

# **Scoping Study for Madhya Pradesh State Climate Change Action Plan**

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*A report for the Government of Madhya Pradesh*

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## **Preface**

The preparation of the report was supported by DFID-India but the views and opinions expressed are the responsibility of Merylyn Hedger and Vaideeswaran S. The project was managed by Virinder Sharma, Livelihoods & Environmental Adviser, Climate Change and Energy Unit, DFID India.

Following submission of this report, on 26 April 2010, State Minister of Energy and Mineral Resources R. Shukla inaugurated a workshop organised by UNDP to strengthen the Climate Change Cell and made the Environmental Planning and Coordination Organisation (EPCO) its nodal agency.

The cell will be developed as a State Climate Change Knowledge Management Centre and the project's cost is € 1.1 million (Rs. 6.5 crore) which will be provided by UNDP as a grant. A project steering committee has been set up under the chairmanship of the Chief Secretary for the successful implementation and inter-department coordination. Principal Secretaries and Secretaries of all the concerning departments have been made members of this committee. A project implementation committee has been set up under the chairmanship of Principal Secretary Housing and Environment.

## Executive Summary

Climate change provides challenges around both the rural and urban fronts for development in the state of Madhya Pradesh (MP). The state is marked with a complex social structure, a predominantly agrarian economy, a difficult and inaccessible terrain, and scattered settlements over a vast area that together pose several formidable problems to service delivery systems. Many areas in MP are vulnerable with considerable poverty and MP already needs to scale up its anti-poverty measures. Climate change has the potential to undermine existing efforts to tackle the mountain of poverty removal in the state and the complex social development problems faced. MP has had considerable experience in challenges associated with managing water infrastructure and accumulated knowledge will be vital in facing the future.

Drought, lack of investment to produce year round cropping, a degrading forest resource are all problems that will be exacerbated by climate change and make the problem of delivering more and better livelihoods more difficult. Economic growth around the state's mineral resources is likely to continue and create an engine of growth, providing problems associated with rapid urbanisation and providing more power from coal can be tackled. There are significant opportunities at this time to ensure pathways allow for advanced energy efficient technologies and infrastructure that can provide the basis for sustainable development.

For the majority of its population who have no or little contact with the commercial energy sector, and need access to energy for economic and social development, there may be new opportunities to tackle long standing problems with a new focus on these issues at national and international levels. There are opportunities to link up with the Government of India (GoI) National Action Plan on Climate Change (NAPCC) policy missions on: enhanced energy efficiency; sustainable habitat; conserving water; and a Green India.

Both of these climate change challenges around the urban and rural nexus could benefit from having a strategic integrated cross-sectoral approach devised at state level, with reference to the national and global frameworks at the next stage.

The State Government of MP intends to prepare a State Action Plan on Climate Change. A scoping study based on Strategic Environmental Assessment (SEA) methodology was commissioned to provide support for the Action Plan. The India Prime Minister (PM) has urged each state Government to create their own State level action plan consistent with the NAPCC<sup>1</sup>. The National Plan has been prepared under the guidance and direction of Prime Minister's Council on Climate Change. The Government has a vision to create a prosperous but not wasteful society, and an economy that is self –sustaining because maintaining a high growth rate to increase living standards is vital for the vast majority of the people and to reduce their vulnerability to climate change. The NAPCC focuses attention on eight priority National Missions.

A small team of consultants carried out the Strategic Environmental Assessment (SEA) scoping study over a period of 2 weeks in February 2010. The study comprised a review of existing documentary information, and a series of meetings and some discussions with Government of MP (GoMP) officials and some representatives of civil society.

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<sup>1</sup> 18<sup>th</sup> August 2009

Because climate change is so cross-cutting there is a need to address risks and opportunities in the development and appraisal of many policies, plans and programmes. For this purpose, SEA was a useful reference tool that provided a basic framework for assessing and managing a broad range of issues that contribute to the integration or mainstreaming of climate change considerations in development planning. As policy on climate change is in its infancy in MP, and will need to be delivered within existing departmental and institutional structures, a bottom-up sector by sector approach was adopted for the scoping study.

In this report, key sectors are analysed with reference to relevant background issues at state and national levels, key issues and concerns are identified and current and potential responses at state level indicated. For each sector, a table is also provided summarising the climate change context, the necessary responses and the state level institutions which will be involved.

