved monitoring surveillance then devise new farming techniques.	DOA.	H	AD	S	PS/DP	ST
AG/CAP/6	Continued liaison work with NCCP and the National Mission on Sustainable Agriculture.	DOA.	H	AD	S	PA	
AG/CAP/7	Training of Farmers in water efficiency	DOH	L	MI	S	CB	ST
AG/CAP/8	Use of GP training Hubs for dissemination of information on climate change	DOH	H	AD	S	CB	ST
AG/CAP/9	National Mission on sustainable Agriculture	DOH	H	AD/MI	S	DP	MT
AG/CAP/10	Establishment of Agromet System in KVKSs	OUAT	M	MI	S	DP	
AG/CAP/11	Creation of awareness among farmers	OUAT/DOA	M	AD	S	CB	
AG/CAP/12	Revisit of agronomic practices of major crops	OUAT	M	AD	S	RS	
AG/CAP/13	Establish Institutional delivery mechanisms to promote best practices on climate change adaptation in rainfed farming conditions	OWDM	H	AD	A	CB	ST
AG/CAP/14	Capacity Building and Technical Support to CBOs for better management of land & water to adapt to climatic risks	OWDM	H	AD	A	CB	ST
AG/CAP/15	Research & Policy: Conduct a study to determine implications of climatic changes on small and marginal farmers of rainfed areas	OWDM	M	AD	A	RS/PS	ST
AG/CAP/16	Establishment of Climate Change Resource Center Network	OWDM	M	AD	S	CB	ST
AG/CAP/17	Promotion of low carbon technologies in climate sensitive watershed area	OWDM	M	MI	A	IP	ST

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
AG/CAP/18	Promotion of SRI	DOA	M	AD	S	CB/DP	ST
AG/CAP/19	Popularization of Environment friendly crop Resources	DOA/OUAT.	M	AD/MI	S	CB/DP	ST
AG/CAP/20	Crop diversification	DOA	M	AD	S	DP/CB/OM	ST
AG/CAP/21	Development of Micro Irrigation & Devt.of Individual/Community Farm Pond	DOH	H	AD	S	DP	MT
AG/CAP/22	Emphasis on Shade net House/Poly House & Mulching	DOH	H	AD	S	DP	MT
AG/CAP/23	Increased area under perennial fruit plantation	DOH	H	AD	S	DP	MT
AG/CAP/24	Documentation of ITK helping in adaptation of climate change	OUAT/DOA	M	AD	S	CB	
AG/CAP/25	Promotion of organic agriculture	OUAT/DOA	M	AD	S	DP	
AG/CAP/26	Popularization of agro-forestry models	OUAT/DOA	M	MI	S	DP	
AG/CAP/27	Impact analysis of climate change on major crops in Orissa	OUAT	H	AD/MI	S	RS	
AG/CAP/28	Screening of and value addition to resilient species from local agrobiodiversity.	OUAT	M	AD	S	RS	
AG/CAP/29	Breeding studies on major crops for tolerance/resistance to high temperature, submergence and drought under elevated carbon dioxide	OUAT	H	AD	S	RS	
AG/CAP/30	Screening of available crop production technologies suitable as potential adaptation and mitigation measures through modeling	OUAT	M	AD/MI	S	RS	
AG/CAP/31	Development of sustainable soil, water and crop management practices	OUAT	H	AD	S	RS	
AG/CAP/32	Performance of situation specific contingent measures in crop production	OUAT	M	AD	S	RS	
AG/CAP/33	Preparedness to tackle emerging scenarios of pests	OUAT	H	AD	S	RS	
AG/CAP/34	Increased production of rice seeds to meet requirement under various weather scenarios	OUAT	H	AD	S	RS	
AG/CAP/35	Identifying suitable rice varieties for vulnerable coastal areas	OUAT	M	AD	A	RS	
AG/CAP/36	Standardizing crop and soil management practices for vulnerable coastal areas	OUAT	M	AD	A	RS	
AG/CAP/37	Climate risk management services	OUAT	H	AD	S	RS	

Coasts & Disasters

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
CDA/CAP/1	Predictions through appropriate modeling to generate different scenarios.	CDA & To be identified	H	AD	A	RS	MT
CDA/CAP/2	Generation of flow series and prediction of the changed salinity regime, salinity flushing, upstream breeding migration, impact on the lake fishery and biodiversity.	CDA & To be identified	H	AD	A	RS	MT
CDA/CAP/3	Prediction of the rate of migration, cross section based on numerical modeling.	Central Water and Power Research Station, Pune	H	AD	A	RS	MT
CDA/CAP/4	Impact on the mangrove diversity.	CDA & To be identified					
CDA/CAP/5	Predictions based on the modeling on the mangrove ecosystem.	CDA & To be identified					
OSDMA/ CAP/1	Flood mapping, flood forecasting models, downscaled climate change projections	Water Resources Department	M	AD	S	OM	ON
OSDMA/ CAP/2	Climate-proofing coastal road infrastructure	Works Department, Rural Development. Department, H & UD Department	M	AD	A	OM	ON
OSDMA/ CAP/3	Capacity building of Urban Local Bodies (ULBs) of the coastal towns on potential climate change impacts	Housing & Urban Development Department, ULBs, OSDMA, Water Resources Department	M	AD	A	OM	ON
OSDMA/ CAP/4	Integration of climate change risks into the State Disaster Management Policy	OSDMA, Water Resources Department	M	AD	A	OM	ON
OSDMA/ CAP/5	Assessment of erosion prone areas with the help of Digital Elevation Model	Housing and Urban Development Department, Works Department, Industries Department and Energy Department, Agriculture Department and Rural Development Department, Transport Department	M	AD	A	PS	ST
OSDMA/ CAP/6	Strengthening delivery and monitoring systems and preparedness in disaster prone regions due to sea level rise	Revenue and Disaster Management Department, OSDMA, Housing and Urban Development Department	M	AD	A	RS	ON
OSDMA/ CAP/7	Strengthening delivery and monitoring systems of health systems preparedness in disaster prone regions	Forests and Environment Department	M	AD	A	OM	ON
OSDMA/ CAP/8	District authorities to develop heat wave disaster plans	OSDMA	M	AD	S	OM	ON

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
OSDMA/ CAP/9	Running drought monitoring and assessment models	Ministry of Agriculture, Govt. of India, Department of Agriculture, Govt. of Orissa, NRSC, ORSAC, OSDMA	M	AD	A	RS	ON
OSDMA/ CAP/10	Study to ascertain long term sustainability of coastal settlements, vegetation and cropping patterns	OSDMA and Special Relief Organisation	M	AD	A	OM	ON
OSDMA/ CAP/11	Conduct a detailed study on cause and effects of micro and meso level effects of coastal erosion.	OSDMA along with different line departments					
OSDMA/ CAP/12	Study/survey may be conducted to ascertain long term sustainability of coastal settlements, vegetation and cropping patterns	OSDMA, Specialized institutions.					
WL/CAP/1A	Survey, Identification, mapping, demarcation, fencing and earmarking of non-forest Government/Private land in 1- 5 km stretch of coastal zone for taking up Reforestation & Afforestation activities both within and outside Sanctuaries and National Parks as bio-shield.	Wildlife	M	MI	A		ST
WL/CAP/2A	Undertake studies on indigenous tree species to assess their vulnerability to climate change. Develop saline resistant, water logging resistant, heat resistant genotypes.	Wildlife	M	AD	A	RS	
WL/CAP/3A	Study and assessment of population of biodiversity of all genera of Invertebrates and Vertebrates with emphasis on flagship species such as Marine Mammals (Cetaceans species) and Sea turtles in the coastal waters and estuarine crocodiles, estuarine terrapins, migratory birds in estuarine as well as tidal influenced habitat. This will also include the biology, lifecycle, abundance and distribution of the species and habitat conditions.	Wildlife	H	AD	A	RS	
WL/CAP/4A	Capacity building through training of wildlife field functionaries for access to up-dated knowledge on climate change and policy issues in connection with climate change.	Wildlife	M	AD	A	CB	

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
WL/CAP/1B	Establishment of rescue centers, equipped with modern facilities so as to cater to the needs of wildlife affected due to climate change	Wildlife	M	AD	A	CB	
WL/CAP/2B	With rise of ambient temperature, erratic rainfall more drought like situation is expected, so to cope up with the situation more water hole for wildlife in protected areas to be created.	Wildlife	M	MI	A	OM	
WL/CAP/3B	Establishment of conservation breeding centres of land and aquatic wildlife of rare, threatened and endangered species as well as other targeted species for maintaining gene pool and for taking of re-introduction programmes of these species as and when the need arises	Wildlife	M	AD	A	OM	

Energy

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
Energy/CAP/01	Study to develop a policy framework for generating cleaner energy through clean coal approaches	Energy Department/ Consultant	H	MI	S	PA	ST
Energy/CAP/02	Switch over from Sub critical Technology to Super critical Technology by which coal consumption will reduce from 1 MT to 0.88 MT per MWh and increase in plant efficiency from 37% to 42%	Energy Department	H	MI	S	PA	MT
Energy/CAP/03	Land bank for gas based power projects in potential areas to utilize gas find from Mahanadi basin	Energy Department	M	MI	A	PA	MT
Energy/CAP/04	Encourage more Gas based Combined Cycle Power Plants where CO2 emission is 0.46 and which can be reduced to 0.25 per MWh	Energy Department	H	MI	S	PA	MT
Energy/CAP/05	Washed coal to be used by the IPPs/ CPPs for generation of power if ash content in coal exceed 40%	Energy Department	H	MI	S	PA	ST
Energy/CAP/06	Use of Fluidised Bed Boiler and coal gasification. This will utilize the mines' rejects and washery rejects for power generation	Energy Department	H	MI	S	PA	ST
Energy/CAP/07	Import of Power from neighboring countries like Bangladesh (rich in gas deposits), Nepal and Bhutan having the scope of huge Hydro potential. Exploring the possibility of state/central PSUs to construct power plants in those countries with a bilateral agreement to export a large portion of the power to India.	Energy Department	H	MI	S	PA/PS	ST
Energy/CAP/08	Implementation of emerging Clean Coal Technologies through pilot projects	Energy Department	H	MI	S	DP	LT
Energy/CAP/09	Installation of equipments at IPPs/CPPs for NOx reduction	SPCB	H	MI	S	PA	MT
Energy/CAP/10	Adoption of Hg reduction measures like Activated Carbon Injection (ACI) or Co-capture with FGD (Flue Gas Desulphurisation)	SPCB	H	MI	S	PA/RS	ST
Energy/CAP/11	SO2 removal from coal/flue gas through dry/wet FGD system	SPCB	H	MI	S	PA/RS	ST
Energy/CAP/12	Installation of High efficiency ESPs followed by Bag Filters in all thermal power Plants	SPCB	H	MI	S	PA	ST

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
Energy/CAP/13	Implementation of Carbon Cap-Trade mechanism for TPP with a system of incentive and penalty for lower/higher level of emissions.	Energy Department/ SPCB	H	MI	S	PA/RS	ST
Energy/CAP/14	Capacity building of Energy Department, OERC and SPCB	Energy Department	H	MI	S	RS	ST
Energy/CAP/15	Integrated Super critical (660 MW) IPP Policy (Coal Washeries, Fly Ash based cement and brick plants) Minimum unit size for the purpose of IPP/MPP should not be less than 300 MW to achieve minimum standards of efficiency.	Energy Department	H	MI	S	PA/RS	ST
Energy/CAP/16	Promoting Merchant Power Plant in Existing Industrial unit with variable PPA (Power Purchase Agreement) option	Energy Department, Industry Department and GRIDCO	H	MI	A	PA	MT
Energy/CAP/17	Revised RPO based on the Changing Load mix and Assessment of Evacuation Infrastructure	Energy Department, OREDA and GRIDCO	H	MI	S	PA/RS	ST
Energy/CAP/18	Functional reorganization of the energy department to have a coherent road map	Energy Dpt./ OREDA (DST)	H	MI	S	PA/RS	ST
Energy/CAP/19	Life Cycle Analysis of Existing Thermal power plant as per CEA Benchmark and implementation of R&M measures to improve the efficiency	Energy Department	M	MI	S	RS	MT
Energy/CAP/20	Improvement of Boiler Efficiency through combustion Optimization by installation of dynamic coal flow balancing system with continuous residual carbon analyser in the boilers.	Energy Department/ SPCB	H	MI	S	PA/IP	ST
Energy/CAP/21	Exploration of Alternate Energy Sources(Tidal, Geothermal, Run of the River, Wind)	Energy Department, OREDA and Consultants	M	MI	S	RS	ST
Energy/CAP/22	To conduct a study for determination of State Emission intensity	Energy Department	H	MI	S	RS	ST
Energy/CAP/23	Develop state-level energy efficiency standards for the various sectors	Energy Department	H	MI	S	PA	ST
Energy/CAP/24	Reduction of T & D losses: Develop an operational plan for a targeted reduction of losses due to pilferage and outdated systems (estimated to be about 40%). Plan should include enhancing present practices for improved load management & implementation	Energy Department & DISCOMS	M	MI	S	IP	MT

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
Energy/CAP/25	Feasibility Study of Evacuation Corridor	Central Power Utilities and Energy Department/ OPTCL	H	MI	S	RS	ST
Energy/CAP/26	Augmentation of T & D infrastructure and investment plan	DISCOMS	H	MI	S	PA	ST
Energy/CAP/27	Implementation of utility level DSM measures	Energy Department, DISCOMS and ESCO	H	MI	S	IP	MT
Energy/CAP/28	Awareness Generation for Energy Conservation	Energy Department	H	MI	S	CB	MT
Energy/CAP/29	Promotion and implementation of the National BEE's ECBC code for widespread adoption in the state to reduce the energy consumption in buildings.	Works Department/ HUD and ULB	H	MI	S	PA/CB	MT
Energy/CAP/30	For proper energy monitoring, capacity building of energy auditors, strengthening of existing energy conservation Cell supported with manpower and infrastructure.	Energy Department	M	MI	S	CB	ST
Energy/CAP/31	To increase energy efficiency through optimization usage pattern and incorporating energy efficiency measures.	Energy Department	H	MI	S	RS	ST
Energy/CAP/32	Compile information from the several studies and initiatives that have been done on fly ash and develop an operational plan including capacity building of concern Department	State Pollution Control Board	H	MI	S	PA/PS/ CB	MT
Energy/CAP/33	Develop an operational plan for the Fund that will get revenue for the sale of power that is exported.	Energy Department/ F&E Department/ SPCB	H	MI	S	PA/PS	ST
Energy/CAP/34	Climate-proofing of proposed power infrastructure proposed in coastal belts e.g 2 Ultra Mega Power Plants	Energy Department	H	MI	A	RS	ST
Energy/CAP/35	Feasibility study of establishment of coal based thermal power plants along coast of Orissa, use of saline water and dedicated rail corridor for coal transportation to be conducted.	Energy Department/ Private Sector	H	MI	A	RS	ST
Energy/CAP/36	Small and Medium hydel plants	OREDA	H	MI	A	PA/PS	MT

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
Energy/CAP/37	To maximize harnessing biomass potential in the state through co-gen/ thermal/power plant/gasification to feed the grid as green power. Increase in application of CPP both in grid and stand alone mode	OREDA	H	MI	S	PA/PS/ DP/IP	MT
Energy/CAP/38	Promotion of Grid based Wind power generation	OREDA	H	MI	S	PS/CB	MT
Energy/CAP/39	To maximize solar power generation in the state in both PV and thermal routes and increase the penetration of stand alone solar systems for use by institutions, communities and individuals	OREDA	H	MI	S	PA/PS/ IP/DP/ OM	MT
Energy/CAP/40	Development of Biogas and manure management	OREDA	H	MI	S	PS	LT
Energy/CAP/41	Examining the bio fuel policy in the state and examining linkage with blending infrastructure	OREDA	H	MI	S	PA/PS/ DP/CB	LT
Energy/CAP/42	Training of the Members of working group or their representatives of different departments and organisations on sector specific climate change issues	F&E Department	H	MI	S	CB/RS	ST

Fisheries & Animal Resources

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
ARD/CAP/1	Scientific Animal Health Management	FARD	H	AD	S	OM	ON
ARD/CAP/2	Improved feeding management	FARD	M	AD/MI	S	OM	ON
ARD/CAP/3	Capacity Building of livestock keepers	FARD	H	AD/MI	S	CB	LT
ARD/CAP/4	Breeding Management	FARD,Orissa Veterinary college	M	AD	A	PA	MT
ARD/CAP/5	Better Waste Management	Energy Department, Khadi & Village Industries	H	MI	S	OM	ON
ARD/CAP/6	Research on easy Methane Harvest Technology	Energy Department, Khadi & Village Industries,	H	MI	S	OM	MT
ARD/CAP/7	Research on Disease Early Warning System	Veterinary Research Institute/ Research Organizations	H	AD	A	OM	MT
FISH/CAP/1	Loss of livelihood due to ban and climate change related implications on the fishery livelihood	FARD	H	AD	A	OM	ON
FISH/CAP/2	Study on climate change and Catch of marine fish	FARD	M	AD	S	RS	ON
FISH/CAP/3	Impact of exuberated extreme climatic events due to climate change	FARD	H	AD/MI	S	PA	MT
FISH/CAP/4	Protection of Fisheries infrastructure and assets	FARD	H	AD/MI	A	PA	ON
FISH/CAP/5	Fishing methods and gears	FARD	H	MI	S	OM	ON
FISH/CAP/6	Health and sanitation in the coastal area	FARD	H	AD	A	OM	ON
FISH/CAP/7	Fishermen welfare activities	FARD	H	AD	S	OM	ON

Forests

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
FOR/CAP/1	Increase reforestation and afforestation activities in degraded forest areas	FED	H	MI	S	PA/IP	ST/MT
FOR/CAP/2	Protect existing forest stocks to act as carbon sink with stronger conservation	FED	H	MI	S	PA/IP	ST/MT
FOR/CAP/3	Increase planting on non-forest land and promote agro-forestry and farm forestry	FED, Works Department, Water Resources Department and Agriculture Department	M	MI	S	PA/IP	ST/MT
FOR/CAP/4	Cover bald-hills with suitable species mix	FED	H	MI	S	PA/IP	ST/MT
FOR/CAP/5	Increase and protect existing mangrove cover along the coast	FED	H	AD	A	RS/PA/IP/CB	ST/MT
FOR/CAP/6	Assess fire management strategies	FED	M	MI	S	PA/IP	MT
FOR/CAP/7	Improved tree planting and forest management to work further in watersheds and with integrated water resources management to increase water storage, reduce surface flow and soil erosion; to assess where tree planting could provide protection in flood prone areas	FED	M	AD	S	PA/IP	ST/MT
FOR/CAP/8	Decrease people dependence on firewood and timber and increase use of improved stoves (chullhas) and wood substitutes	FED and Orissa Renewable Energy Development Agency	L	MI	S	PA/IP	LT
FOR/CAP/9	Work to establish new systems to support for community users. Aim to create new marketing structures for users of traditional forest products to improve incomes and livelihoods to reduce pressures on forest destruction.	FED	M	MI	S	PA/IP	LT
FOR/CAP/10	Undertake studies on indigenous trees species to assess their vulnerability to climate change. Develop heat resistant genotypes in tree nurseries.	FED and Indian Council of Forestry Research and Education	M	AD	S	PA/IP	LT
FOR/CAP/11	Assess additional threats to biodiversity and wildlife. Forest consolidation, linking forest fragmentations, habitat development and mitigation of man-wild animal conflicts	FED	H	AD	S	PA/IP	LT

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
FOR/ CAP/12	To obtain access to updated knowledge on climate change science and policy developments and make this available for frontline staff and forest managers and policy makers. Bring in trainers to develop modules for forest training institutes	FED	H	AD	S	PA/IP/ CB	LT
FOR/ CAP/13	Capacity building of Panchayati Raj institutions/communities/JFM institutions to adapt to climate change, e.g. in the handling of NTFPs, value addition and employment generation	FED and Panchayati Raj Department	M	AD	S	PA/IP/ CB	ST/MT
FOR/ CAP/14	Monitoring carbon stock and biodiversity at regular intervals	FED	H	MI	S	RS	LT

Health

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
H/CAP/1	**Capacity Building** of the health sector on climate change on both adaptation and mitigation aspects	DoHFW/WCD/Lab. & Employment/ Revenue	H	AD/MI	S		
H/CAP/2	Integrating climate change considerations in the State Health **Policy**	DoHFW	H	AD/MI	S		
H/CAP/3	Strengthening approaches to manage **vector borne disease** that have worsened due to climate change impacts	DoHFW/NVBDCP	H	AD	S		
H/CAP/4	Strengthening approaches to deal with **heat wave conditions** exacerbated due to climate change.	DoHFW/Revenue	H	AD	S		
H/CAP/5	Strengthening approaches to deal with the physical and psychological impacts due to **extreme weather conditions** caused by climate change	DoHFW / OSDMA	M	AD	S		
H/CAP/6	Addressing **drought, nutrition & food security** due to increased risk of droutht, consequent decline in agriculture and increased malnutrition & food security	DoHFW/WCD/Agric.	M	AD	S		
H/CAP/7	Undertaking measures to manage **water borne disease** that have worsened due to climate change impacts	DoHFW/PHED	H	AD/MI	S		
H/CAP/8	**Research & studies** on climate change and health impacts	DoHFW/Agric./WCD					
H/CAP/9	Addressing **food safety** that is undermined as a result of increased ambient temperatures and extreme events	DoHFW / Agric.	M	AD/MI	S		
H/ CAP/10	Studying the interlinkages between **air quality** and climate change, and implicatins on health	SPCB / DoHFW	M	AD/MI	S		

Industry

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
IND/CAP/1	Integrate climate concerns in IPR	Ind Department	H	MI	S	PA	ST
IND/CAP/2	Formulate industrial cluster policy for minimum carbon footprint	Ind Department	H	MI	S	PA	LT
IND/CAP/3	Carry out a study to determine appropriate policy instruments to promote energy and material efficiency in industrial clusters	Ind Department, SPCB	H	MI	S	PA	ST
IND/CAP/4	Providing incentives for RD&D in climate resilient technology development	Ind Department	M	AD	S	PA	
IND/CAP/5	Devise a mechanism for green belt development and maintenance for industrial clusters	IDCO, SPCB	M	MI	A	OM	
IND/CAP/6	Incorporate climate change concerns in the draft SEZ policy and PCPIR master plan	Ind Department	H	MI/ AD	S	PA	ST
IND/CAP/7	Preparation of an SEA framework to be used as templates for policy making in cross Sectoral issues like energy policy, Water plan, tourism policy, Agro processing policy etc	Ind Department	M	MI/ AD	S	PA	
IND/CAP/8	Integrating climate concerns in steel and mining policy	Ind Department	H	MI/ AD	S	PA	ST
IND/CAP/9	Study the impact of climate change on supply side capacity of the food processing industries.	Ind Department	L	AD	S	RS	
IND/ CAP/10	Study the feasibility of establishing and operating bio-methanetion process for food processing cluster in PPP mode	IPICOL	L	MI	A	PS	
IND/ CAP/11	Installation of centralized solar heating system in food processing cluster for supplying hot water.	IPICOL, OREDA	L	MI	A	IP	
IND/ CAP/12	Preparation of Regional Environmental Management Plans for major industrial clusters	SPCB	L	MI/ AD	A	RS	
IND/ CAP/13	Preparation of GHG profile of major industrial clusters and introduce a system of GHG auditing for major industrial sectors	SPCB, Ind Department	H	MI	A	PS	MT
IND/ CAP/14	Heat Island study for Angul-Talcher and Jharsuguda-Ib valley area	SPCB	H	AD	A	RS	ST
IND/ CAP/15	Setting emission targets for Thermal Power, Iron & Steel, Aluminium and Cement sector	Ind. Department, SPCB	M	MI	S	PA	
IND/ CAP/16	Establishment of a monitoring network for GHG emission in major industrial clusters	SPCB	M	MI	A	IP	
IND/ CAP/17	Devise a sensitization programme for adoption of CDM in MSME industries through seminars and other awareness programmes	DI, SPCB	L	MI	S	PA	

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
IND/ CAP/18	Strengthening of help desk in IPICOL for advising MSME industries on benefit of CDM	Ind Department	L				
IND/ CAP/19	Establishing facilitation cell in regional offices of SPCB for advising MSME industries on benefit of CDM	SPCB	L	MI	S	CB	
IND/ CAP/20	Imparting training on CDM to the officials of Industries Department, IPICOL and SPCB	IPICOL	H	MI	S	CB	MT
IND/ CAP/21	Provision of subsidy on consultancy charges to MSME for adopting CDM	Ind. Department	M	MI	S	PA	
IND/ CAP/22	Establishment of a system of empanelment of CDM consultants	IPICOL	L	MI	S	PA	
IND/ CAP/23	Identify a host training institute assess the training needs of related agencies and prepare training modules	F & E Department	H	MI	S	CB	ST
IND/ CAP/24	Training of officials of Industries department, Directorate of Industries, IPICOL, SPCB etc on various aspects of climate change	F & E Department	H	MI/ AD	S	CB	MT
IND/ CAP/25	Imparting training to MSME sector on climate change risk and mitigation	SPCB, DI, IPICOL	H	MI/ AD	S	CB	MT
IND/ CAP/26	Establishment of a Training and Research Institute on Climate Change	Ind. Department	L	MI/ AD	S	CB	
IND/ CAP/27	Establish a network with Research and educational institutes like IITs, IMMT etc.	F & E Department	M	MI/ AD	S	CB	
IND/ CAP/28	Strengthening Center for Environment Studies to build capacity to carry out RD&D projects in climate change mitigation and adaptation	F & E Department	L	MI/ AD	S	CB	
IND/ CAP/29	Institute a study on impact of climate change on paddy, sugarcane and forest	APICOL, Agriculture Department	L	AD	S	RS	
IND/ CAP/30	Introduce a programme for mandatory water and wastewater audit in water intensive industries like Thermal Power, Iron & Steel, Sponge Iron, Paper etc	SPCB, WR Department, CGWB	M	AD	S	PA	
IND/ CAP/31	Establishment of a benchmark for water use in respective sectors	SPCB, IPICOL	M	AD	S	PA	
IND/ CAP/32	Revision of water charges and incentivising water efficiency to ensure efficient water management for industrial consumption.	Ind Department WR Department	M	AD	S	PA	
IND/ CAP/33	Promoting water harvesting and storage in industrial clusters	IDCO, SPCB	M	AD	S	PA	
IND/ CAP/34	Devise a mechanism to implement a system of compensatory water harvesting and storage around industries/industrial clusters by the concerned industries	WR Department	H	AD	A	PA	LT
IND/ CAP/35	Establishment and monitoring of Pollution Prevention Plans in industrial clusters	SPCB	M	AD	A	IP	

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
IND/ CAP/36	Heat Island study for Angul-Talcher and Jharsuguda-Ib valley area	SPCB	M	AD	A	RS	
IND/ CAP/37	Creation of adequate green zones and water bodies in industrial clusters	IDCO	M	AD	A	IP	
IND/ CAP/38	Establishment of a mechanism to ensure that the coastal industries incorporate the extreme climate conditions during structural design phase	OSDMA, SPCB	L	AD	A	PA	
IND/ CAP/39	Streamlining institutional arrangement for Disaster Management in coastal industrial belts like Paradeep, Dhamra and Gopalpur	Ind Department, Directorate of Factories and boilers	H	AD	S	CB	MT
IND/ CAP/40	Strengthen OSDMA with training and equipments for technical disaster management	OSDMA	H	AD	S	CB	MT
IND/ CAP/41	Establishment of a network with DMI, Bhopal, OSDMA and coastal industrial houses	OSDMA	M	AD	S	CB	
IND/ CAP/42	Reclamation of coastal low lying areas with scientific disposal of fly ash of thermal power plants	SPCB	M	AD	S	IP	
IND/ CAP/43	Development of coastal green belt in Paradeep and Dhamra	F&E Department	L	AD	A	IP	
IND/ CAP/44	Generate awareness, create capacity and train the industrial personnel on benefit of cleaner production	IPICOL, SPCB, NPC	L	MI	S	CB	
IND/ CAP/45	Launching a awareness campaign on benefits of CP for the MSME sector	DI	L	MI	S	CB	
IND/ CAP/46	Technology assessment and exploring alternatives for steel making with an objective of minimizing carbon foot print	IPICOL	M	MI	S	RS	
IND/ CAP/47	Carry out an energy efficiency study for, integrated steel plant and sponge iron plants and exploring scope of waste heat utilization.	SPCB	H	MI	S	RS	ST
IND/ CAP/48	Institute a comprehensive study on processing and utilization of char from sponge iron plants.	SPCB	H	MI	S	PS	ST
IND/ CAP/49	Setting emission targets for Iron & Steel, sector	Ind. Department, SPCB	M	MI	S	PA	
IND/ CAP/50	Discourage accumulation of fly ash in thermal power plants. Instituting a system of cess on accumulated fly ash	Ind. Department, Energy Department, SPCB	H	MI	S	PA	MT
IND/ CAP/51	Demonstration project for Carbon Capture and storage in thermal power sector	IPICOL, SPCB	L	MI	A	IP	

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
IND/ CAP/52	Setting emission targets for Thermal Power plants	Ind. Department, SPCB	H	MI	S	PA	ST
IND/ CAP/53	Technology assessment and exploring alternatives for power generation with an objective of minimize use of water and coal	IPICOL, Energy Department	M	MI	S	PS	
IND/ CAP/54	Conducting an energy efficiency study for ferro-alloys sector in Orissa	Energy Department	M	MI	S	PS	
IND/ CAP/55	Developing a mechanism to use waste plastics, rubbers, tyres and other waste carbonaceous waste material for co-processing in cement kilns	SPCB, H&UD Department	L	MI	S	PS	
IND/ CAP/56	Carry out a material and energy audit in paper industries of Orissa.	Energy Department	L	MI	S	PS	
IND/ CAP/57	Carry out a material and energy audit in aluminum industries of Orissa.	Energy Department	M	MI	S	PS	
IND/ CAP/58	Carry out a material and energy audit in cement industries of Orissa.	Energy Department	M	MI	S	PS	
IND/ CAP/59	Institute a comprehensive study on processing and utilization of spent pot lines from aluminum smelters.	SPCB	M	MI	S	PS	
IND/ CAP/60	Setting emission targets for Cement, paper, Aluminum and Cement sector	SSPCB	L	MI	S	PA	

Mining

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
MIN/CAP/1	Draft State Mineral Policy incorporating climate concerns	S&M Department	H	AD	S	PA	
MIN/CAP/2	Prepare Regional sustainable mining plans for Joda-Barbil, iron and manganese area, Mayurbhanj iron ore zone,Talcher-Angul Area, Ib-valley area,Sukinda chromite belt, Sundergarh lime stone and dolomite belt, eastern ghats bauxite zone	S&M Department, IBM, CMPDI	M	MI			
MIN/CAP/3	Carry out a study to determine appropriate policy instruments to promote energy efficiency in mining clusters and mineral transport.	S&M Department	H	MI	S	RS	
MIN/CAP/4	Providing incentives for RD&D projects in Environmental friendly technology development for small mining sector (Graphite and granite and other minor mineral)	S&M Department	M	AD			
MIN/CAP/5	Devise a mechanism for green belt development and maintenance in mining clusters	S&M and F&E Department, IBM	M	MI			
MIN/CAP/6	Explore cleaner technology and best practices in coal mining	S&M Department, CMPDI	M	MI			
MIN/CAP/7	Conduct a study to identify cleaner technology for using coal (Like coal washing, coal to liquid etc.) in industrial process	S&M Department	M	MI			
MIN/CAP/8	Conduct a study to determine the potential of coal bed methane in the coal fields of Orissa	Dirctorate of Mining, CMPDI	M	MI			
MIN/CAP/9	Exploring techno-economic viability of capturing coal bed methane for use in industrial sector	S&M Department, CMPDI	M	MI			
MIN/ CAP/10	Prepare a coal evacuation plan separately for Talcher Coalfield and Ib-valley coalfield	S&M Department, Transport department, CMPDI	L	MI			
MIN/ CAP/11	Carry out a research programme for controlling coalfield fire and subsidence due to underground coal mining	S&M Department	M	MI			
MIN/ CAP/12	Conduct a study to identify the potential of beneficiation of low grade iron ore, manganese, graphite and chrome ore.	S&M Department	H	MI	S	RS	
MIN/ CAP/13	Conduct a study to explore best practices in metal mining	S&M Department	H	MI	S	RS	
MIN/ CAP/14	Conduct study to explore feasibility of nickel extraction from nickeliferrus overburden of Sukinda mining area		M	MI			

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
MIN/ CAP/15	Prepare an action plan to mitigate hexavalent chromium pollution in the streams and ground water of Sukinda valley area.	Dirctorate of Mining	M	MI			
MIN/ CAP/16	Conduct a R&D project for recovery of metallic ore and strategic minerals from tailings		M	MI			
MIN/ CAP/17	Prepare a energy efficient mineral evacuation plan separately for Joda-Barbil area, Sukinda and Koira area.	S&M Department, Transport department	M	MI			
MIN/ CAP/18	Institute a system of energy audit in metal mining sector	Directorate of Mining	M	MI			
MIN/ CAP/19	Preparation of Regional Environmental Management Plans for major mining clusters like Talcher-Angul, Ib valley, Joda-Barbil, Koira and Sukinda	SPCB	M	MI & AD			
MIN/ CAP/20	Establish a robust system of Environmental monitoring in major mining clusters	SPCB	H	MI	A	IP	
MIN/ CAP/21	Protection of water harvesting structures, reservoirs, weirs etc. from pollution and capacity reduction in catchments in mining intensive areas and restoration.	S&M Department and WR Department	H	AD	A	IP	
MIN/ CAP/22	Creation and maintenance of green zones in major mining clusters	F&E Department	H	MI	A	OM	
MIN/ CAP/23	Devise a sensitization programme for adoption of CDM in mining sector through seminars and other awareness programmes	S&M Department, SPCB, IBM	M	MI			
MIN/ CAP/24	Imparting training on CDM to the officials of Steel and Mines Department, Directorate of Mines, IBM and SPCB	World Bank	H	MI	S	CB	
MIN/ CAP/25	Identify a host training institute to assess the training needs of related agencies and prepare training modules	S&M Department.	M	MI			
MIN/ CAP/26	Strengthen Directorate of mines in respect of human resources, technology and development of database.		H	MI&AD	S	CB	
MIN/ CAP/27	Training of officials of S&M department, Directorate of Mines, SPCB, IBM etc on various aspects of climate change	S&M Department	H	MI & AD	S	CB	
MIN/ CAP/28	Establishment of a Training and Research Institute on Climate Change	S&M Department	M	MI & AD			
MIN/ CAP/29	Establish a network with Research and educational institutes like IITs, ISM and IMMT etc.	S&M Department	M	MI & AD			
IND/ CAP/30	Strengthening Center for Environment Studies to build capacity to carry out RD&D projects in climate change mitigation and adaptation	F & E Department	M	MI & AD			