Two sets of sectors are reviewed in different sections: those which relate closely to climate change mitigation/energy issues and those where the major issues arise from climate change impacts and adaptation. Climate change mitigation/energy related sectors are; industry, energy, transport, mining, infrastructure, and urban. Sectors where actions will be dominated with adaptation to the serious impacts of climate change are: water, forestry, agriculture, animal husbandry, coasts, fisheries, health and social vulnerability. Obviously most sectors involve both dimensions, for example, opportunities exist to utilise the carbon sequestration function of trees and soils in forestry and agriculture, and critical industry and power infrastructure may be vulnerable to more intense and extreme weather events. The report recommends that developing integrated strategies for these cross cutting adaptation, mitigation and climate services will need to be considered further in the next stage and suggests key dimensions.

Finally, the report outlines what the next steps might be. It will be vital that climate change is embedded into the state's development planning so all the actions identified in this report need to be reviewed by GoMP technical specialists and department experts. The state Government intends to factor climate change into its activities for next year and ultimately climate change needs to be embedded within the five year and annual planning process in all components. However, this will need institutional and technical capacity and additional revenues for investments. Priorities need to be chosen and efforts mobilised. It will be vital to establish what actions are underway but need to be scaled up, what undertaken differently, and what new actions should be started up. A fully empowered and resourced coordinating institutional structure within the state Government is urgently needed to spearhead actions supported by a dedicated small technical team which could link with climate change cells in the different departments/agencies.

## Section A Context and Approach

### 1.1 Background

Climate change provides challenges around both urban and rural fronts for development in Madhya Pradesh. Many areas in MP are vulnerable with considerable poverty and MP already needs to scale up its anti-poverty measures. Climate change has the potential to undermine existing efforts to tackle the mountain of poverty removal in the state and the complex social development problems faced.

For India as a whole, the GoI has decided that climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihood of its people. India may face a major threat because of projected changes in climate as its economy is closely tied to into its natural resource base and climate sensitive-sectors.

The Government has a vision to create a prosperous but not wasteful society, and economy that is self-sustaining; maintaining a high growth rate to increase living standards is vital for the vast majority of the people and to reduce their vulnerability to climate change. The vision aims to achieve national growth objectives by enhancing ecological sustainability leading to further mitigation of greenhouse gas emissions.

Source: NAPCC 2008

The Government recognises that to deal with the challenge of climate change there is a need to act on several fronts simultaneously. Eight National Missions form the core of the NAPCC which will promote understanding of climate change, adaptation and mitigation, energy efficiency and natural resource conservation. Some of the strategies and programmes are already part of current action, although they may need a change direction and accelerated implementation. The Missions are being institutionalised by their respective Ministries and it is clear that several will involve action at state level. The India PM urged each state Government to create their own State level action plan consistent with the strategies in the NAPCC<sup>2</sup>. The NAPCC has been prepared under the guidance and direction of Prime Minister's Council on Climate Change.

The NAPCC focuses attention on 8 priority National Missions. These are:

1. Solar Energy
2. Enhanced Energy Efficiency
3. Sustainable Habitat
4. Conserving Water
5. Sustaining the Himalayan Ecosystem
6. A "Green India"
7. Sustainable agriculture
8. Strategic Knowledge Platform for Climate Change

The State Government of Madhya Pradesh intends to prepare a State Action Plan on Climate Change. This scoping study based on Strategic Environmental Assessment (SEA) methodology was commissioned to provide support for the Action Plan.

### 1.2 Recent observations and trends on climate

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<sup>2</sup> 18<sup>th</sup> August

Analyses of observed trends and projections of future climates are better developed for India and South Asia as a whole than for MP. Further, they provide an overall context for the external changes which are affecting and will affect the state.

Key observed past and present climate trends and variability for India were identified in the IPCC Fourth Assessment Report<sup>3</sup>:

- increasing trends in annual mean temperature which have resulted in an increase of 0.68°C over the last century with a more pronounced warming during post monsoon and winter<sup>4</sup>
- an increase in extreme rains in north-west India with decreasing monsoonal rainfall and a lower number of rainy days along the east coast
- in coastal Asia an increased rate of sea level rise over the past decade has been reported.

Key changes in extreme events identified in the IPCC Fourth Assessment Report:

- There has been an increase in the number of hot days and an increase in multiple-day heat waves in the past century and an increase in deaths due to heat stress in recent years<sup>5</sup>;
- There have been serious and recurrent floods in the north-east States of India in 2002, 2003, and 2004 with further extreme events in Mumbai (2005) and in Sutra, Barmer and Srinigar during the monsoon season of 2006;
- Consecutive droughts in 1999 and 2000 in NW India led to sharp decline in water tables, consecutive droughts between 2000 and 2002 caused crop failures, mass starvation, and affected 11 million people in Orissa.