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
MIN/ CAP/31	Generate awareness, create capacity and train the mining personnel/lease holders on benefit of cleaner production	Directorate of mines, IBM	H	MI	S	CB	
MIN/ CAP/32	Imparting training on energy efficiency in haulage, transport, pumping system, motors, process heating, compressed air system etc.	Directorate of mines, IBM	M	MI			
MIN/ CAP/33	Identify areas in mining process where energy savings and emission reduction can be achieved.	Directorate of mines, IBM	H	MI	MI	RS	
MIN/ CAP/34	Develop a methodology to measure, monitor and verify the amount of carbon sequestered by plantation programmes in mining sector	F&E Department	M	MI			
MIN/ CAP/35	Develop emission intensity targets for different mining sectors	SPCB, IBM	M	MI			
MIN/ CAP/36	Carry out Regional Hydro-geological survey for major mining cluster of Joda-Barbil, Koira, Talcher-Angul, Ib valley, Sukinda valley area, Sundergarh lime stone and dolomite belt, eastern ghats bauxite zone.	WR Department, S&M Department, CGWB	M	MI			
MIN/ CAP/37	Devise a mechanism to implement a system of compensatory water harvesting and storage around mining clusters by the concerned mines	S&M Department, WR Department, CGWB	M	AD			
MIN/ CAP/38	Protection and restoration of water harvesting structures in catchments in mining intensive areas	S&M Department and WR Department	H	AD	A	IP	
MIN/ CAP/39	Creation of an Environmental restoration fund by contribution from mining houses.	S&M Department	M	MI			
MIN/ CAP/40	Prepare an action plan for reclamation and rehabilitation of old abandoned mines	S&M Department	L	MI			
MIN/ CAP/41	Construction of rest shelters with plantations in mining areas to provide shelters during heat wave conditions	S&M Department	M	AD			
MIN/ CAP/42	Plan for supply of drinking water in the vicinity of mining clusters	RWSS	H	AD	A	PS	

Transport

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
C&T/CAP/1	Use of alternate fuel to conventional fuel	C&T	H	MI	S	PA	ST
C&T/CAP/2	Policy of Phasing out old Vehicles for emission reduction	C&T	H	MI	S	PA	ST
C&T/CAP/3	Ensuring Fuel efficiency (Drivers Training)	C&T	H	MI	S	CB	ST
C&T/CAP/4	Strengthening enforcement wing for emission level check-up (Burning fuels more efficiently)	C&T	M	MI	S	CB	ST
C&T/CAP/5	Revising State Transport Policy	C&T	H	MI	S	PA	ST
C&T/CAP/6	Introduction of MRTS in suburban areas including electric-operated vehicles, preparation of DPR	Housing & Urban Dev Department	H	MI	A	DP	MT
C&T/CAP/7	Protection of Coastal Road Infrastructure from sea erosion	Works Department	H	AD	A	IP	MT
C&T/CAP/8	Green low carbon footprint highway	Works Department	H	MI	A	DP	MT
C&T/CAP/9	Avenue tree plantation for carbon sequestration	Forest & Environment Department & Works Department	H	AD	A	DP	ST
C&T/CAP/10	Integration of urban development and land use planning with transport planning	Housing & Urban Dev Department	H	MI	S	PA	ST
C&T/CAP/11	Development of inland waterways/ setting of ports	C&T	H	MI	S	PS	ST
C&T/CAP/12	Survey of ambient air quality of towns/cities	C&T and PCB	H	MI	A	RS	ST
C&T/CAP/13	Generating public awareness on road safety and traffic management of carbon emission reduction	C&T and NGOs	H	MI	A	CB	ST
C&T/CAP/14	Encouraging transportation of bulk dirty cargo through rail network	C&T	H	MI	S	PA	MT
C&T/CAP/15	Promoting and incentivizing use of non-motorized vehicles	Housing & Urban Dev Department	M	MI	A	DP	ST
C&T/CAP/16	Strategic study for expanding public transportation across the state	C&T	H	MI	S	PA	ST
C&T/CAP/17	Expansion of rail network to reduce carbon emissions	C&T	H	MI	S	PS	ST
C&T/CAP/18	Carbon emissions estimation from the transport sector	C&T	H	MI	S	RS	ST
C&T/CAP/19	Blending of biofuel in auto fuel	C&T	M	MI	S	RS	MT

Urban

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
HUD/ CAP/1	Capacity Building of ULBs on Climate Change impacts & preparedness	H&UD and SPCB	H	AD	S	CB	ST
HUD/ CAP/2	Conduct a techno-economic study on energy efficient designs and equipment for urban water supply and sewerage schemes in ULBs	H&UD, OWSSB and Consultants	H	AD	A	RS	ST
HUD/ CAP/3	MSW composting for both energy efficiency and addressing the methane generation from waste	H&UD, ULBs and Consultants	H	MI/AD	A	IP	LT
HUD/ CAP/4	Conduct a techno-economic study on switching to energy efficient street lighting and develop a Programmatic CDM proposal for implementation by ULBs	H&UD and ULBs	H	AD	A	PS/DP	LT
HUD/ CAP/5	Mandating water assessment and audit	H&UD and CE, PH(Urban)	H	AD	S	PA	ST
HUD/ CAP/6	Revising the guidelines for preparation of Master Plan/CDP and preparing an Integrated City Development Plan with land use and transport planning	H&UD, Town Planning, Dev. Authorities, ULBs	H	MI/AD	A	PS/DP	ST
HUD/ CAP/7	Promoting & Incentivising use of non-motorised transport	H&UD, ULBs, Works Department	H	MI	A	PA/PS/ DP	LT
HUD/ CAP/8	Introduction of BRTS/MRTS and Solar or electric operated vehicles	H&UD, ULBs	M	AD	A	IP	LT
HUD/ CAP/9	Formulate state specific ECBC code and Revision of OPWD Act in line with ECBC code	Energy Department, Works Department	H	AD	S	PA	ST
HUD/ CAP/10	Developing a promotion plan of energy-efficiency in buildings through the adoption of ECBC code and piloting in one city - Green Building	BDA, Town Planning, OREDA, CE(Building)	H	AD	A	PS/DP	ST
HUD/ CAP/11	Improvements to water harvesting in urban areas with restoration of water tanks and artificial recharge	Water Resources Department	H	MI/AD	A	IP	LT
HUD/ CAP/12	Developing models of urban storm water flows and capacities of existing drainage systems with climate change	Water Resources Department	H	AD	A	PS/DP	ST
HUD/ CAP/13	Commissioning Urban Heat Island Study	Energy Department, SPCB	H	MI/AD	A	RS	ST
HUD/ CAP/14	Coastal Road Infrastructure	CE (Roads), CE(N.H), CE (RD QP)	H	MI	A	PS	LT
HUD/ CAP/15	Fly ash in road construction	CE (World Bank Projects), CE (RD QP)	M	MI/AD	S	RS/CB/ DP	ST

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
HUD/ CAP/16	Green low carbon foot print Hway	CE (Roads), CE (N.H), CE (World Bank Projects), CE (RD QP)	M	MI	S	RS/CB/ DP	LT
HUD/ CAP/17	Urban tree Plantation	CE (Roads), CE (N.H), CE(World Bank Projects), F&E	H	MI/AD	S	CB/IP	ST
HUD/ CAP/18	Transport Policy & Boat Policy	Commerce & Transport Department	H	MI	S	PA	ST
HUD/ CAP/19	Development of inland water ways/ setting of ports	Commerce & Transport Department	M	AD	S	IP	LT
HUD/ CAP/20	Survey on ambient air quality of Towns/Cities and encouraging use of Bio fuel, CNG/LPG	Commerce & Transport Department and OSPCB	H	MI	S	PA	ST
HUD/ CAP/21	Generating Public awareness on Road Safety	Commerce & Transport Department, CE (World Bank Projects), NGOs, VOs	H	MI	S	CB	ST

Water

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
WR/CAP/1	Expansion of Hydrometry network	WR, CWC, CGWB, F& E	H	AD	S	CB	MT
WR/CAP/2	Development of flood forecasting models	WR, IMD	H	AD	S	RS	MT
WR/CAP/3	Downscaling of Global Circulation Model	WR, IMD, F & E	H	AD	S	CB	MT
WR/CAP/4	Increasing the water use efficiency, Bench Marking, Water Audit in irrigation projects	WR, H&UD, Industry, RD, energy, Agril.	H	AD	S	CB	MT
WR/CAP/5	Construction of Water Harvesting Structures i.e., Check-dam to adapt to the climate change scenario.	WR	H	AD	S	IP	ST
WR/CAP/6	Provision of fresh water storage structures (Major & Medium) for enhancement of per capital availability	WR, IMD, Agril., H&UD, Ind.	H	AD	S	IP	MT
WR/CAP/7	Improvement of drainage system	WR	H	AD	A	IP	MT
WR/CAP/8	Maintaining Environmental Flow in wetland	WR, IMD Research Organisation, F & E	H	AD	S	RS	MT
WR/CAP/9	Awareness raising with Pani Panchayat through Farmers' Training Programme & creation of Agro-climatic stations.	WR, Agril.	H	AD	A	CB	ST
WR/CAP/10	Integrated Water Resources Management	W.R	H	AD	S	CB	MT
WR/CAP/11	Renovation and improvement of existing storage structures	WR, Panchayati Raj	H	AD	S	IP	MT
WR/CAP/12	New Ground Water Legislation for Urban Water Harvesting	WR, CGWB, H&UD, Development Auth. & Imprv. Trust	H	AD	S	PA	MT
WR/CAP/13	Consumptive use of surface and ground water	WR	H	AD	S	CB	MT
WR/CAP/14	Regulation of Water drawal and wastewater discharge	WR, F&E, H&UD	H	AD	S	CB	MT
WR/CAP/15	Improvement and implementation of Technology for desalination of sea and brackish water	WR, H&UD	M	AD	A	RS	MT
WR/CAP/16	Encourage the use of non-conventional water for beneficial uses.	WR, H&UD, Agril., F&E, Research Organisation	M	AD	A	RS	MT

No.	Title	Orgns.	Priority	Type	Scale	Nature	Time Frame
WR/CAP/17	Improvement of flood management plan and other extreme events like cyclone, drought etc.	WR, IMD, OSDMA, Revenue Department	H	AD	S	CB	MT
WR/CAP/18	Creation of database for ground water resource	WR, CGWB	H	AD	S	CB	MT
WR/CAP/19	Establishment of Academia - Department Interaction	WR, Research Organisation	H	AD	S	CB	MT
WR/CAP/20	Inter Basin Transfer of Water from Surplus Basin to Deficit	WR, IMD, CWC	M	AD	S	PA	MT

Legend:

Priority: H – High, M – Medium, L – Low

Type: MI - Mitigation, AD - Adaptation

Scale: S – State-wide, A – Particular/Focused Area

Nature: RS - Research Study, PA - Policy Action, PS - Pre-investment Study, DP - Demonstration Project, IP - Investment Project, CB - Capacity Building, OM - Regular Operation & Maintenance

Timeframe: ST – Short-term (1-2 years), MT- Medium Term (3-5 years), LT – Long term (> 5 years)

Annexure 6

Stake Holder Response

Agriculture

Sl. No	Issue	Suggestion/ Comments	Agency	Remarks
1	Linkage with National Mission	Each sector, wherever possible, should be linked to the respective Mission of the National Action Plan on Climate Change.	MoEF, GoI	Covered under Para 4.1.1
2	Setting of targets for adaptive and mitigative measures	Various mitigative /adaptive activities have been proposed; indicative targets to be achieved through these activities may be mentioned.	MoEF, GoI	Covered under AG/KP/4.
3	Inclusion of activities provisioned under National Agriculture Mission	Provisions to include additional activities which are not covered under the State Plan but listed in the National Agriculture Mission may be made	MoEF, GoI	Covered under AG/CAP/6 and 9
4	Review of past policies and protection of Agricultural land	Analyze all past policies. Protecting and conserving the existing agricultural land resources from non-agricultural use through a system similar to but more effective than the regime for transfer of land of scheduled caste/tribes. Study on corporatization and commercialization of agriculture. To create adequate cold storage and post-harvest management infrastructure through more efficient/attractive supporting mechanisms than those presently adopted but not much successful in increasing private entrepreneurship in this sub sector.	Orissa environmental Society, Odisha Water Forum, Janata Vikash Manch, RCDC. Odisha Nagarika Samaj (ONAS) Vasundhara, BBSR Nature Environment and Wildlife Society, Angul	Covered under AG/KP/1. For urgent /emergent Community needs diversion of agriculture land would be made following due process of law. Covered under AG/KP/1.
		Criterion of adequate cold storage facilities, supply chain and post- harvest infrastructure through more efficient and financial support - The budget of Rs. 143 Crores for reviewing the present agricultural policy is a big wastage and misutilization proposed by government. All budgetary provisions/projections should be based on appropriate measurable targets and financial calculations.	Odisha Nagarika Samaj (ONAS)	This budget is indicated for policy screening and seed improvement as listed under AG/CAP/2

Sl. No	Issue	Suggestion/ Comments	Agency	Remarks
5	Watershed development	Critical multi-stakeholders Review of Watershed programs in the state required; NREGS fund can be utilized. Focus on Agro -forestry approach to reduce solar radiation which affects the production in dry land. Renovation of small natural water bodies. There is a need to increase the irrigated area of the state through construction of a good number of small and medium Irrigation projects especially in the upper catchment area not only to enhance food production but also to prevent damage due to flood and drought.	Orissa environmental Society, Odisha Water Forum, JanataVikashManch, RCDC, NIPIDIT BiswanathHota Retired Deputy Conservator of Forest, Bhawanipatna	Review is a part of the watershed programme. NREGS in watersheds is implemented as a part of convergence covered under AG/KP/4. Excavation of small water bodies is one of the outputs in NREGS/Watershed programmes. Agro-forestry covered under AG/CAP/26.
6	Addressing vulnerability	Planning Climate Change Actions as per agro climatic zone. CCAP must address vulnerability of small and marginal poor and tribal farmers; it must promote farmers' institutions to interact with other stakeholders. Local perspectives in terms of impact of climate change on agriculture are not reflected. Strategy on Weather insurance and Back yup plan for disasters must be clearly spelled out	Orissa environmental Society, Odisha Water Forum, JanataVikashManch, RCDC, NIPIDIT	Study proposed to determine implications of climate changes on SF/MF covered under AG/CAP/15: State has already initiated weather based crop insurance to mitigate climate risks. Also included in AG/CAP/37
7	Organic Farming	To declare organic farming as industry so as to give a boost to organic practices in agriculture that would help reduce the chemical vulnerability of agricultural lands as well as of wild flora & fauna associated with or affected by agriculture(like certain bird species). Chemical farming should not be encouraged anymore and organic farming should be subsidized. Emphasis on organic farming with reduction of chemical vulnerability of agriculture lands	Dr. BhagbanPrakash Convener, OdishaNagarikaSamaj (ONAS), NIPIDIT Nature Environment and Wildlife Society Angul	Promotion of organic agriculture covered under AG/CAP/25:

Sl. No	Issue	Suggestion/ Comments	Agency	Remarks
8	Crop diversity pattern	To develop a standard crop diversity pattern that would be mandatory(within 1 year of approval of this Plan) for any single agriculture land of size more than 1 acre so as to ensure at least sporadic canopy cover of taller plants (like banana and other fruit crops) in the agricultural fields. A minimum standard sporadic canopy cover required to reduce the vulnerability of large agricultural fields (single-owned or multi-owned) to climate' change (in this context, solar radiation) can be developed by scientists • Develop standard crop diversity and rotation pattern for a particular agricultural land	Dr. BhagbanPrakash Convener, OdishaNagarikaSamaj (ONAS), NIPIDIT	Crop Diversification covered under AG/CAP/20
9	Promotion of SRI	System of Rice intensification (SRI) which is emerging as sustainable paddy cultivation practice and is believed to be contributing positively to arrest climate change by emitting less methane gas should be promoted among the farmers. Similar practices like SSI (Sustainable Sugarcane Initiative) are to be promoted. * Adoption of alternative agricultural practices and appropriate technology like SRI [System of Rice Intensification] and low water requirement crops	Dr. Bhagban Prakash Convener, Odisha Nagarika Samaj (ONAS), Nature Environment and Wildlife Society, Angul	SRI method is included in AG/CAP/18 Other such studies will be carried out under AG/CAP/29
10	Mitigate Drought	Drought is a very big issue for climate change- nothing discussed to mitigate drought in the document	Dr. Bhagban Prakash Convener, Odisha Nagarika Samaj (ONAS),	Covered under AG/KP/9: Developing sustainable soil, water and crop management practices. Covered under AG/KP/10: Breeding studies on major crops for tolerance/resistance AG/KP/5: Integrated watershed development AG/CAP/37: Climate risk management services All these deal with drought mitigation in

Sl. No	Issue	Suggestion/ Comments	Agency	Remarks
				addition to other key priority activities.
		No focus on indigenous seed variety/traditional crops which are resistant to weather extremes. Involvement of other actors should be there other than the government. The action plan should talk about how low carbon economy can be brought in which is completely missing in the present document. Even though women constitute the largest producer but role of women in agriculture is ignored. Tribal areas should be included as rain fed areas.	Nature Environment and Wildlife Society Angul	
11	Food Security	Area development plan for crops that ensure food security	R.C Dash NIPDIT & PAG, Phulbani	National Food Security Mission is working on the select crops to ensure food security.
12	Rural technologies	Application of low cost rural technology for preservation of crops at the producers' level. Emphasis on traditional methods of preservation. Promotion of indigenous technology in agriculture.	R.C Dash NIPDIT & PAG, Phulbani	AG/CAP/17: Promotion of low carbon technologies in climate sensitive watershed area AG/CAP/24: Documentation of ITK is helping in adaptation to climate change covered under some programmes o tribal development department
13	Community to gain CER	The promotion of perennial fruit cultivation will lead to growth of green mass which act as carbon sink. The authorities should look how this can be effectively used by the community to gain CER (carbon exchange rate) thus assisting the community.	Vasundhara, Sahid Nagar	Promotion of Perennial fruit orchards covered under AG/CAP/23

Sl. No	Issue	Suggestion/ Comments	Agency	Remarks
14	Conducting climate related research studies	A remarkable shift in pattern of food grown in tribal dominated area is observed. A paradigm shifting in the cultivation of water intensified crops like rice is observed at water scarcity area. It will have pressure on water thus affecting the community. Thus from climate change perspective this is quite important. A thorough research should be undertaken to assess the impact. Apart from this the potentiality of GHG emissions (methane) from traditional disposal of agricultural waste should be assessed. A through research should be undertaken to know the amount of green house gas emitting from the state from the traditional way of disposal of agricultural waste.	Vasundhara, Sahid Nagar	Study proposed in AG/KP/10.AG/KP/11, AG/CAP/15, AG/CAP/30
15	Promotion of indigenous traditional varieties	Breeding studies on major crops for tolerance/resistances: Instead of conducting research to identify the genotypes of rice, green gram, black gram and other agricultural crops that have specific resistance to multiple stresses, the local indigenous variety of seed should be promoted. In the name of research, there is a chance of promotion of hybrid variety of crops, Bt crops which will have catastrophic impact on the health as well as on the existing gene-pool. Rather the indigenous traditional variety of seeds should be promoted. It has been already proved that the local varieties are more resistant to various types of climatic variations. So these can be promoted.	Vasundhara, Sahid Nagar, BBSR -	Covered under AG/CAP/28: Screening of and value addition to resilient species from local agro biodiversity.

Sl. No	Issue	Suggestion/ Comments	Agency	Remarks
16	Cluster approach to encourage sustainable development	There is need to make specific allocation of funds to extend support to interested farmers in cluster villages on different areas of the state so as to encourage sustainable cultivation and to increase the carbon sequestration and also to reduce serious health hazards arising due to large scale application of chemical pesticides. Study also reveals that the soil that had been organic, had 15 to 28 % greater carbon content than soil treated with chemical pesticides and fertilizers. Organic food products are also tasty, healthy and fetch higher price. The practice also improves the condition of the soil and environment.	BiswanathHota Retired Deputy Conservator of Forest, Bhawanipatna	Watershed management/ Crop management practices/ Organic Farming/ Seed improvement/ Agro-Forestry/ Fruit plantation/ Farm Ponds etc have been proposed under AG/KP/4, AG/CAP/21, AG/CAP/23 , AG/CAP/25, AG/CAP/26
17	Mitigation measures	There seem to be 3 components in the agriculture part of the plan a. Scoping-screening for forecasting, b. Research on adaptation techniques ,and c. Implementation of Adaptation on ground which involves training for existing staff and farmers and on-ground implementation of adaptation mechanisms. What is significantly missing is the mitigation part where the reduction of GHGs through shifting away from chemical fertilisers and carbon sequestration through organic farming could be mentioned and in fact should be pursued. To look at Political precedents on this, interestingly the Andhra Pradesh Government is trying to look at the possibility of accessing CDM money for promoting organic farming rationalizing this ask on the basis of the above two reasons.	Biswajit Mohanty Wildlife society of Orissa, Cuttack	Developing water-efficient micro irrigation methods and individual/ / Agro-Forestry/ Fruit plantation/ Plantations in wastelands in rain fed watershed area/ Improved crop management practices like organic farming, vermin-compost etc. Climate risk management services (weather based crop insurance). Covered under AG/CAP/21, AG/CAP/26, AG/KP/5, AG/CAP/25, AG/KP/10

Coasts and disaster

Sl. No.	Issue	Suggestions/ Comments	Agency	Remarks
1	Adoption and mitigation- aspects dealt with under this sector are not adequate.	Conservation/plantation of mangrove medicinal plants on mud flats should be taken up with community's participation.	NIPIDIT & Phulbani Action Group	This issue is addressed in the key priority- 9 "strengthening of coastal protection methods", of sector Coast & Disaster of CCAP.
2	The document is not talking about the disaster risk reduction , mitigation , adaptation at local level	Local communities should be capacitated to formulate their own contingency plan and respond to the emerging disasters/risks.	NIPIDIT & Phulbani Action Group	This issue is addressed in the key priority- 4 "Conducting micro-level vulnerability assessment" and priority 12 "Setting up an integrated training and capacity building protocol" of sector Coast & Disaster of CCAP.
3	Coordination between Coastal Zone Management Authority and Forest Department is missing.	----	NIPIDIT &Phulbani Action Group	OSCZMA functions in the Forest and Environment Department under the chairmanship of the Principal Secretary, Forest and Environment Department so coordination is there
4	Flood mapping, flood forecasting and down scaled climate change projections modelling.	Apart from this too much dependency on technical aspects will work like boomerang. So instead of relying on such high technology, rather focused should be on the traditional knowledge, experience of river side people in flood forecasting which is quite effective.	Vasundhara	Keeping in view the extreme climate events likely to be exuberated due to climate change and complexity of the issue it is essential to go for modelling.
5	Studying coastal erosion.	There is a requirement of studying the erosion of rivers apart from sea.	Vasundhara	This is not within the scope of this sector. It is a part of the Basin Management Plan. IWRM will address this issue.

6	Needs assessment and constructing multipurpose cyclone shelters	Though development of new multipurpose cyclone shelter is needed, there is a dire need of proper maintenance of old shelters that has been developed. Apart from this essential facility such as deep bore well near to the shelter, provision of HAM radio should be provided.	Vasundhara	Suggestions are being incorporated in the Action Plan.
7	Dredging and river mouth widening to improve flood management:	Apart from this, un-regular lifting of sands from river beds needs to be checked. There is an urgent requirement of assessing the upcoming impact of construction of port on flood control and sea erosion point of view.	Vasundhara	This is a cross cutting issue.
8	Baseline /benchmarking of coastal resources	A good starting point in this regard might be to ensure the mapping of existing spread of mangroves, sand-dunes and other fragile coastal ecosystems which also serve in the context of mitigation. Such a reference should act as a baseline	Biswajit Mohanty	This issue is addressed in the key priority-2 "Assessment of erosion prone areas with the help of Digital Elevation model" and key priority-3 "Studying coastal erosion". of sector Coast & Disaster of CCAP.
9	Assessment of erosion prone areas of the Orissa coast	For arresting coastal erosion, suitable safeguards need to be built to ensure that other coastal hard engineering structures – breakwaters etc and groynes, seawalls are avoided in general and considered only	Biswajit Mohanty	This issue is addressed in the key priority-2 "Assessment of erosion prone areas with the help of Digital Elevation model", of sector Coast & Disaster of CCAP.
10	Impacts of construction of new ports	Ports have been recognised by the NIO as one singular aspect of coastal development contributing towards coastal erosion (NIO studies estimate that around 25% of India's coastline has eroded).	Biswajit Mohanty The Wildlife Society of Orissa	Partly addressed in CAP 4.9.11 This issue will also be addressed in Environmental Impact Assessment studies while considering proposal of new ports in the state.

11	Actions proposed relate to studies, research, modelling would be difficult to execute at State level, as Climate Change is Global Phenomena, also Limited Capacity at State level	Studies may be taken up as part of National/International initiative.	Vrutti Livelihood Resource Centre, Bhubaneswar	Proposed studies, modelling would be carried out by commissioning the services of the competent institutes at the national level.
12	Focus and clarity on preparedness and adaptation strategies – mainly at community level is essential.	Need for evaluating different options before allocating resources.	Vrutti Livelihood Resource Centre, Bhubaneswar	This issue is addressed in the key priority 4 "Conducting micro-level vulnerability assessment" and priority 12 "Setting up an integrated training and capacity building protocol", of sector Coast & Disaster of CCAP.
13	Coastal erosion	Sea erosion is already a phenomena Focus need to be to find technical solution to adopt/prevent Sea Erosion	Vrutti Livelihood Resource Centre, Bhubaneswar	This issue is addressed in the key priority-3, "Studying coastal erosion", of sector Coast & Disaster of CCAP.
14	Limited involvement of local community and civil society	Involvement of vulnerable population like coastal fishermen, Civil Society, Private Sector, PRIs coastal villages in implementation process	Vrutti Livelihood Resource Centre, Bhubaneswar	This issue is addressed in the key priority 4 "Conducting micro-level vulnerability assessment" and priority 12 "Setting up an integrated training and capacity building protocol" of sector Coast & Disaster of CCAP.
15	Early warning system	Early warning system in Coastal Fisheries may be integrated with efforts related to Disaster Management	Vrutti Livelihood Resource Centre, Bhubaneswar	This issue is addressed in the key priority 12 of the Fishery and Animal Husbandry Sector of CCAP.

16	Coastal erosion	It is described that coastal erosion and sea level rise etc. To support this fact, past events or reference from the relevant report may also be quoted.	MoEF	Experience is available in Satabhaya and Pentha. Further studies will be taken up through ICZM studies.
17	Migration and Human settlement	Details of migration and human settlement in coastal areas and their linkage with Climate Change need to be established in this sector	MoEF	The state has conducted multi-hazard assessment and migration from coastal areas is largely related to extreme events. Better preparedness would reduce such impacts and this has been addressed in State Disaster Management Policy.

Fisheries and AH

Sl. No.	Issue	Suggestions	Agency	Remarks
1	The action plan document doesn't talk about the interests of fisher folk.		NIPIDIT &Phulbani Action Group	The issue is addressed in the Key priority 11 "Welfare scheme for coastal fishermen" of sector Fisheries & Animal Resource Development Sector of CCAP.
2	Resource allocation	Fisheries and Livestock Sector are going to be impacted greatly by climate change. But only 12.5 crore rupees is allocated for the same. This is less than 1% of the overall budget.	NIPIDIT &Phulbani Action Group	The budget for key priorities of this sectors is 217.00 Crores and not 12.5 Crores .
3	Gochor land	Protecting all gochar lands from encroachments and non-grazing.	NIPIDIT &Phulbani Action Group	The suggestion is included in the key priority -2 " Emphasis on fodder production ,fodder conservation and rotational grazing" of sector Fisheries & Animal Resource Development Sector of CCAP.
4	Conservation of live stock	Conserving & promoting indigenous livestock-based food security systems	NIPIDIT &Phulbani Action Group	The suggestion is addressed in the key priority -4, of sector Fisheries & Animal Resource Development Sector of CCAP.
5	Awareness	Generating awareness among the fishing communities regarding usage of nets.	NIPIDIT &Phulbani Action Group	The suggestion is addressed in the key priority -8, of sector Fisheries & Animal Resource Development Sector of CCAP.

Sl. No.	Issue	Suggestions	Agency	Remarks
6	Capacity Building	Provision has been made for properly training the live stock keepers in various advanced technologies. These capacity building and training exercises may be expanded to deal with various other development and research activities.	MoEF	The suggestions are being incorporated in the Action Plan (extended to poultry)
7	Welfare scheme for Fishermen	Various saving schemes for fishermen have been included in this report. Other schemes may also be highlighted for protection of the fishermen under the circumstances of loss of aquatic life due to floods, cyclones etc.	MoEF	The suggestions are being incorporated in the Action Plan. Awareness about the existing insurance products can be generated and the insurance coverage for other materials can be included for vulnerable areas.

Forestry

Sl. No.	Issue	Suggestions	Agency	Remarks
1	Community participation	CFM missing from the strategy	NIPDIT, Phulbani, Orissa Dr. ManasRanjan Senapati	Community participation is the key to the success of implementing the OCAP. Therefore, community participation has been emphasized in (i) Protecting existing forest stock to act as carbon sink for stronger conservation (Para 4.5.3.), (ii) Assessing fire management strategies (Para 4.5.7), (iii)Working to establish new systems to support for community users (Para 4.5.9), (iv) Capacity building of VSS to adapt to climate change (Para 4.5.13).
2		It seems that people's traditional knowledge, practice of forest protection has not been duly recognized in this draft action plan. Although a large tract of forest is being protect and managed by community, their effort has not been mentioned in this report.	Vasundhara	
3		Overemphasis over the role of Forest Department and justifying its role as master of Forest reiterating its colonial position and totally bypassing the community based forest protection initiatives without funding (government and non-government).	Dr.Manohar Chouhan	
4	Awareness creation	Awareness should be made for joint forest management in the field of reforestation.	Dr.N.K. Samant	Community participation is the key to the success of implementing the OCAP. Therefore, community participation has been emphasized in (i) Protecting existing forest stock to act as carbon sink for stronger conservation (Para 4.5.3.), (ii) Assessing fire management
5	Reforestation to be left to village	Reforestation work should be left to village and government should provide technology for that.	Dr.N.K. Samant	
6	Natural regeneration through community protection	Natural regeneration would be preferred in case of degraded forests through community protection rather than plantation whose survival rate is minimal.	Nature Environment and Wildlife Society, Angul	

Sl. No.	Issue	Suggestions	Agency	Remarks
7	Involvement of NGOs and people in plantation	ii. In all programs/projects like FDA, NREGS , CAMPA, OFSDP, Bamboo Mission, Forest Village Programe, Industrial plantation, canal embankment plantation etc. implemented by Forest Department should be implemented in a participatory /Joint Forest Management (JFM) mode with involvement of NGOs and focus should be on natural regeneration and protection by people rather than plantation.	Nature Environment and Wildlife Society, Angul	strategies (Para 4.5.7), (iii)Working to establish new systems to support for community users (Para 4.5.9), (iv) Capacity building of VSS to adapt to climate change (Para 4.5.13).
8	Assessing additional threats to biodiversity and wildlife.	Villages close to forested areas are witnessing increasing infiltration on wildlife which increases threat not only to human beings but also to wild animals. To provide protection to wildlife actions should be taken up to create adequate number of water structures inside the forest to cater to drinking water needs of wild animals.	1. NIPDIT, Phulbani, Orissa 2. Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	Biodiversity including wildlife aspect has been dealt in Para 4.5.11.
9	Community-based wildlife conservation	Encouraging community-based wildlife conservation through various support mechanisms like compensating the loss to crops or livelihood because of this protection.	1.NIPDIT, Phulbani, Orissa 2.Dr. Manas Ranjan Senapati 3. Odisha Nagarika Samaj	
10	Plantation and biodiversity	The draft action plan puts a major focus on plantation whereas plantation cannot create forest and so cannot create biodiversity. Even compensatory plantation is not actually compensatory in terms of the loss of ecosystem & biodiversity. The Forest Department must not adhere to any superficial strategy that increases the state burden of debt and can't substitute for loss of biodiversity.	1. NIPDIT, Phulbani, Orissa 2. Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	The focus is to restock and protect the existing forest by assisting natural regeneration supplemented by planting of indigenous local species.

Sl. No.	Issue	Suggestions	Agency	Remarks
11	NTFPs and livelihood	The document is completely silent on people's dependence on NTFPs for sustenance and livelihood. Rather, it talks about reducing the pressure of communities on NTFPs which indicates that the forest dependents will be alienated from the resource in the future. On the other hand it is widely known that around one-fourth population of the state is critically dependent on NTFP livelihood. Again, the NTFP dependent regions are considered as the most poverty stricken and backward areas. Further, this dependence has also been a major triggering factor motivating the rural communities to undertake forest protection and management of their own. Considering these facts priority should be given to strengthening sustainable NTFP livelihood. Ex-situ cultivation of NTFPs which support livelihood and health (with traditional knowledge) should be strongly supported.	1. NIPDIT, Phulbani, Orissa 2. Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	It has been included in Para 4.5.9.
12	NTFP inventorization, conservation and marketing	Protecting and conserving the forest-based food security systems through proper inventorization of various non-timber forest products, promotion of their in situ and ex-situ conservation/propagation, value addition & processing through a centralized effort some autonomous body like NTFP Development Authority. NTFP crop failures should be adequately compensated through cash or kind.	Odisha Nagarika Samaj	It has been included in Para 4.5.9.

Sl. No.	Issue	Suggestions	Agency	Remarks
13	NTFP marketing	On page 37 under section 4.5.13 there is mention about NTFP related livelihood promotion and capacity building. But based on past experience, the govt. may think of strengthening the TDCC or any other suitable agency to take up the marketing on behalf of the NTFP collectors in a way that is beneficial to them (in the lines of GCC in AP or NFP federation of Chhatisgarh). Required budgetary provisions towards this may be provided. It is also needed to promote non forest based livelihood in an intensive way in the tribal areas so that the low productivity of the NTFP species (due to climate change) does not hit them hard. NREGS fund can be used for this purpose.	Dr.D.Suryakumari, Director, Centre for People's Forestry	This is incorporated in Para 4.5.9 (in efficient marketing network)
14	Research agenda	Research agenda should also include periodic study on forests cover and impact on climate change, threats to forest based livelihood etc.	1.NIPDIT, Phulbani, Orissa 2.Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	This has been planned in Para 4.5.14.
15	Protecting and rejoining wildlife corridor	Protecting and rejoining wildlife corridors through natural and artificial methods.	1.NIPDIT, Phulbani, Orissa 2.Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	Linking forest fragmentation has been included in Para 4.5.11. However the suggestion will be taken care while preparing the detailed action plan
16	Natural regeneration of degraded forests	Natural regeneration would be preferred in case of degraded forests through community protection in CFM mode.	1.NIPDIT, Phulbani, Orissa 2.Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	This will be taken care in the preparation of detailed action plan under Para 4.5.2 and 4.5.3. In reforestation/ Afforestation activities in degraded forest areas, a process of assisted natural regeneration will be followed.

Sl. No.	Issue	Suggestions	Agency	Remarks
17	JFM policy	People should be granted full ownership rights over their protected patches irrespective of the legal status, crop status, area or registration under JFM	1.NIPDIT, Phulbani, Orissa 2.Dr.Manas RanjanSenapati	The State JFM Resolution has been revised in 2008. Further revision to address the societal development will be taken up in due course.
18	JFM policy	The exclusive Community Forest Management Institutions in Odisha which have been existing much earlier than the JFM policy and which lose their strength & rights under the present JFM regime, need to encouraged and legal recognisation should be accrued to them as the carbon sink promoters because research says that they sequester carbon from the atmosphere @ 2.55 tones / ha / year through their efforts.	Odisha Nagarika Samaj	
19	JFM policy	Community forestry management is a remarkable feature in Orissa. Enabling and facilitating environment should be created to foster community forestry. Tenurial security should be given to such communities.	Odisha Nagarika Samaj	
20	JFM Resolutions vis-à-vis Forest Rights Act	While the most important role of the government and non-government organizations and institutions is to ensure holding of fair and inclusive (Participation of all) Gram sabha, the Gram sabha / Pallisabha have been manipulated as and when necessary by the government and even by the non government organizations and institutions to serve their temporary and some time their fraudulent need. In this context, giving more emphasis on Vana Samrakshyana Samitties (VSS) formed under JFM where forest Department play a crucial role is constitutionally questionable after the enactment of the Forest Rights Act,2006 which purposively kept the government personal out from the community	Dr.Manohar Chouhan	The State JFM Resolution has been revised in 2008. Further revision to address the societal development will be taken up in due course.