### **1.3 What climate change could mean**

These observed features are of interest as they mirror projected climate changes for India which will have serious impacts for water supply, agriculture and health. There are however considerable uncertainties about the future behaviour of the monsoon which makes precise prediction difficult:

- Annual mean temperature is expected to rise between 2.5°C and 5 °C degrees under range of scenarios with warming more pronounced in the northern parts of India under sources.
- Some simulations have indicated that summer monsoon intensity may increase beginning from 2040 by 10 per cent by 2100<sup>6</sup>. There may be a general increase in monsoon precipitation in the monsoon season but an overall decrease in the number of rainy days and an increased intensity of rainfall.
- For South Asia, most of the AR4 models project a decrease in precipitation in December, January and February. The IPCC4AR identified that the number of people under severe water stress is likely to increase substantially in absolute terms in South and South East Asia in the foreseeable future<sup>7</sup>
- An increase in occurrence of extreme events including heat wave and precipitation events is also projected along with an increase in the inter annual variability of daily precipitation in the Asian summer monsoon.

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<sup>3</sup> Tables 10.2 and 10.3

<sup>4</sup> Table 10.2

<sup>5</sup> Table 10.3

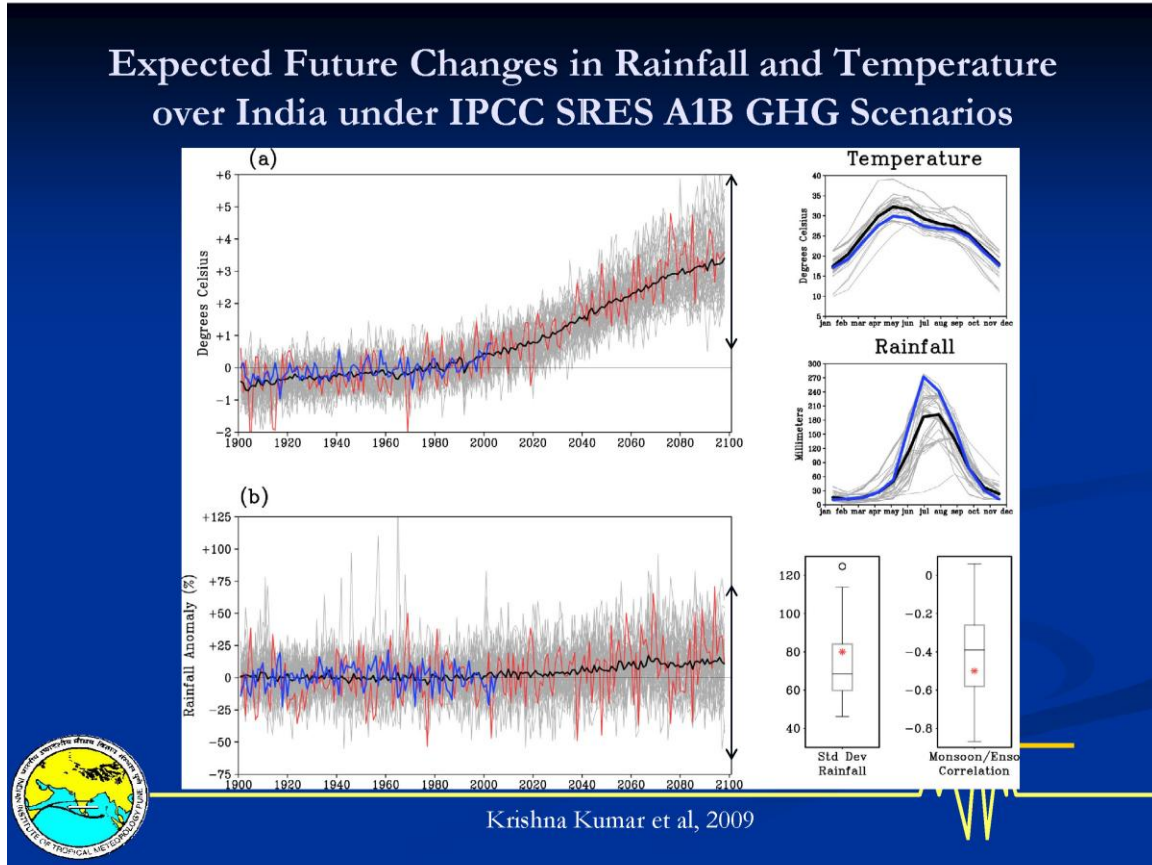
<sup>6</sup> NCCP

<sup>7</sup> IPCC 4AR ch 10 10.4.2.3



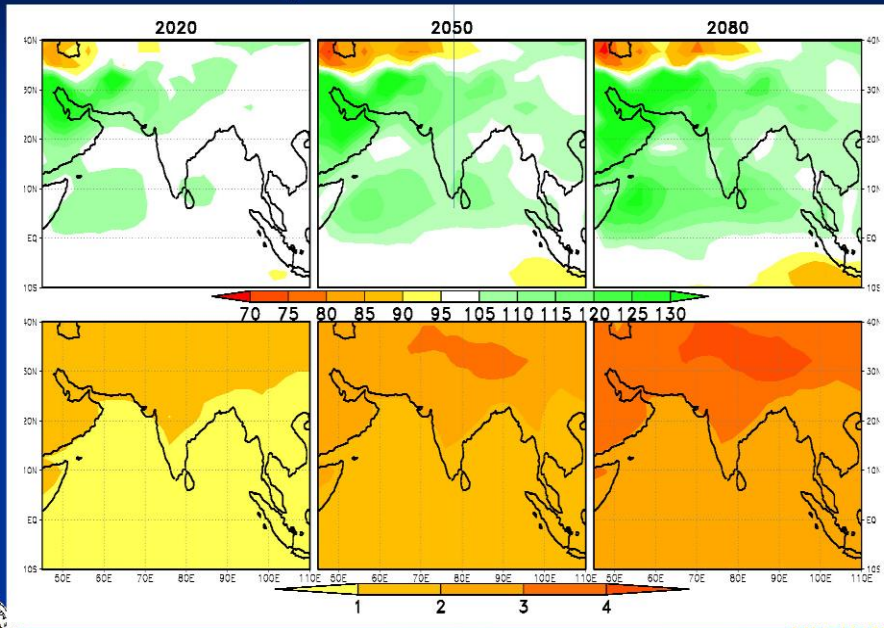
- An increase of 10-20 per cent in tropical cyclone intensities is projected for a rise in sea surface temperature of 2-4 degrees relative to the current threshold temperature.

The diagrams below from the Indian Institute of Tropical Meteorology IITM, Pune show some results using a range of IPCC emissions scenarios and a range of global climate models.



## Expected Future Change in Monsoon Rainfall and Annual Surface Temp for 2020's, 2050's and 2080's

Rainfall



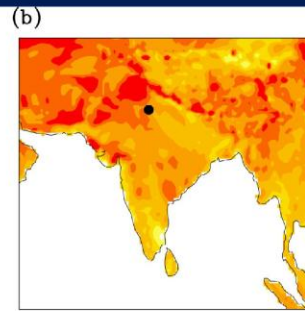
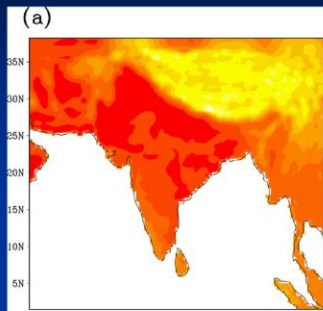
Temp



Krishna Kumar et al, 2009

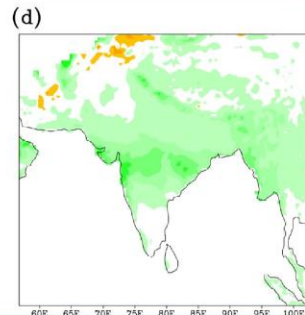
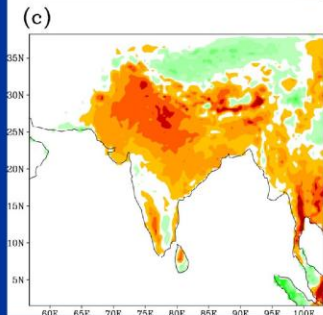
## Projections of Regional Tmax and Daily Rainfall Changes