Sl. No.	Issue	Suggestions	Agency	Remarks
		based informal institutions. While the Gram Panchayat consisting of number of habitations/villages have been the central point in dealing with the community people, there is an urgent need to target every habitations/villages as a separate unit while making any plan and dealing with the community people at the grass root level.		
21	Forest Rights Act, JFM Resolutions and mandatory conservation of existing forests	Mandatory conservation of existing forests, potential forest areas, and all such hills that have potential for forest growths. Forest lands remaining after the allotment of parts thereof under Forest Rights Act are to be made free from further encroachments and also conserved with community assistance. Forests claimed under community rights are to be essentially conserved by the allotted communities. To ensure that forest protecting communities conserve and protect their local forests with sincerity and spontaneous sense responsibility, the key issue discouraging them from having this sincerity as well as sense of responsibility should be immediately solved in the light of the last but unimplemented JFM resolution of 1990s and the provisions of FRA,200 i.e. they should be granted full ownership rights over their protected patches irrespective of the legal status, crop status, area, or registration under JFM, but with a condition that in no case the harvesting or final harvesting by them in the forest would disturb the average forest cover or canopy. (that would be determined in each case).	Odisha Nagarika Samaj	As above
22	Compensatory afforestation	Making compensatory Afforestation of indigenous species essentially local to the affected area, and implemented through the involvement of affected communities.	1.NIPDIT, Phulbani, Orissa 2.Dr.Manas Ranjan Senapati 3. Odisha Nagarika Samaj	This practice is presently followed.

Sl. No.	Issue	Suggestions	Agency	Remarks
23	Alternative livelihood support	Encouraging alternative livelihood support to the forest dwellers.	1.NIPDIT, Phulbani, Orissa 2.Dr.Manas Ranjan Senapati	This has been included in Para 4.5.9.
24	Conversion of forest land for non-forestry purposes	The current status of forest in the state should be strictly maintained. No further conversion of forest to non-forestry purpose should take place except under the provisions of Forest Rights Act (for Scheduled Tribes & other traditional forest dwellers)2006.	Odisha Nagarika Samaj	For urgent/ emergent community developmental needs diversion of forest land would be made following the due process of law.
25	Diversion of forest for non-forestry purpose	Diversion of forest for non-forestry should be disallowed without consultation of local communities.	Odisha Nagarika Samaj	
26	Covering bald hills with suitable species mix	Reforestation/afforestation of all hills potential of forest growth would be taken up with the help of local communities and under their ownership. Monoculture is not to be promoted, and various indigenous species having multiple utilities as well as suitability for local biodiversity should be planted in consultation with local communities. The Forest Department should certify a hill that is not suitable for forest growth, following which only the revenue department may lease it out (if necessary).	1.Odisha Nagarika Samaj 2. Vasundhara	Since the overall approach is biodiversity conservation/ development, the indigenous mix species will be promoted.
27	Covering bald hills with suitable species mix	Reforestation/afforestation of all hills potential of forest growth would be taken up with the help of local communities and under their ownership. Monoculture is not to be promoted, and various indigenous species having multiple utilities as well as suitability for local biodiversity should be planted in consultation with local communities. The Forest Department should certify a hill that is not suitable for forest growth, following which only the revenue department may lease it out (if necessary).	1.Odisha Nagarika Samaj 2. Vasundhara	Since the overall approach is biodiversity conservation/ development, the indigenous mix species will be promoted.

Sl. No.	Issue	Suggestions	Agency	Remarks
28	Covering bald hills with suitable species mix	According to the action plan proposed under this area, it will require nearly 835 years to cover the entire area which is ridiculous. A more practicable and strategy needs to be developed and community's participation should be encouraged in this regard.	Odisha Nagarika Samaj	The process of afforesting bald hills is intrinsically difficult and area specific approach is necessary. Efforts will be made to enhance the pace of afforestation in bald hills.
29	Protection of mangrove cover	Increasing and protecting existing mangrove cover along the coast. For this purpose all mangrove patches, irrespective of their legal status or crop status, should be handed over to OSDMA or other such agency for necessary conservation and regeneration activities with community involvement.	Odisha Nagarika Samaj Vasundhara	Forest Department has the expertise to mange and restock mangrove vegetation along the coast and at present conservation and regeneration are undertaken with community participation.
30	Conservation of vultures	Special efforts on high priority for the conservation and reproduction of vultures, with community involvement.	Odisha Nagarika Samaj	Vultures are part of wildlife management plan.
31	Obtaining access to updated knowledge	Obtaining access to updated knowledge on climate change science and policy developments and regular interactions with international bodies like IUFRO so as to ensure updated approaches on climate change.	Odisha Nagarika Samaj	This will be part of the implementing strategy of OCAP.
32	Capacity building of Panchayati Raj institutions/ communities and their institution	Capacity building of Panchayati Raj institutions/ communities and their institution (like village forest protection committees not affiliated to JFM or FDA)/JFM institutions to adapt to climate change. Communities conferred with resource rights under FRA should be capacitated on sustainable forest management contributing to arresting climate change effects.	Odisha Nagarika Samaj	Already included in Para 4.5.13.
33	Protection and conservation of natural hot spots of medicinal plants	Protecting and conserving natural hot spots of medicinal plants like Gandhamardan hills. In-situ conservation and propagation should be the priority.	Odisha Nagarika Samaj	It is broadly included in Para 4.5.11.

Sl. No.	Issue	Suggestions	Agency	Remarks
34	Assessing fire management strategy	Local community and forest staff should be empowered to arrest forest fire by equipping them with modern equipments, fire extinguishers etc.	Odisha Nagarika Samaj	Covered under Para 4.5.7.
35	Integrated forest management policy	Integrated forest management policy should be there.	Odisha Nagarika Samaj	It has been emphasized in the action plan
36	Justification for reforestation and afforestation	The action plan envisages undertaking reforestation/ afforestation activities in 12,500 Sq km area in the next 5 years. For this it has kept a budget of Rs.2,400crore. Reforestation and afforestation activities are nothing new in Orissa. Huge sums of money have been pumped into such activities. However, success of such programmes has always been shrouded in suspicion. Hence, a huge budget here requires some justification from the government. The justification should come with explanation on how much have been spent and how much forest cover has improved due to such plantation. The other point is that Orissa has moderate forest coverage or better than that coverage in only 18.3 percent of its total geographic area. In such context, a target of 12,500 sq km looks quite insignificant to improve forest coverage drastically. Besides, a realistic assessment of available land for afforestation/reforestation has to be made taking the FRA into consideration.	Odisha Nagarika Samaj	In view of extensive degraded forests, reforestation/ afforestation is absolutely necessary. Objective is to restock and protect existing forest.
37	Growth of green cover	A growth of 10% green cover will be achieved by what time and the modalities need to be spelt clearly with year-wise target.	Dina Krushna Joshi	

Sl. No.	Issue	Suggestions	Agency	Remarks
38	Creating forest in revenue area	Creating more forest in revenue area to compensate the loss on forest cover due to mining and industries Under CAMPA may will cost us dear as the loss is of potential agricultural land which could have been used in case of food insecurity. How judicious is this move need to be studied.	Dina Krushna Joshi	Non-agricultural lands are generally considered for compensatory afforestation.
39	Creation forest and agricultural land in lieu of land diverted for industrialization and urbanization	As massive agriculture & forest land have been used for industrialization, mining activities and subsequent urbanization, therefore proportionate agricultural & forest land should be created in this area.	Citizen's Action Forum & ZillaMahila Mancha.	
40	Tree planting by industries	Every industry has to plant tree, the land provided by Orissa Government. That will also maintain by them. Type of tree that will select & provide by Govt.of Orissa. Above all process will be done under supervision of District Collector or nominate member by Govt.of Orissa. Every industry has to go through the one format given by Govt.of Orissa.	UtkalKeshari Biswal	Industries bear the cost of compensatory afforestation as per Forest Conservation Act, 1980 and deposit NPV for the forest land used by them.
41	Conspiracy of the MoEF and Forest Department to bring more and more revenue common land (Westland) under forest category through planned plantation programme	9. There has been conspiracy of the MoEF and Forest Department to bring more and more revenue common land (Westland) under forest category through planned plantation programmes leading to land alienation of the tribal and marginal community. These plans are seems to be blindly planned for the plantation programme even in the waste revenue land and bald-hills areas of many districts without calculating the implications as these lands are under occupation of the local community people. In these area, the number of landless, small and marginal land holders are in majority and they occupies those land and are cultivate those land for their subsistence. There is an urgent need to identify such occupations and to settle them against the cultivators by simplifying the	Dr.Manohar Chouhan	Thrust is to cover land already recorded as forest.

Sl. No.	Issue	Suggestions	Agency	Remarks
		procedures under revenue laws (deserving the un-leasable land) And without finding out the actual status of the waste lands, hills etc and planning for the plantation over them would be just a dream. Besides, the individual occupations over the waste land in the village, there is a great difference between the thoughts of the Government and community people over the community land/common land. While the community people believes these common land as their own land (every one has equal rights individually without any abstraction of others or collective rights of accesses and of use), the Govt. hardly recognizes the collective rights and thought that whatever land in the village not legally belonged to any private person is government land where it can plan whatever it centrally decided. Thus there is great need to understand the relationship of the community people with the common land and also the land use patterns before planning anything		
42	Forest Rights Act, 2006 and Central PESA, 1996 intentionally bypassed	Intentionally, bypassing the constitutional enactment of Forest Rights Act, 2006 and Central PESA, 1996, which has centralized the community (Gram Sabha) in every respect relating to the protection, regeneration and management of the forest, wildlife and biodiversity?	Dr.Manohar Chouhan	Question does not arise. Implementation of all programmes of OCAP will be within the framework of laws.

Sl. No.	Issue	Suggestions	Agency	Remarks
43	Wrong estimation of plantation programmes (area)	Wrong estimation/calculation of plantation programmes (where plantation will be done). The Govt.of Orissa has reported that 265755.77 acres of forest land have been distributed to 168403 number of forest dwellers under individual forest rights and 35064.57 acres of forest land have been distributed under community forest rights by 30th April,2010 under the Forest Rights Act,2006. Besides, thousands of forest dwellers are occupying over forest land are cultivating them and have claimed under forest rights act and thousands of villages are yet to be given their community forest rights under the FRA 2006.	Dr.Manohar Chouhan	Afforestation will be taken up on the vacant /degraded forest land with community participation.
44	Monoculture plantation	In the name of forest regeneration/afforestation/ reforestation, the Forest Department has always gone for the monoculture plantation programme destroying the natural forest habitations and bio-diversity. In this respect, the scientific forest management was followed from the British imperialism to generate more and more revenue by selling timbers, allowing private parties to cut forest as much as they could through forest corporations, the natural forest regeneration through simply protection by the community people have been totally and intentionally neglected.	Dr.Manohar Chouhan	Afforestation programme is implemented as per Working Plans prescriptions. Working Plans have been prepared for scientific management of forests.

Sl. No.	Issue	Suggestions	Agency	Remarks
45	Imposition of formal institutions over the community people replacing the informal, traditional institutions	There has been a practice of imposition of formal institutions over the community people replacing the informal, traditional institutions. Formalizing the institution is not a problem but has been seen that by putting government personnel in the community based formal institutions, the good practices of the informal institutions have been killed and it has become power centers revolving round the government personnel. Thus whenever any plan are being made these formal institutions are felt responsible and accountable while the importance of the community people who are the centre of the plan are bypassed. In such practices the community people losses its credibility and confidence by always depending on the government persons /institutions. Thus, there is a need to change the attitude and practices in the designed plans, giving central authority to the local community people in devising and executing the plans.	Dr.Manohar Chouhan	Community participation in forestry activities are as per the Government policy outlined in JFM Resolution.
46	Monitoring of carbon stock and biodiversity	Since it is clearly pointed out of the cross cutting issues in different sectors of interventions, the Forest Department can not alone be responsible for handling the matters. The Revenue Department, the Tribal welfare Department and the Panchayati Raj Department should be collectively responsible for any plan towards monitoring of carbon stock and biodiversity at regular intervals and see the various programmes implemented.	Dr.Manohar Chouhan	For monitoring of carbon stock and biodiversity at regular interval, appropriate mechanism has been provided in the OCAP.

Sl. No.	Issue	Suggestions	Agency	Remarks
47	Study on the implications of non-funded forest protection initiatives by the community people and its impact over the carbon stocks, etc.	In the study part, there is also a greater need to study the i) Implications of non-funded forest protection initiatives by the community people and its impact over the carbon stocks. ii)Impacts of the scientific forest management system based on monoculture plantations. iii)Impact of continuous practices and activities of the forest corporations upon the carbon stocks. iv)Assessment of forest diversion for the non-forest uses. v)Assessment of the status of plantations done in the name of compensatory afforestation over the period. vi)Study on the individual contributions towards climate change. For example promoting small and marginal farmers to plant trees in bond (hida) of their private cultivable lands for their own household uses etc.	Dr.Manohar Chouhan	This has been dealt in Para 4.5.3 and 4.5.14.
48	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 zone	Plantation in non-forest land will lead to create pressure on agricultural as well as waste land, It will lead to food insecurity.	Vasundhara	Plantation on non-forest land is limited to orchards, trees in farm bunds, roadside plantation, and canal bank and irrigation projects. Tree planting will also be taken up on non-forest private land along the coast for security of coastal region against storm and cyclone.

Sl. No.	Issue	Suggestions	Agency	Remarks
49	Studies on indigenous trees species	Undertaking studies on indigenous trees species to assess their vulnerability to climate change: It is an established fact that indigenous plants are more resistant to any sort of climatic variability. So making studies on the vulnerability to climate change itself means that as if the plant are vulnerable .This type of research will yield no result. There is a dire need of protecting and conserving natural hot spots of medicinal plants like Gandhamardan, Khandadhar, Niyamgiri hills. In-situ conservation and propagation should be given priority.	Vasundhara	Although indigenous plants are more resistant to short term variations in climatic condition, the impact of climate change needs to be studied for advancing scientific knowledge to develop mitigation strategy.
50	Incentive to private individual.	In the field of forestry private individual should be given some incentive to plant forest and increase the forest cover both in private land, government land and reserve forest.	Dr.N.K. Samant	Already covered in Para 4.5.4
51	Individual rights for fruits and homestead use.	Certain amendment are to be incorporated in the Forest Act,1972 and Forest Conservation Act,1980 recognizing individual rights for fruits and homestead use.	Dr.N.K. Samant	It already exists in JFM policy.
52	Industrial development not at the cost of forest degradation and livelihood security of the people	Industrial development is the key for the development of Orissa, but not at the cost of forest degradation and livelihood security of the people. The present South Korea POSCO project in Orissa which will cut down 2.8 lakh trees would have serious repercussions on cyclone, forest conservation and the livelihood security of the people.	Anjan Kumar Sahu	Government is committed to environment friendly development.
53	Promotion of EDC	Promotion of EDC (Eco-Development Committees) and Eco-development activities including eco-tourism rather than Afforestation in protected areas and sanctuaries of Odisha.	Nature Environment and Wildlife Society, Angul	This will be taken care in detailed action plan of Para 4.5.11.
54	Environmental assessment by civil society organizations	Environmental assessment of all industries should be done by civil society organizations and report should be publicly disclosed for proper implementation EAP/EMP by	Nature Environment and Wildlife Society	Already being done through public hearing.

Sl. No.	Issue	Suggestions	Agency	Remarks
		industry.		
55	Need for massive afforestation	Needs massive forestation. If we see our southern/western Orissa de-forestation is the only lively hood for 60/70% population.	N.S. Swain	Massive afforestation / reforestation has been included in Para 4.5.2.
56	Alternative source for fire wood	We should provide alternative source for fire wood to the multitude of people.	N.S. Swain	Already in vogue.
57	Fund for helping villages that are protecting their forests to gain access to alternate livelihoods and alternate fuel sources	It ignores the contribution of community forest management in protecting and developing Orissa forest and allocates no budget for helping villages that are protecting their forests to gain access to alternate livelihoods and alternate fuel sources.	N.S. Swain	Compensation in the form of developmental action in VSS/EDC is being done.
58	Rewards for detection of forest offences	The Orissa Rewards for Detection of Forest Offences Rules,2004, is not encouraging because the percentages of reward are very slow. So reward should be given to informers as well as Govt. staff @ 35% & 15% respectively of theft materials towards incentive. The reward also may be given to villagers / institutions / person(s) those who will catch theft of forest materials with the auto vehicles. By enhancing reward percentage public will be more encouraged to inform the clandestine operations.	Orissa Krushak Mahasangha	The Orissa Reward for Detection of Forest Offence Rules,2004 has provision for grant of reward to forest officials and public informers in cases of seizure of forest produce to the extent of 25% of the sale price of the seized produce. These rules came into force from 28.1.2005.The staff taking part in the detection and seizure are entitled to 45% and the informers are entitled to 45% and the balance 10% of the value of the seized produce is credited to a welfare fund for forest officials and informers. Detailed guidelines for implementation of

Sl. No.	Issue	Suggestions	Agency	Remarks
				the Rules were issued by Government on 4.12.2006. This rule has been promulgated only recently, and its utility and effectiveness need to be carefully assessed before any modification or enhancing of the reward amount is to be considered by Government. Also there is apprehension that enhancing the reward amount beyond the existing level might create an incentive for the unscrupulous elements to resort to illicit felling and commission of forest offence and claim reward as informers. A proper balance has to be struck between the desirability of the grant of reward and misuse of the provision.
59	Aluminium and Iron to be used as alternative material to wood for making door, window and furniture.	Forest has capacity to absorb Carbon dioxide and Carbon-monoxide. So, use of valuable wooden materials in private buildings may completely be banned by making appropriate law. Those who will use these materials shall be liable for disconnection of electric supply, heavy fine and severe punishment. The money collected (from illegal users) may be given to informers as well as Govt.staff on 35% & 15% respectively of theft	Orissa Krushak Mahasangha	Aluminium and Iron cause more damage to environment in long run and hence substituting wood by Aluminium and Iron materials for construction is not desirable.