Highest daily Tmax (C) in The Baseline Period



Expected change in Tmax in Future under A2

Expected change in No. of Rainy Days In future under A2



Expected change in Rainfall Intensity in a rainy day in future



Krishna Kumar et al, 2009

### 1.4 Critical features of Madhya Pradesh

Madhya Pradesh is one of the largest states of the Republic of India. The state is marked by a complex social structure, a predominantly agrarian economy, a difficult and inaccessible terrain, and scattered settlements over a vast area that together pose several formidable problems to service delivery systems. According to the 2001 census, Madhya Pradesh has a population of about 60 million, which is around 6 per cent per cent of the country's population. Ranking 7th in terms of population size and 23rd in terms of population density among the 35 states and union territories, it is a large state with a widely dispersed population and relatively low density. From the point of view of per capita income, literacy, urbanisation, infrastructure facilities and other development indicators, Madhya Pradesh belongs to the category of less developed states of the country<sup>8</sup>.

The last official published estimates showed that 37 per cent (approximately 23 million) of its population live below the poverty line despite a tremendous reduction in poverty over the past 25 years. This is 11 per cent higher than the national poverty head count ratio<sup>9</sup>. The social profile of the state reflects a higher proportion of economically and socially backward population. More than 35 per cent of the total population belong to the marginalised scheduled castes and scheduled tribes compared to 25 per cent for India and these groups form most of the poor (roughly two-thirds). Despite a growth rate of 44 per cent in the urban population the proportion of its people living in the rural areas is fairly high at over 70 per cent<sup>10</sup>.

MP was the first state to decentralise and establish three-tier Panchayaati Raj and Urban Local Bodies as the institutions of local self-governance. This has changed delivery of key services such as education whereby structures right from state to village level have been made by integrating the administrative, academic units and local bodies<sup>11</sup>. Implementation of livelihoods programmes is at local level. MP now has a total of 50 districts; intra-state disparities led to the split of the more backward regions into Chatisgarh in 2001.

### **1.5 Employment and growth**

MP is predominantly an agricultural state: 43 per cent of the workers were cultivators and 29 per cent agricultural labourers, 4 per cent engaged in household industry and 25 per cent in other services according to the last census. So the basic livelihoods of three-quarters of the state are drawn from agriculture, forestry and fishing. Agriculture on which the rural population depends has not registered any growth in real terms in recent years. Furthermore in the last five years or so, manufacturing (both registered and unregistered) has actually been declining. It is the boom in construction, transport, trade, hotels and restaurants, communications, banking and other financial services that has been pulling the state up from an otherwise poor financial performance in the same core sectors<sup>12</sup>.

Both the secondary and tertiary sectors have grown in the past four years at around 3 per cent in real terms (2003-4 to 2007-8). Per capita income in rural areas is only 40 per cent of that in urban areas (Rs 8,900 compared to Rs 22,100 for 1999/2000 the last year for which data is available). Overall the growth rates in per capita income for MP have been less than for India as a whole (0.80 compared to 4.85 1999-2000 to 2007-8). In fact between 1999 and 2008, when the Indian economy grew at an average annual rate of over 7 per cent, MP

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<sup>8</sup> Draft State Health Sector Plan

<sup>9</sup> When the last surveys were undertaken by the Planning Commission in 1999-2000 SOE, p65

<sup>10</sup> SOE p65

<sup>11</sup> HDR 2007 p124

<sup>12</sup> HDR 2007 p135

registered a meagre growth of just 3.5 per cent. This was lower than the growth of some of the poorest states like Bihar (5.1 per cent) and Uttar Pradesh (4.4 per cent).

The development policy for Madhya Pradesh is outlined in the 11<sup>th</sup> Five-Year Plan of the GoMP. The plan establishes clear targets for poverty reduction and human development, while addressing the need for economic growth across different sectors. The GoMP has fixed an ambitious target of achieving overall growth rate of 7.6 per cent for the 11th Plan period (2007-12). The transformation of Madhya Pradesh into a developed state will be a challenging task given the current level of development but there has been effective fiscal management during the last 3-4 years.

## 1.6 CO2 Emissions

Studies on state-level emissions are limited. One of these studies revealed that there is considerable inter-state variation in CO2 emissions. State level CO2 emissions figures for 2000 indicate that Uttar Pradesh (prior to the state's bifurcation) has the highest level of pollution followed by Madhya Pradesh, Maharashtra, Andhra Pradesh, West Bengal, Gujarat and Tamil Nadu. In per capita emission terms, Madhya Pradesh (prior to the state's bifurcation) has the highest emissions at 660 metric tonnes followed by 450 metric tonnes for Delhi, Orissa and Goa. The following table provides the comparative data - both aggregate and per capita - of key states.

Table: State-level CO2 Emissions: 2000

('000 metric tons of carbon)

No.	State	Aggregate	Per Capita
1	J&K	696.5	0.07
2	HP	659.1	0.11
3	Punjab	10845.7	0.45
4	Haryana	5460.5	0.26
5	Uttar Pradesh	44268.3	0.27
6	Rajasthan	8929.3	0.16
7	Delhi	6033.8	0.44
8	Bihar	9012	0.11
9	Orissa	16172.3	0.44
10	West Bengal	23363.7	0.29
11	Assam	1097	0.04
12	Gujarat	18461.5	0.37
13	Maharashtra	35595.4	0.37
14	Goa	652.2	0.44
15	Madhya Pradesh	39729.4	0.66
16	Andhra Pradesh	30126	0.40
17	Karnataka	9059.6	0.17
18	Kerala	3034.2	0.10
19	Tamil Nadu	17584.9	0.28
20	Others	43712.6	0.62

*Source: Ghoshal and Bhattacharya (2007)*

In terms of per capita emissions, Madhya Pradesh (prior to its bifurcation) had aggregate emissions of 39, 729.4 tons and per capita emissions of 0.66. Madhya Pradesh's high aggregate and per capita emissions are due to its coal-based thermal power and also the major energy-intensive industries.

## 1.7 Social development aspects

The performance of MP on Millennium Development Goal (MDG) targets has been poor particularly those on hunger, maternal and child mortality, water and sanitation and environmental sustainability. Infant mortality rates continue to be among the highest in the country at 74, comparable to Orissa (73) and Uttar Pradesh (71). MP is the only state in India that has an 'extremely alarming' hunger problem, a situation comparable to Ethiopia and Chad, according to the International Food Policy Research Institute (IFPRI).

Rates of sanitation are very low, in 2005 it was estimated that less than 10 per cent of rural households had a toilet compared to the national average of 24 per cent, in urban areas the figure was only 68 per cent. In 2001 the census showed that 68 per cent of all households had access to safe drinking water (62 per cent in rural areas).

## 1.8 Environmental aspects

Districts in Madhya Pradesh were identified as being amongst the highest in India in terms of social vulnerability in a study which examined exposure to the effects of climate change and economic globalisation<sup>13</sup>. Natural calamities like drought, floods and hailstorms are a common feature for the state. Almost every year one or other part of the state is generally hot. Between 1991-2003 in all but 2 years (1990-91 and 1993-94) floods or droughts have been experienced<sup>14</sup>. The MP State of Environment report has analysed the natural disasters in the state (mainly drought, floods and heat waves).

There is no clear increase in temperatures in the state in recent years but the summary decadal trends in rainfall suggest below average rainfall trends<sup>15</sup>. During discussions, senior civil servants in water resources and forest departments commented on their perceptions of increased and intense droughts, and erratic rains during the monsoon. In addition an increase in temperatures in groundwater in the state has been observed. Staff within the MP Health Technical Assistance Support team were very concerned about the complex issues around droughts, when food grain production was disrupted, particularly those which were very important for food security. There is considerable temporary urbanisation during drought periods despite food for work programmes, and their estimates are that drought affects around half of the Districts each year. These issues were mirrored with discussions with the Japan International Cooperation Agency (JICA) staff on the reproductive health project who commented how much temporary migration disrupts monitoring of pregnancies and births.

The forest and environmental resources in the state are also under continual pressure and severe pollution of rivers/wetlands, degradation of forests and biodiversity loss has been reported. Poverty environment linkages are impacting on the health indicators and disease burden in the state. Inadequate sanitation and unsafe drinking water has been reported from most of the districts in the state.

Critical issues on climate and environment in the state are:

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<sup>13</sup> O'Brien, K R., Leichenko, U, Kelkar, H. Venema. G. Aandahl, H. Tomkins, A. Javed, S. Bhadwal, S. Barg, L. Nygaard and J. West, 2004; Mapping vulnerability to multiple stressors: climate change and globalisation in India. Global Environmental Change vol 14 p303-313.