Sl. No.	Issue	Suggestions	Agency	Remarks
		materials towards incentive. The name of informers may be kept secret. P.V.C. Aluminum an Iron may be used as alternative material to wood for making door, window and furniture.		
60	Plantation and further follow up action to be assigned on tender basis to private agencies	Due to rampant corruption, plantation schemes have failed. Thus, plantation and further follow up action may please be assigned on tender basis to private agencies by taking bank guarantee.	Orissa KrushakMahasangha	Failure of plantation programmes is not a fact. Low survival at some places is attributed to various biotic factors
61	Separate species to be planted in Govt land and private land	Some specific species of tree may be planted by Govt. and some species of trees may be planted by private for commercial purpose. The T.T. permit system for commercial tree cutting may be abolished.	Orissa Krushak Mahasangha	Afforestation programme is based on site suitability for various species.
62	Plantation as a school and college curriculum	Plantation may be included as compulsory subject in the academic curricular in High School, +2 and +3 levels.	Orissa Krushak Mahasangha	Environmental conservation and other related aspects are already covered in the school and college curriculum.
63	Reward to the informer of poaching cases	Wild animals to a greater extent are protecting forest. So the informers of the poachers may be awarded with a cash prize of Rs.25,000 to Rs.50,000/-. The name of the informer may be kept secret. Also 24 hour ANTI-POACHER squad MAY BE MADE IN ALL Wild Life Forest Divisions and Reserve Forests. Retired defense personnel may please be posted in said mobile squad by giving police power and weapons.	Orissa Krushak Mahasangha	Already there.
64	Formation of State Environment Protection Council	State Environment Protection Council (His Excellency Governor as the Chairman) may please be reconstituted as early as possible and the council should sit twice in a year.	Orissa Krushak Mahasangha	Machinery required as per law are already in place.

Sl. No.	Issue	Suggestions	Agency	Remarks
65	Specific indicative targets for afforestation and carbon sequestration	Specific indicative targets for afforestation, carbon sequestration and reducing emissions from deforestation and forest degradation activities may be incorporated as one of the major adoptive/ mitigative activities for reducing GHG emissions.	MoEF, Govt of India	Targets for afforestation/ reforestation have been mentioned in the Plan. Estimation of carbon sequestration potential is in progress.
66	Linkages with Green India Mission and CAMPA activities	Linkages with the Green India Mission may be established and accordingly text may be revised. CAMPA activities may also be referred where appropriate.	MoEF, Govt of India	Already covered in Para 4.5.1.

Health

Sl. No.	Issue	Suggestions/ Comments	Agency	Remarks
1	Respiratory disease	Incidence & Prevalence of Acute Respiratory Infections and Psychosomatic disorders are increasing steadily	Prasanta Kumar Hota, Executive Director Solidarity for Social Equality (Human Rights Centre) AdarshaPada, Post: Rajendra Collge, Balangir-767002	This is already addressed in section 4.6.11 of the action plan
2	Biomedical Waste Management	Management of hospital waste is not in the plan.	R. C. Dash NIPIDIT & PAG, Phulbani	This issue is covered under the existing provisions of BMW Management Rules 1998 under the EP Act.
		Biomedical waste and municipality waste should be properly managed	Prasanna Kumar Behera Honorary Secretary Nature Environment & Wildlife Society (NEWS) L-11/47, Tamrit Colony Angul-759122, Odisha	
		Revamping domestic and hospital solid waste management system	Orissa Voluntary Health Association Lokswasthya Bhawan, Bhubaneswar-	
		Biomedical waste, municipality waste & Solid Waste Management Rules properly enforced /implemented.	Prasanna Kumar BeheraHonorary Secretary (NEWS) L-11/47, Tamrit Colony Angul-759122, Odisha	
	Drug Policy	Not mentioned about review of existing drug policy and illegal drug business.	R. C. Dash NIPIDIT & PAG, Phulbani	It is a sub-activity of Health Policy and it has been addressed under PanchByadhi system.
		Enforcement of drug adulteration Act.	Dr.Bhagabanprakash Orissa NAgarikaSamaj	
	Health Security	High priority on industrial / occupational health security.	Dr.Bhagabanprakash Orissa NAgarikaSamaj	Addressed in Health/KP/2
	Drinking Water	Safe drinking water should be included in all particularly on a priority basis for the underprivileged people.	Dr.Bhagabanprakash Orissa NAgarikaSamaj	Addressed in para 4.6.10 Apparently food safety also includes safe drinking water.
	Heat Wave	Strengthening approaches to deal with heat wave conditions exacerbated due to climate change	Orissa Voluntary Health Association LokswasthyaBhawan, 165- Laxmisagar Square Bhubaneswar-751006, Orissa	Addressed in Health/KP/4.

	Measures to diseases	Undertaking measures to manage water borne diseases that have worsened due to climate change impacts.	Orissa Voluntary Health Association LokswasthyaBhawan, 165- Laxmisagar Square Bhubaneswar-751006, Orissa	Addressed in Health/KP/7.
	Study	Studying the inter-linkages between air quality and climate change, and implications on health.	Orissa Voluntary Health Association Lokswasthya Bhawan, 165- Laxmisagar Square Bhubaneswar-751006, Orissa	Addressed in Health/KP/10.
	Research	Research and studies on climate change and health impacts.	Orissa Voluntary Health Association Lokswasthya Bhawan, Bhubaneswar-	Addressed in Health/KP/8.

Industry

Sl. No	Issues	Comments	Respondents	Remarks
1.	Industrial policy	Various policies have been proposed to be integrated. Reasons for the same may be given	MoEF, Govt. of India	Industrial development of a state is guided by various policies and framework. Prominent of them are Industrial policy. MSME development policy, SEZ policy and PCPIR framework. The action plan aims at integrating climate concerns in each of those policies, so that the development follows a carbon efficient trajectory. The proposal is not to integrate all the policies
2.	Use of ground and surface water by industries	Industries should be totally banned from using underground water.	Prasanta Kumar Hota, Executive Director Solidarity for Social Equality (Human Rights Centre) AdarshaPada, Post: RajendraCollge, Balangir-767002 Phone: 06652-250242	IND/ KP/ 5 addresses protection and conservation of water resources. Complete prohibition on use of water by industry is not feasible. Apprehension on non implementation is well taken and care shall be taken while framing the mechanism for compensatory water harvesting by industries.
		Supply of river water & ground water should be completely banned for industrialization and industries should be directed to use rain water or di-salined water.	Rabindra Prasad Pattnaik, Advocate Er. SasmitaBehera President Convener (Citizens Action Forum) Mahila Mancha	
		Compensatory water harvesting system in the industrial premises sounds good but in practice, it is quite difficult to adopt. Considering the space availability and pattern of rain in these areas, this is not going to solve the problem. Rather the industries should take initiative to build water harvest structures in the surrounding area of their work place. Similarly the industries should be	Vasundhara, A-70, Sahid Nagar, Bhubaneswar	

Sl. No	Issues	Comments	Respondents	Remarks
		stopped from exploring ground water resources as it is putting pressure on common people.		
3.	Fly ash utilisation	There is a greater need to force use of fly ash bricks and for that unless and until soil bricks are not banned, heavily taxed and many more fly ash industries are opened with a cheaper bricks are available, this problem of fly ash is not going to be solved	Bijoy Mishra	This aspect is covered in the fly ash notification of Govt. of India. State level action is also initiated to achieve greater level of compliance. Action point IND/KP/8 addresses promotional issues of fly ash utilisation.
4.	Heat Island Study	Conducting Heat Island study for Talcher- Angul and Jharsuguda as decided to add a few new areas under present Industrilasation process, like Kalinga Nagar area under jajpur dist. and Paradip area.	Bijoy Mishra	Heat island studies are expensive and complex studies. In the initial phase studies are suggested in the area where extreme heat conditions prevail during summer. Other areas can be added subsequently as and when need arises.
		The heat island study should be extended to all the industrial clusters located in the state apart from Angul- Talcher and Jharsuguda area. Industrial city like Kaling-nagar, Paradeep, Joda-Badbil, Rourkela, Kalunga, Kuarmunda and Bonei should be included to study such impact.	Vasundhara, A-70, Sahid Nagar, Bhubaneswar	
5.	Char disposal in Sponge Iron Plant	Unburned or half burn Charcoal fines from sponge iron units needs to be used for Coal Briquettes as tests are been done in the field level by NGOs and will surely bring down burden of char dumping in forest areas and cause for huge loss of forest areas.	Bijoy Mishra	Disposal of char is identified as one of the problem and has serious climate concerns since they adversely alter the land use pattern. The action plan IND/KP/8 addresses the promotional aspect of utilization of char for gainful use.
6.	Green House Gas Emission Reduction and	CCAP should focus GHG reduction with quantified sources of emissions & sinks	Prof. Artabandhu Mishra, Sambalpur	Some aspects are addressed in IND/KP/2. Action shall be taken as per the framework of National Mission on

Sl. No	Issues	Comments	Respondents	Remarks
	monitoring	Non-coal based energy production not spelt		Enhanced Energy Efficiency. Various comments in this segment on monitoring and reduction of GHGs will be addressed through the proposed (Perform Achieve and Trade) PAT scheme of Beauro of Energy Efficiency and will be guided by India's position in the UN negotiation platform.
		These emissions can be reduced by conserving energy, using it more efficiently or changing to cleaner and green energy sources. Green energy is defined as electricity or heat generated from renewable sources i.e. wind, solar, geothermal, biomass, landfill gas etc. Incorporating green building practices is becoming an increasingly common and cost-effective way to reduce energy consumption.	Dr.Manas Ranjan Senapati	
		Assessment of Green house gas emission should be extended to individual industries as in Orissa, there are a large number of industries located in different places. For e.g. there are no industrial clusters in district like Keonjhar. But the total numbers of industries are quite large. All industries should be directed to bring out the figure regarding their GHG emissions. They should be asked to reduced their GHG emission by adaptation of various update technology.	Vasundhara, A-70, Sahid Nagar, Bhubaneswar	

Sl. No	Issues	Comments	Respondents	Remarks
		Industries should be taxed for Carbon Emission.	Rabindra Prasad Pattnaik, Advocate Er. Sasmita Behera President Convener	
		Role of corporate for reducing carbon and compensating the damages of people's health, economy and the resource.	Prasanta Kumar Hota, Executive Director Solidarity for Social Equality(Human Rights Centre)Balangir-767002	
		Proposed Carbon audit procedure to track the carbon footprint of industrial system should b examined more closely in line with Government Policy. Such objectives should be linked to national objective of reduction of energy intensity (and not carbon footprint) per unit of output and not absolute level.	MoEF., Govt. of India	
		Role of corporate for reducing carbon and compensating the damages of people's health, economy and the resource.	R. C. Dash NIPIDIT & PAG, Phulbani	
7	CEPI and Policy for industrialisation	The observations, analysis & recommendations made in "Comprehensive Environmental Assessment of Industrial Clusters", prepared by the statuary body CPCB along with IIT Delhi have been completely ignored in the said "Draft".	Rabindra Prasad Pattnaik, Advocate Er. Sasmita Behera President Convener (Citizens Action Forum) Mahila Mancha	The views are on issues of local pollution and carrying capacity of a region. An industrial cluster with capacity more than its environmental carrying capacity may make the region more vulnerable to climate change. Restricting industrialisation up to the point of carrying capacity is being carried out by SPCB separately by conducting REMP. The outcome of the studies can be used for policy making process for industrial development of the state. Including them in CCAP may not serve any further purpose.

Sl. No	Issues	Comments	Respondents	Remarks
		No further industries should be allowed in over saturated polluted areas. Carrying capacity of all the developing areas must assessed and finalized through open and transparent public consultations before allowing any new industry to come up in the concerned cluster.	Dr.Bhagaban Prakash Orissa Nagarika Samaj	
		No further Power Plants, Industrialization and expansion of existing units should be allowed in Angul-Dhenkanal region.	Rabindra Prasad Pattnaik, Advocate Er. SasmitaBehera President Convener (Citizens Action Forum) Mahila Mancha	
		No new industries & mines should be allowed in the areas like critically polluted, ecological sensitive, and wildlife (elephant) corridor & habitat & water catchments	Prasanna Kumar Behera Honorary Secretary Nature Environment & Wildlife Society (NEWS) L-11/47, Tamrit Colony Angul-759122, Odisha	
		The plan document is not having policy on what condition to invite industries and the management of industrial waste	Prasanta Kumar Hota, Executive Director Solidarity for Social Equality (Human Rights Centre) : Rajendra College, Balangir-767002	
8.	Plantation	Every industry has to plant tree, the Land provided by Orissa Government. That will also maintain by them .Type of trees that will select & provide by Govt. of Orissa	Utkal Biswal	Included in the comprehensive action plan (IND/CAP/37) and can be taken up next in the priority.
9.	Encouragement of local Industrialist	No Planning to discourage the multinational to come for mining and industries.	R. C. Dash NIPIDIT & PAG, Phulbani	Not relevant to climate change.

Sl. No	Issues	Comments	Respondents	Remarks
10	Industrialization in AngulTalcher	Large scale deforestation of Sal Jungle by the Industries in Angul and Talcher area knowing fully well that aforestation of Sal Jungle is not scientifically possible. In flow of various Thermal Power Plant and Captive Power Plant in various Industries working in Angul and Talcher area are only responsible for rising heat in the area. JSPL who mostly install it industry devastating vast Sal Jungle measuring 500 hector may be asked for reforestation of sick Sal forest within the Talcher and Angul area.	Dr. N.K. Samant F.R.C.S (London) President Angul Nagarika Mancha, Angul	Induced in comprehensive action plan(IND/CAP/37). Industrialization and afforestation will be guided by the objectives and framework of National Green India Mission.
11	Industrial corridor	Absence of Industrial corridor for plying heavy vehicles for industries. Care is not also taken to avoid air pollution in open cast coil mines for which the general publics are surviving in unsustainable environment.	Dr. N.K. Samant F.R.C.S.(London), President Angul Nagarika Mancha, Angul	Bulk of the transportation of industrial goods in our state is confined to transportation of minerals and metals. It is thus included in action plan for mining sector.
12	Hydro Power Project	Lack of promotion for hydro power project as natural source of water is plentily available in Angul and Talcher due to locational advantage by the side of the river Mahanadi and Bramhani	Dr. N.K. Samant F.R.C.S.(London), President Angul Nagarika Mancha, Angul	Potential for hydro power projects not only depend upon water availability, available head is also an important aspect. Development of hydro power however has a large bearing on climate change. It is thus included in water sector action plan.

Sl. No	Issues	Comments	Respondents	Remarks
13	Disposal of Industrial waste	Lack of disposal of industrial waste and garbage.	Dr. N.K. Samant, F.R.C.S.(London), President AngulNagarika Mancha, Angul	Views are not clear. However, if it means lack of facilities for disposal of industrial waste, the present policy is to restrict infrastructural capacity, so that there is a greater pressure for utilization of waste. This, along with the promotional action suggested in action plan IND/KP/8 will lead to enhanced waste utilization.
14	Waste Water	All most all industries are disposing the industrial waste water in to the river and streams which pollutes the fresh water and creates artificial scarcity of fresh water. Strong penalty should be imposed on these types of industries.	Prasanna Kumar Behera Honorary Secretary Nature Environment & Wildlife Society (NEWS) L-11/47, Tamrit Colony Angul-759122, Odisha Phone: - 06764-236832, 236532	Pollution of river and stream is a local pollution issue, but it enhances climate vulnerability by making the clean water availability scarce. The prevailing law (Water prevention and Control of Pollution Act. 1974) has adequate provisions to regulate water pollution of rivers and streams by imposing stipulations and penalty. Thus, inclusion in CCAP is not felt necessary.
15	Ban of Old Machineries	Restriction & proper monitoring the use of old machineries by industries & mines	Prasanna Kumar Behera Angul-759122, Odisha	This is an important aspect. Old machineries are less efficient. The PAT scheme under National Mission on Enhanced Energy Efficiency provides a mechanism to address this issue. It is a market based mechanism to achieve higher energy efficiency. A state level action in this regard may be redundant.
16	Water Reservoir and Plantation	Water reservoir and plantations should be done in every village adjoining to the industry / mines by industries / mines as a part of CSR activity	Prasanna Kumar Behera	This issue is addressed in IND/KP/5 and has been adequately described in 4.7.6

Sl. No	Issues	Comments	Respondents	Remarks
17	Fund to promote recycling	Definite allocation of fund has to be made to promote industries based on recycled materials like paper, paper products, scrapes and electronic goods etc. to reduce CO_2 emission.	BiswanathHota, Retired Deputy Conservator of Forest, Bhawanipatna.	Section 4.7.9 and action point IND/KP/8 addresses the issue of promoting reuse and recycling of various industrial waste. Funding for promotion can be considered at the policy level.
18	Emission Target	Setting emission targets for National Power Plant may be reviewed. This must be linked with National Energy Efficiency Mission with specific reference to Performance, Achieve and Trade (PAT). Advice of BEE should be sought.	MoEF,Govt of India	The emission targets will be aligned to the national objective and guided by National Mission for Enhanced Energy Efficiency. Para 4.7.10 clarifies its alliance with the national policy. However, in the face of a national target a state level target becomes redundant. Thus this action point may be dropped from the action plan.