<sup>14</sup> SOE p71

<sup>15</sup> SOE chap 2 Overview

- Assessment of current observed climate variability and predicted climate change impacts in MP, with specific reference to the vulnerable regions and communities
- Development of State level Climate Change Strategy and Action Plan
- Integration of climate resilient and low carbon development in sectoral strategies and development programmes
- Facilitate access to cleaner energy, renewable energy and propagate energy efficiency
- Facilitate access to Clean Development Mechanism and carbon markets in the industries, renewable energy, forestry and municipal solid waste (MSW) sectors.
- Support pilots on payment for environmental and forestry services
- Support integrated water resources planning and management in river basins of the state.

### **1.9 Study Aims and Approach**

Action on climate change will involve reframing development pathways with low carbon growth so development opportunities are protected and increased. Climate change policy could provide a new drive to deliver better access to energy in rural areas and for poor groups. People's livelihoods and assets will also need protecting from the potentially damaging impacts of climate change which again will require increased resources; and existing resources will need to be deployed in new ways so that investments in development are not undermined, for example by investing in agricultural strategies that are resilient to higher temperatures and more variable and intense rainfall, or by building new schools which will not flood and/or get very hot.

Because climate change is so cross-cutting there is a need to address risks and opportunities in the development and appraisal of many policies, plans and programmes. There was no specific ready-fit methodology that could be applied that would have worked perfectly within the scoping study. As policy on climate change is in its infancy in Madhya Pradesh, and will need to be delivered within existing departmental and institutional structures, a bottom-up sector by sector approach was adopted. For this purpose, the SEA is an effective tool that provides a framework for assessing and managing a broad range of issues that contribute to the integration or mainstreaming of climate change considerations in development planning<sup>16</sup>. The objective of this study is to assist the GoI to build greater climate resilience by strengthening institutional and planning capacities to adapt to climate change at the state level. More specifically, the SEA methodology applied to climate change aims to:

- Identify key climate vulnerabilities and risks likely to affect development and development plans of the states,
- Assess institutional and planning capacities to manage these risks and vulnerabilities identifying key institutional and planning gaps at the state level and their inter-linkages with national and local level planning.
- Facilitate the development of improved strategic and sector plans for continued sustainable development and economic growth, taking into account changing climatic conditions and promoting,

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<sup>16</sup> In this context, see Organisation for Economic Cooperation and Development / Development Assistance Committee (OECD / DAC) Advisory note titled Good Practice Guidance on SEA (OECD/DAC 2006) and its supplementary note titled Strategic Environmental Assessment and Adaptation to Climate Change (OECD/DAC 2008).

- Facilitate better coordination, integration, and enhancing of various existing programmes, currently delivered by different departments/institutions in a fragmented manner.
- Assess and recommend specific measures to strengthen the policy and incentive framework, including the knowledge base, for supporting the process of adaptation.
- Assess and recommend specific measures for climate change mitigation and adaptation co-benefits.
- Support the development of a State level action plan and strategy to deal with climate change.

### **1.10 Approach to climate change in the State**

Madhya Pradesh is leading in terms of defining the state organisational arrangements and in doing analytical work and technical studies pertaining to climate change. The state Government has established a Climate Change Cell in its agency, Environmental Planning & Coordination Organization (EPCO), which is under the Department of Housing & Environment. As a part of the Cell's activities, a number of technical studies and plan preparations are being initiated. These include the preparation of the state Climate Action Plan with support from the UNDP, an adaptation study focusing on rural areas with GTZ support that will feed into the Action Plan preparation, and a vulnerability assessment study in selected districts with support from the British Government's Department of Energy & Climate Change (DECC) are being initiated or under progress. In addition, some technical studies are being done with support from national agencies such as the Bureau of Energy Efficiency (BEE). All of these initiatives are clearly indicative that Madhya Pradesh has demonstrated its proactiveness and taken the lead in addressing climate change issues.

### **1.11 DFID's role**

DFID, along with ADB and UNICEF, provide the bulk of bilateral/multilateral aid to Madhya Pradesh. The total value of donor commitments in MP is Rs. 10745 crores (approx £1400m). ADB's involvement is in roads, power and urban sector infrastructure. Other donors like UNICEF, IFAD, IDA, JICA work in specific sectors. The World Bank is currently engaged in MP in rural livelihoods and in water & sanitation. It is also considering proposing to the government the development of a comprehensive assistance strategy including a governance action plan.

DFID has been working in MP since early 2000 and has a diverse portfolio of programmes. The overall goal of DFID's engagement in MP is to achieve a significant reduction in poverty and vulnerability in MP in line with the MDG targets and state priorities. Presently, there are four state-level programmes under implementation. These are (i) Strengthening Performance Management in Government, (ii) Urban Services for the Power, (iii) Power Sector Reform and (iv) Rural Livelihoods Programme.