Mining

Sl. No.	Issue	Comments	Respondents	Remark
1	Mineral Policy related Issues	State Mineral Policy needs to be interfaced with Green India Mission and environmental Regulations under the Environment Protection Act.	MoEF Govt of India	Incorporated in Para 4.8.2
		In Mining front lot of conflict is occurring as yet the PRI is not given authority to decide on the issues. And as in Mining the peripheral communities will be directly affected immediately, hence the decision to set mines is totally to be left to community, so that they can also prepare themselves to cope with the Changing climate/ environments. Priority of involvement of PRI on mining issues is totally neglected.	Prasanta Kumar Hota, Executive Director Solidarity for Social Equality (Human Rights Centre) AdarshaPada, Post: Rajendra Collge, Balangir-767002 Phone: 06652-250242	
2	Management of Underground and surface Water	Mines should be totally banned from using underground water	Prasanta Kumar Hota, E D Solidarity for Social Equality	The water issues around mines are extremely important. MIN/ KP/ 5 addresses issues related to protection and conservation of water resources. It will be made mandatory for mines encountering ground water table, to use abandoned pits as aquifer recharging pits. However, complete prohibition may not be feasible. An exercise to map the origin of rivers and streams in the state shall be taken up to identify the risk. Since this is an extremely important aspect, will be added as a new action points. The aspects of plantation
		Mining activities results in premature death of perennial springs thus leading to pollution of water bodies and water scarcity. Till date, a number of perennial springs have been affected in mine infested area of Joda ,Badbil, Koida and Banspal. The draft action plan lacks any concrete measures to address the problem. Rather the government should make measures to debar mining activities at origin place of perennial springs.	Vasundhara, A-70, Sahid Nagar, Bhubaneswar	

		Green fencing / belt should be done before undertaking mining activities.	Dr.Bhagabanprakash Orissa NagarikaSamaj	is taken care of under the existing regulations, thus need no special emphasis.
		Water reservoir and plantations should be done in every village adjoining to the industry / mines by industries / mines as a part of CSR activity	Prasanna Kumar Behera Honorary Secretary Nature Environment & Wildlife Society (NEWS)L-11/47, Angul-759122,	
3	OB management and mining area restoration	Over Burden Dumps (OB Dumps) at mining area should be properly managed with adequate aforestation& distributed it to land less/affected people.	Rabindra Prasad Pattnaik, Advocate Er. SasmitaBehera President Convener (Citizens Action Forum) Mahila Mancha	This is an important aspect and is covered in priority list (CAP/MIN/40)
		The coal mines both open cast and underground mines are to be directed to fill up underground vacant space by sand and open cast mines are to be directed to fill up by sand and ash which would be cost effective measure for government.	Dr. N.K. Samant, F.R.C.S.(London), President Angul Nagarika Mancha, Angul	
		Reclamations old mines & the overburden soil should be shifted to abandon mine for filling up the pit.	Prasanna Kumar Behera Honorary Secretary Nature Environment & Wildlife Society (NEWS)	
4	Strengthening environmental monitoring	There is a direct need of strong monitoring mechanism to check the irregularities in the mining like mining in forest land, beyond the lease boundary. Advanced mechanism like use of RS to monitor the forest land, should be adopted to make it more scientific and efficient.	Vasundhara, A-70, Sahid Nagar, Bhubaneswar	The state govt. is already taking several steps to strengthen the monitoring mechanism. This aspect is also covered in MIN/KP/4.
5	Sprinkling	Coal mines should sprinkle water round the clock in the affected area.	Dr. N.K. Samant, F.R.C.S.(London), President AngulNagarika Mancha, Angul	This is more of air pollution problem than climate change issue.

Transport

Sl. No.	Issue	Comments / Suggestions	Name of Agency	Remarks
1	Reduced Tree Cover in urban areas	In Transportation, provision is to be made for avenue plantation as a primary prerequisite in all road construction works. Estimate of all roads should be done with special provisioning of avenue plantation and made mandatory to be implemented by the concern contractors/ agencies That should also protect the plantation for at least initial three to five years.		During implementation, this needs to be considered under sequestering carbon through avenue plantations. (KP8)
2.	Alternate transport system like inland waterways	Developing inland waterways 4.9.11- Records are already there of the losses incurred due to oil leak in Paradip and Gopalpur coast, even though it is in marine ecosystem, but what will happen if it is in fresh water as we critically depends on for all our sustenance. Hope this factor will be addressed while taking a decision on inland water transport.	Bijoy Mishra	During implementation, this needs to be reflected in the revised State Transport policies (KP1) and also in the action plans for developing inland waterways (KP10).
3.	Alternate fuels like bio-fuel	Dev of Bio fuel- It may be the concept of 21st century, but whether Jatropa or any other, where the land is and who has studied its effect and when there is food insecurity and dependency on other countries for pulses, cereals and many other items, can we afford to have such a initiatives.		Good observation. The following should be considered in KP4: Jatropha plantations will be on wastelands.
4.	Incentive and penalties for modal shift	4.9.3.- Increase in urban Transport system- To see that these systems survive, extra taxes needs to be levied on those who uses private vehicles to schools,	Bijoy Mishra	During implementation, this needs to be reflected in the integration of urban and transport planning (KP2).

Sl. No.	Issue	Comments / Suggestions	Name of Agency	Remarks
		colleges and all such places, so that a huge amount of fossil fuel can be saved from burning and in turn will help in slowing down the process of climate change.		
5.	River-linking	No river joining, ports on river mouths are to be permitted as these will badly affect the Coastal Ecosystem and finally we may loose a natural barrier, which can be of a great help in wake of Sea born natural disaster and Tsunami in coming days.	Bijoy Mishra	During implementation, this needs to be reflected in the revised State Transport policies (KP1) and also in the action plans for developing inland waterways (KP10).
6.	Low Carbon Transport Infrastructure	Promoting environment friendly roads construction materials and methods.	NIPDIT	This is a part of KP5. During implementation, this needs to be reflected in the piloting of low carbon, green highways. (KP5)
7.	Plantations	Mandating minimum damage to the existing tree stock, adopting tree translocation technology for successful uprooting & relocationing of trees to be removed, and selecting suitable species for plantation that would be beneficial for biodiversity also.	NIPDIT	This is a part of KP5. During implementation, this needs to be reflected in the piloting of low carbon, green highways. (KP5)
8.	Run off management	Mandating adequate water percolation measures in all roads	NIPDIT	Water percolation along the roads tend to damage. In any case, precipitation on the roads is led to the storm water drains, which either recharge groundwater or join surface waters.
9.	Public Transport	Strengthening of public transport system	NIPDIT	During implementation, this needs to be reflected in the integration of urban and transport planning (KP2).

Sl. No.	Issue	Comments / Suggestions	Name of Agency	Remarks
10.		Public transport system should be made more energy efficient and converted to CNG/Solar mode		During implementation, this needs to be reflected in the integration of urban and transport planning (KP2).
11.		Regulation of old vehicles (more than 15 years) and phasing out redundant ones.		During implementation, this needs to be reflected in the work done under encouraging fuel use efficiency and tightening enforcement (KP6).
12	Congestions	The present road condition is not sufficient to accommodate the plying of heavy vehicles in absence of an industrial corrider like SukindaParadip express way.	Dr N K Samant	This needs to be considered in the integration of urban planning with transport planning (KP2)
13	Transport Planning and Implementation Issues	Public transport system should be introduced by joining small towns/suburb area f 10 km of district.	Nature, Environment & Wildlife Society (NEWS)	This needs to be considered in the integration of urban planning with transport planning (KP2)
14		All laws relating to MV Act should be properly implemented.	NEWS	This would be taken care under tightening enforcement (KP6)
15		Restriction on use of old vehicles.	NEWS	It has been considered under KP6
16.		Provision of cycle path and stand in municipality and NAC areas.	NEWS	To be considered during integration of urban planning with transport planning (KP2)
17		Provision of truck terminal	NEWS	To be considered during integration of urban planning with transport planning (KP2)
18.		Carbon emission from bio-fuel burning.	Orissa Voluntary Health Association	To be considered under carbon emission estimation from transport sector CAP18

Urban

Sl. No.	Issue	Suggestions/ Comments	Agency	Remarks
1	Habitat and waste management	To be included in mitigative measures under Para 3.2.2	MoEF, GoI	The text under urban to be deleted from para 3.2.3 and included under para 3.2.2 with addition of the following:- "The increased urbanisation and developmental activities have resulted in considerable increase in the quantum of solid waste generation, placing enormous strain on natural resources and undermining efficient and sustainable development. Therefore, there is a need to raise awareness on the use of appropriate technologies for the efficient management of solid waste". Please remove the sentence pertaining to flash floods as it is about adaptation.
2	Building regulations	Roof top rain water harvesting structures to be made mandatory for all apartments and big houses. Per colony garden-cum-plantation are to be made mandatory.	Orissa Nagarik Samaj, NIDPT & Phulbani Action Group, Civil Societies	The following text to be added to para 4.10.10 on page 53. "The provision of rain water harvesting in all the houses as per clause 44 and provision of plantation as per clause 28 of Part IV of planning and Building Standard Regulations, 2008 of Bhubaneswar development Authority is to be strictly enforced. The same provisions are also to be included in all other building regulations which are under process."
3	Green building	Promoting and mainstreaming green building concept.	Orissa Nagarik Samaj, NIDPT & Phulbani Action Group.	To be included as an additional activity under para 4.10.11 on page 53. The state specific ECBC Code will be adopted along with suitable revisions of OPWD Act by the Works Dept. A model plan of energy efficiency in building in conformity with the ECBC Code will be developed and piloted in one city as Green Building. A technical organisation or consultant will be engaged by Bhubaneswar Development Authority to

Sl. No.	Issue	Suggestions/ Comments	Agency	Remarks
				study existing building regulations and bring out an energy efficient design of buildings in conformity with the State ECBC Code. This will be piloted in Bhubaneswar by constructing one such complex which will be replicated subsequently in other parts of the state."
4	Municipal Solid Waste Management	Provision for proper bio-medical waste management- banning of waste of polythene	Civil Societies	The following text to be included in para 4.10.5 on pages 52-53. "Proper management of bio-medical waste and the provision of ban on use of polythene will be duly considered for developing an ideal climate-friendly MSW management plan.

Water

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
1	Ground Water-Developing surface water bodies near mines and industries	In Water front, Industries and Mines should be totally banned from using underground water. They should be given the opportunity to fulfil their water need by developing Surface Water bodies near their mines/ industries. The Agency should invest in developing their sources of Water requirements because the underground Water is the "Aqua-guard water" of rural India (70% of total population of India) and also the same is depleting very fast.	Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	Covered under industry sector. Covered under water/KP/5 Under this investment initiative, particular areas will be identified, existing water bodies will be protected, new water harvesting structures, e.g., check dams for retention of runoff water, are being planned and implemented and ground water recharge options will also be implemented
2	Ban on using of ground water by the industries			
3	No groundwater use by the industries	Water Mission talks about pricing/which will be good if it for Commercial use, but certainly not for Domestic or Agricultural Use as it will directly affect the common man, who holds the dubious distinction of being the Poorest of all in the nation. A new phase of Water Conflict will come to existence. On a specific note water use by industries in Western Orissa which are traditionally drier districts need to be brought under regulation and a Simple 'No' to Ground water use is the need of the hour.	Bijoy Mishra	Policy matter related to groundwater regulations addressed in the state water policy and the frame work of GW regulation is in advance stage of consideration by the Government
4	Regulation for groundwater use	Policy formulation for no ground water usage for industrial purposes	R.C. Dash, NIPDIT & PAG, Phulbani • Solidarity for Social Equality (Human Rights Centre) Bolangir&Subamapur districts	The frame work fdr'* GW Regulations is in advance stage . of consideration by Govt.
5	Groundwater Recharge	Absence of taking measure for ground water recharge	President AngulNagarika Mancha, Angul	Covered in urban industry and water Sector water/KP/5

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
6		Ground water recharge and other techniques should be implemented especially in fluoride affected areas to reduce fluoride contamination	Nature Environment and Wildlife Society, Angul	Covered under industry, urban sector and water sector. Water/ KP/5
7	Monitoring. of groundwater level	Use of pheizometer for monitoring of around water level in time & report should be disclosed before public.	Nature Environment and Wildlife Society, Angul	System already in existence. Covered under water sector water/KP/1
8	Protection from over exploitation of ground water	Effective strategies to protect groundwater from over-exploitation should be implemented on urgency basis	OdishaNagarikaSamaj, Bhubaneswar	Frame work of GW Regulation is in advanced stage of consideration by the Government
9	Rise in temperature due to depletion of groundwater table	Depletion of ground water due to mismanagement of existing water bodies which really avert the rise in temperature in the area.	President AngulNagarika Mancha, Angul	Covered under water sector - Water/KP/5
10	Ground water related issue	It has to take into account groundwater related issues	Focus Orissa Forum Change, Food Rights Collective, Orissa Environmental Society, Odisha Water Forum	Frame work of GW Regulation is in advanced stage of consideration by this government.
11		It has to take into account the issue of groundwater use by industries very seriously		
12.	Rain water harvesting	Rain water harvesting structures must be introduced and made mandatory in all the big buildings in rural and urban areas.	R.C. Dash, NIPDIT &	Covered under Urban sector
			PAG, Phulbani, OdishaNagarikaSamaj, Bhubaneswar and Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	
13.		Thirty years later one third population will suffer from chronic water shortage. Waste water from kitchen sink, wash basin, bathroom etc can be collected and used for flushing, cleaning, gardening etc. Every	Dr.ManasRanjanSenapati, Bhubaneswar	Covered under urban sector

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
		day one person uses 15-20 litres of fresh water for flushing. If rain water from only *2%* area of country is captured, it is equivalent to 117 litres/ person. Roof too rain water harvesting is very much required. Such practices can be employed in urban areas by academic institutions, entrepreneurs, malls, business houses, commercial establishments, apartments, private and government buildings.		
15		Working towards greater water-efficiency: provisions of mandatory implementation of rain water harvesting in all the houses, installation of water meters in domestic and industrial houses, ban of further dig of deep bore well, should be included in the draft action plan report.	Vasundhara, Bhubaneswar	Covered under urban and industry sector
16		Compulsory rain water harvesting system for every new building (private, individual and Govt.)	Nature Environment and Wildlife Society, Angul	Already covered- under urban sector
17	Water Use efficiency	Working towards greater water-efficiency: provisions of mandatory implementation of rain water harvesting in all the houses, installation of water meters in domestic and industrial houses , ban of further dig of deep bore well, should be included in the draft action plan report	Vasundhara, Bhubaneswar	Covered under Urban and Industry sectors
18	Ban on use of water for industrialization	Supply of river water and ground water should be completely banned for industrialization and industries should be directed to use rain water or desalinated water.	Zilla Mahila Manch, Angul and Solidarity for Social Equality (Human Rights Centre) Balangir & Subarnapur districts	Orissa State Water Policy prioritises water use. Industries located in the coast are encouraged for desalinization
19	Use of desalinated water			

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
20	Saline Ingression	Under water resources Saline Ingression is there and will be more as the period of rainy days will reduced keeping the annual rain nearly same as earlier, which will cause flood, cyclone more in coming days, need to be addressed with proper planning for the issue	Bijoy Mishra and Solidarity for Social Equality (Human Rights Centre) Balangir & Subarnapur districts	Covered under - State Water Policy. Covered under- water/KP/1 Frame work of GW Regulation is in advanced stage of consideration by this government
21		It has to take into consideration issues of saline water ingression	Focus Orissa Forum Change, Food Rights Change, Food Rights Collective, Orissa Environmental Society, Odisha Water Forum	Industries located in the coast line are encouraged for desalination
22	Ban on deep bore well	Complete ban on permission of digging deep well which is the main cause of ground water level depletion.	President AngulNagarika Mancha, Angul	Frame work of GW Regulation is in advanced stage of consideration by the Government
23	Management of Water Resources	The state will be challenged in many fronts on the issue of water resources as more coal based industries, mining in forest areas and industries in drier areas are coming in a big way	Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	Covered under water/KP/5,7,9
24	Management of Water Resources	Use of water meter should be made mandatory and flow of wastewater in are to be strictly prevented	OdishaNagarikaSamaj	Systems already exist under the provisions of Water (PCP) Cess Act
25		Water ponds with integrated fish farming, duck rearing, poultry culture, bee keeping etc. should be promoted	OdishaNagarikaSamaj	Schemes are in place
26		There is hardly any money allocated for developing small and micro level irrigation facilities. There is no allocation for increasing the supply of electricity to farmers. On the other hand the government has planned for enhancing the fees for irrigation	Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	Covered under WR/KP 5

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
27		It has to factor in potential of very high intensity water related disasters	Focus Orissa Forum Change, Food Rights Collective, Orissa Environmental Society, Odisha Water Forum	
28		Rivers must be allowed to have natural flow. The idea of river water drainage into the sea as a 'waste' has to be aborted. Minimum interference in river flow has to be assured.	Focus Orissa Forum Change, Food Rights Collective, Orissa Environmental Society, Odisha Water Forum	Covered under WR/KP 7. Under this initiative, a research study will be done in different river basins to determine the environmental flow that will be required to sustain the health and the aquatic ecosystems. Based on the outcomes of this research study, thrust actions will be identified, planned and implemented.
29	Construction of dam	Integrated water resources management. No more big dams.	R.C. Dash, NIPDIT & PAG, Phulbani and Solidarity for Social Equality (Human Rights Centre) Balangir & Subamapur districts	Covered under water/KP/9. Under this, integrated water resources management leads to conserving water, minimizing waste and ensuring equitable distribution across various applications. This is already being practiced within the state. Further capacity building will be done to make integrated water resources management practices operational across the different river basins in Orissa
30.	Flood control	Treatment of water at source to arrest floods	Odisha Nagarika Samaj and Solidarity for Social Equality (Human Rights Centre) Balangir & Subamapur districts	Covered under water/KP/2 and control made by storage dam Under this research initiative, a prototype information system will be developed, demonstrated and validated for effective near-real time flood forecasting, warning and management

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
31.	Agriculture	Low water requiring crops should be promoted	R.C. DASH NIPDIT and PAG Phulbani • Solidarity for Social Equality (Human Rights Centre) Balangir & Subamapur districts	Covered under water use efficiency-Water/KP/4 Covered under Agriculture sector Under this capacity building initiative, sectoral use of water will be identified, wastage will be monitored, technologies / approaches to reduce wastage will be explored and implemented.
32.		Pesticide use during rains should be banned	OdishaNagarikaSamaj	Covered under Agricultural sector
33.		Focused how to reduce water use in agriculture but not mentioned about the irresponsible / irrational use of water by industry. The water quality is damaged through industrial waste / industrial effluents this plan is not supporting poor farmers rather industries.	Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	Covered under industry sector
34.	Conservation of water bodies	Traditional water bodies should be freed from encroachment as well as measures should be undertaken for protection and rejuvenation these structures with community participation	OdishaNagarikaSamaj, R.C. Dash NIPDIT and PAG Phulbani and Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	Covered under urban sector, rural development dept. and panchayat Raj scheme
35.	Conservationof wetland	Conservation of small and medium local wetlands (common property) in urban and rural areas	R.C. Dash NIPDIT and PAG Phulbani Solidarity for Social Equality (Human Rights Centre) Balangir & Subarnapur districts	Covered under Urban sector
36.	Conservation of Water Resources	Mandatory conservation and protection of critical water bodies (surface / underground), which if disturbed beyond their threshold limit, can adversely affect hydrological balances in large areas causing salt	Odisha Nagarika Samaj	Frame work of GW Regulation is in advanced stage of consideration by this government

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
		water intrusion, depletion of groundwater level, etc.		
37.	Conservation of water resource	Mo Pokhari scheme has to be implemented effectively	Odisha Nagarika Samaj	Covered under urban, rural Dev, Panchayat RAJ Dept.
38.	Conservation of wetland	Conservations of small and medium local wetlands (common property) in urban and rural areas	Odisha Nagarika Samaj	Schemes are in place covered
39.		Integrated water resources management. No more big dams.		Covered under Integrated water resource management water/KP -9
40.	Water use policy	Policy for water management for domestic, agriculture and industries	R.C. Dash NIPDIT and PAG Phulbani	Covered under IWRM water/KP/9 Under this integrated water resources management leads to conserving water, minimizing waste and ensuring equitable distribution across various applications. This is already being practiced within the state. Further capacity building will be done to make operational integrated water resources management practices across the different river basins in Orissa
41.	Compensatory water harvesting	Implementing a system of compensatory water harvesting -compensatory water harvesting system in the industrial premises sounds good but in practice, it is quite difficult to adopt considering the space availability and pattern of rain in these areas, this is not going to solve the problem. Rather the industries should take initiative to build water harvest structures in the surrounding area of their work place. Similarly the industries should be stopped from exploring ground water resources as it is putting pressure on common people.	Vasundhara	Covered under industry sector. Covered under water/KP/5 , Under this investment initiative, particular areas will be identified, existing water bodies will be protected, new water harvesting structures, e.g., check dams for retention of runoff water, are .being planned and implemented and ground water recharge options will also be implemented

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
42.	Protection of Perennial Spring	Protecting water bodies: mining activities results in premature death of perennial springs thus leading to pollution of water bodies and water scarcity.. Till date, a number of perennial springs have been affected in mine infested area of Joda, Badbil, Koida and Banspal. The draft action plan lacks any concrete measures to address the problem. Rather the government should make measures to debar mining activities at origin place of perennial springs.		Covered under MIN/KP/5 which addresses protection and conservation of water resources.
43.	Joining of river	Conservation of flood water can only be made by a canal conjoining both Mahanadi and Brahmani through Lingara which is a cost effective measure and in land water transport will also be possible.	President, Angul Nagarika Mancha, Angul	
44.	Water audit	Water auditing & water budgeting system to create a consciousness towards	Vrutti Livelihood Resource Centre, Bhubaneswar	Covered under water/KP/4 Under this capacity building initiative, sectoral use of water will be identified, wastage will be monitored, technologies/ approaches to reduce wastage will be explored and implemented.
45	Coastal	Efficient water use. Need for exclusive focus on coastal embankments & saline Freshwater interface along the coastal line		Covered under Coastal sector
46				
47	Contamination of Water Resource	location of all major rivers catchment area, stream position, blockage if any, point of contamination and all such details can give a scientific truth in the administration hand to assign different developmental activities and failing which severe action under newly made Green Court for speedy decision and terms like	Bijoy Mishra	Covered under water/KP/7'' Under this initiative, a research study will be done in different river basins to determine the environmental flow that will be required to sustain the health and the aquatic ecosystems. Based on the outcomes of this research study, the thrust actions will be identified, planned and implemented

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
		cancellation of MOU, Lease need to be added up.		
48.	Fluoride in water	Due to fluoride pollution by Nalco in air, water and soil, piped drinking water should be supplied to all the people.	President Citizen's Action Forum &ZillaMahila Mancha, Angul and Solidarity for Social Equality (Human Rights Centre) Balangir&Subarnapur districts	Specific Issue not related to Climate Change Action Plan
49.	River flow and quality	Maintain of natural stream that has been blocked, removal of blockage of all type of water flow, checking of pollution of water bodies by disposal of domestic sewage, industrial effluents, has been omitted from the draft action plan	Vasundhara, Bhubaneswar	Covered under environmental flow - WR-7 Under this initiative, a research study will be done in different river basins to determine the environmental flow that will be required to sustain the health and the aquatic ecosystems. Based on the outcomes of this research study, the thrust actions will be identified, planned and implemented.
50.	Water Quality	Mandating water quality management for all ULBs, PRIs; industries / mines and other water user institutions / agencies	Odisha Nagarika Samaj, Bhubaneswar	Covered under respective sectors.
52.		It accepts that climate change is going to cause erratic monsoons and increased incidence of droughts and reduce agricultural production. However, it proposes not increasing irrigation coverage but increase in water tariff collected from farmers.	Solidarity for Social Equality (Human Rights Centre) Balangir & Subarnapur districts	Covered under WR/KP 5
53.		Pollution of water must be treated as a serious offence and deterrent measures have to be kept for offenders	Odisha Nagarika Samaj, Bhubaneswar	Systems are in place
54.	Water Policy	The water plan and state water policy have to be revisited and clear action points be charted therein.	Odisha Nagarika Samaj, Bhubaneswar	

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
55.	Alternate source - of drinking water	Promoting low cost and eco friendly technologies mitigation of arsenic, fluoride and other such water quality problems along with mandatory mechanisms to providing adequate (quality and quantity) alternative drinking water supply for the affected areas.		Various programmes of state Govt, are under implementation
56.	Drinking water	It has to take into account drinking and sanitation issues at all	OdishaNagarikaSamaj, Bhubaneswar	Covered under health sector
57.	Protection of water resources - Preservation of portable water	Protect water source and preserve potable water.	Anjan Kumar Sahu, Centre for Science 8, Environment Jawaharlal Nehru University UmeshPurohit - Youth Service Centre	Covered under Water/KP/5 Under this investment initiative, particular areas will be identified, existing water bodies will be protected, new water harvesting structures, e.g., j check dams for retention of runoff water, are being planned and implemented and ground water recharge options will also be implemented
58.	Promotion for hydropower	Lack of promotion for hydro power project as natural source of water is available in plenty in Angul and Talcher due to location advantage by the side of the river Mahanadi and Brahmani.	President AngulNagarika Mancha, Angul	Strategic plan to address the issue are already covered
59.	Wastewater recycling	Absence of recycling of waste water of various industries		Covered under industry sector
60.	Water transportation	In land water transportation should be encouraged both in river Mahanadi and Brahmani.		Covered under transport sector
61.	Creation of water reserves	Creation of water reserve, farm ponds and plantations should be compulsory items in NREGS implemented by different departments and gram panchayats	Nature Environment and Wildlife Society, AngulUmeshPurohit - Youth Service Centre	Covered under Water/KP/5 Schemes are under implementation

Sl. No.	Issues	Suggestion/ Comments received	Agency	Remarks
62.	Misuse of water	Over use and misuse of water by industries should be restricted and it should be mechanically monitored by using water measuring devices and by jointly by district environmental society / pollution control board / water commission etc.		Covered under industry sector
63.	Safe drinking water	Water management strategy should also incorporate strategy to mitigate vector borne/water borne diseases. Safe drinking water should be ensured for all particularly on a priority basis for the under-privileged people.	Orissa Voluntary Health Association, Bhubaneswar	Schemes under implementation.
64.	Monitoring of developmental work	Citizens monitoring and social audit of all kinds of water development works done by public authorities so as to ensure that the structure has been made strictly as per the hydrological recommendations	Odisha Nagarika Samaj	System are in place not related to climate change
65.	Inter-sectoral Coordination	Inter-sectoral coordination to be improved	Odisha Nagarika Samaj	

Annexure 7

List of References

General

1 Intergovernmental Panel on Climate Change (IPCC), Climate Change Report, Synthesis, 2007.

2 National Action Plan on Climate Change, June 2008.

3 Orissa State of the Environment Report, 2007

4 Economic Survey 2008-09, Government of Orissa.

5 Orissa State Climate Change Action Plan: Scoping Report, March 2010.

Agriculture

6 Common Guidelines for Watershed Development Projects, GoI, 2007

7 Climate Change in Western Orissa – A Policy Brief, Orissa Watershed Development Mission, 2010

8 Guidelines for National Agriculture Development Programme, Rashtriya Krishi Vikash Yojana (RKVY), Department of Agriculture, GoI, April, 2007.

9 National Action Plan on Climate Change, GoI

10 National Food Security Mission-Operational Guidelines, GoI, 2008-09

11 National Horticulture Mission- Operational Guidelines, GoI.

12 Orissa Watershed Development Mission, Performance Assessment of Cluster Livelihoods Resource Centers (CLRCs), September 2009.

13 Orissa Watershed Development Mission Report, 2000-2007

14 Perspective and Strategic Plan for Watershed Development Projects, Orissa Watershed Development Mission, 2010

15 State Agricultural Policy (2008)-Agriculture Department, GoO.

16 Synthesis Report: Effects of Climate Change in WORLP, Working Paper No. 69.

17 Policy Option & Devlopement Priority to cope with climate change impact in Agriculture sector of Orissa state, dissertation by Dr. Aurobindo Behera.

Coasts & Disasters

18 Anonymous, 2004. Revised Coastal zone management plan, Sri Lanka. Coast. Cons Deptt., Ministry of Fish & Aquatic Resources New Secretariate, Maligawatta, Colombo.10. P. 1 -7

19 Behura, B.K. 1999. Bhitarkanika. The wonderland of Orissa. Nature & wildlife conservation Soc. Orissa. Bhubaneswar. P. 19 - 29

20 Brown, B.E. 1997. Integrated coastal management South Asia DFID. Centre for Trop Coast, Manag. Deptt. of Marine Sc. & Coastal Management. New castle upon Tyne NEI, 7RU. U.K. P. 4.1 – 4.10

21 Pattnaik, A.K., P.C. Panda and S.N. Pattnaik,2003. Flora and Vegetation of Chilika lagoon, Orissa. A synoptic analysis. Plat Sci. Res. 25(1&2):1-12.

22 Pethick, J. 1999. An introduction to Coastal geomorphology 14th Edition Edward Arnold. London. P. 9 – 18

Energy

23 National Environmental policy, 2006

24 Fly Ash notification of Ministry of Environment & Forest, Government of India, Nov 2010

25 OERC Annual Publication, 2007-08

26 Policy Guidelines on power Gneration from Non-conventional Energy Sources: 6971/ST, ST- IV- RE 13/2005/3.12.2005

27 Policy Guideline for Raising Energy Plantation and Biod-diesel

28 Production : S&T Dept Resolution dated 23.8.2007

29 Jawaharlal Nehru National Solar Mission Document publshed in January 2010

30 Draft Guidelines for GBI, Small Solar Power dated 10.3.2010

31 Global Warming and Climate Change, Mahendra Pandey, 2005

Fisheries

32 Antony Raja, B., Current knowledge of fisheries resources in the shelf area of the Bay of Bengal. Madras, India : FAO/SIDA Bay of Bengal Programme. BOBP/WP/8. 1980.

33 Chagunda et al., 2009. Effect of genotype and feeding regime on enteric methane, non-milk nitrogen and performance of dairy cows during the winter feeding period. Livest. Sci. v122. 323-332.

34 Desai, B.N. and R.M.S. Bhargava, 1998. Biologic production and fishery potential of the Exclusive Economic Zone of India. In: K. Sherman, E. Okemwa and M. Ntiba (eds), "Large Marine Ecosystems of the Indian Ocan: Assessment, Sustainability, and Management." Blackwell Science

35 Dwivedi, S.N. 1993. "Long-Term Variability in the Food Chains, Biomass Yield, and Ocenaography of the Bay of Bengal Ecosystem," in Kenneth Sherman, et al. (eds.), Large Marine Ecosystems: Stress, Mitigation, and Sustainability (Washington, D.C.: American Association for the Advancement of Science, 1993) pp. 43-52

36 Role of Women in Small Scale Fisheries of the Bay of Bengal. Madras, India : FAO/SIDA Bay of Bengal Programme. BOBP/REP/4. 1980.

37 Suryanarayana, M., Marine tisherfolk of north-east coastal Andhra Pradesh. Calcutta : Anthropological Survey of India. Memior Nc.47. 1977.

Forests

38 Forest Survey of India, Ministry of Environment & Forests, Govt of India: India State of Forest Report 2009. FSI, MOEF, Dehradun, 2009

39 Spittlehouse, D.L. and Stewart, R.B.: Adaptation to climate change in forest management. B C Journal of Ecosystems and Management, vol.4, No.1, 2003. http://www.forex.org/jem/ 2003/ vol4/ no1/art1.pdf

40 Ranindranath, N H and Samashekar, B S, 1995. Potential and economics of forstry options for carbon sequestration in India, biomass and Bioenergy , 8(5): 323-336

41 Ravindranath N H., Murthy I. K., Sudha P, Ramprasad V., Nagendra , M.D.V., Sahana, C.A., Khan,H. and Srivathsa, K.G. 2007. Methodological Issues In Forestry Mitigation Projects: A case study of Kolar District, Mitigation and Adaptation Sttegies for Global Change, Volume 12, Number 6/ July, 2007.

42 Khan Md. N I., Rempei Suwa, Akio Hagihara 2009. Biomass and avove ground net primary production in a subtropical mangrove stand for Kandeliaobovata (S., L.) Yong at Manko

43 Journal of Tropical Forestry, Vol-10, Oct-Dec 1994.

Health

44 Report on Activities of Health & Family Welfare Dept. (2007-08)

45 Workshop Proceedings – Why does the Health Sector need to engage in protecting Human Health for Climate Change, IIPH, Hyderabad (17-18, Sept., 2009)

46 Orissa Vision – 2010 – A Health strategy Feb, 2003, Orissa State – Health Policy, Strategy and Action Plan Points

47 Programme Implementation Plan Orissa, 2009-10 / National Rural Health Mission / Health & Family Welfare Dept.

48 IPCC Asia Report, Chapter 8 Human Health, 2007

Industry

49 Industrial Policy Resolution 2007

50 MSME Development Policy 2009

51 Draft State Economic Zones Policy

52 PCPIR framework document

53 Prospects of Ancillary and Downstream Enterprises in Orissa

Mining

54 Mine water and the Environment, Vol 13, June – December, issue, 1994 PP 1-14

55 OECD Global Forum on International Investment, Conference on Foreign Direct Investment and the Environment. Lessons to be Learned from the Mining Sector7 - 8 February 2002. OECD Headquarters, 2 rue André Pascal, 75775 CEDEX 16, Paris, France

56 Climate Change Background Paper on Mineral Resources by Brad Mullard , Director Coal and Petroleum Development, NSW DPI

57 British Columbia Mining Plan, Ministry of Energy and Mines, PO Box 9324 Stn Prov Govt 1810 Blanshard Street, Victoria, BC V8W 9N3.

58 OECD Global Forum on International Investment. Conference on Foreign Direct Investment and the Environment, African Mining Sector by Dr. C. Frick Council for GeoScience, OECD Headquarters, 2 rue André Pascal, 75775 CEDEX 16, Paris, France.

59 Reclamation of Mining plans, Indian Bureau of Mines

Transport

60 Transport Policy of Orissa - 2007, Commerce & Transport (Transport) Dept, Govt. of Orissa

61 Orissa Boat Rules - 2004, Commerce & Transport (Transport) Dept, Govt. of Orissa

62 Policy Guidelines for Raising Energy Plantation and Biodiesel Production - 2007, Science & Technology Dept. Govt. of Orissa

63 Statistical Abstract of Orissa- 2008, Bureau of Statistics, Govt. of Orissa.

64 Energy Efficiency and Climate Change consideration for on-road transport in Asia- Asian Development Bank, 2006.

65 Mass Transit System for Cuttack and Bhubaneswar - Final Feport Phase-I, 2008, RITES Ltd.

Urban

66 Website for the Housing & Urban Development (HUD) Department, Govt. of Orissa

67 Inputs provided by different Working Group members.

Water

68 Great Barrier Reff, Climate Change Action Plan 2007-2012, Website: www.gbrmpa.gov.au

69 Ministry for the co-ordination of Environmental Affairs (MICOA), National Adaption Programme of Action (NAPA), Approved by the Council of Ministers at its 32nd Session, December, 04 2007, Manputo