### **1.12 Study Methodology & Timeframe**

The objective of the scoping study was to identify key areas of focus to deal with climate change and climate variability, leading to the development of the state level action plan and strategy. This will also identify further studies/initiatives that would be required to facilitate climate change adaptation and mitigation considerations in the State's overall planning. The purpose is to assess whether the Government and other stakeholders are on the right path to embedding effectively climate change adaptation, mitigation and management of risks from future climate change impacts, into policies / plans / programmes / practices / decision making and with those of the wider public and the private sector.

### ***Team***

A small team of DFID consultants carried out the scoping study. The team included (i) Merylyn Hedger (UK-based International Consultant); and (ii) Vaideeswaran S. (National Consultant). The team conducted this study with active support and co-operation of EPCO. DFID's State Office and the offices of the four DFID-sponsored programmes – SPMG, MP PSR, MP USP and MP RLP supported the team as well.

### ***Secondary information***

A study of the information available with DFID India on Madhya Pradesh and additional web-based secondary information research was done. This covered reviewing the information available with the IPCC, other research articles relevant to climate change impacts in India and studies relevant to Madhya Pradesh. This was done in January 2010, prior to proceeding with a visit to the state.

### ***Primary information***

Initial kick-off meeting at the DFID India office, New Delhi: The consulting team presented an overview of the scoping study with a specific focus on the methodology. In response, feedback was collected from the participants on different aspects of working within the state. Subsequently, further secondary information was collected from the different participants. This was held on January 27, 2010.

Initial meetings with EPCO, Bhopal: The consulting team had initial discussions with the Executive Director, EPCO, and the Climate Change / CDM Cell of the GoMP that is based in EPCO. The various initiatives already under way in Madhya Pradesh pertaining to climate change were discussed. On its part, the consulting team briefed EPCO about the activities proposed under the scoping assignment and the outputs expected. Discussions were also held on how these outputs can be integrated with GoMP's other climate change initiatives, particularly the state Climate Action Plan preparation. These discussions were held in Bhopal on January 28, 2010.

Individual meetings with GoMP departments and stakeholder organisations: A series of individual meetings were held with the GoMP officials of the various departments (with the assistance of EPCO) and with DFIDI programmes & associated organisations (with the assistance of DFIDI-Madhya Pradesh office). As a CDM & Carbon Trading Workshop was being organised between Jan 29-30, 2010, the DFIDI consulting team participated and had many interactions with other participants during the workshop itself.

Given the short timeframe of a week, it was not possible to cover all the GoMP departments and key stakeholders. All of these individual meetings were held in Bhopal between January 29, 2010 and February 6, 2010.

De-briefing meeting on the interim findings in MP: The consulting team had a debriefing team with the Executive Director, EPCO, and the Climate Change Cell on the interim findings. This was held in Bhopal on February 3, 2010. Subsequent to that, a broader meeting to share the interim findings was planned with other line departments under the chairmanship of the Chief Secretary or the Principal Secretary (Environment). However, this was not possible due to other state Government exigencies. It was decided that the findings would be presented in the inception workshop planned as a first step in the UNDP initiative to prepare the State Climate Action Plan. It was also felt that it would be a good way to integrate the scoping study findings with those of the State Climate Action Plans.

De-briefing meeting at DFID: The consulting team presented the findings of the scoping study and shared some of the outputs that were prepared. In response, feedback was collected from the participants. This meeting was held on February 8, 2010.



### **1.13 Report preparation and structure**

Based on the secondary information review and the information collected from the various meetings and feedback from the different presentations made, the team prepared the report. The draft report was completed and submitted to the GoMP in March 2010 for comment.

Two sets of sectors are reviewed in different sections: those which relate closely to climate change mitigation/energy issues (Section B) and those where the major issues arise from climate change impacts and adaptation (Section C). Climate change mitigation/energy related sectors are; energy, industry, energy and urban. Sectors where actions will be dominated with adaptation to the serious impacts of climate change are: rural development sectors: agriculture and forestry, water and health sector is analysed with reference to relevant background issues at state and national levels, key issues and concerns are identified and current and potential responses at state level indicated. For each sector, a table is also provided summarising the climate change context, the necessary responses and the state level institutions which will be involved.

Obviously most sectors involve both dimensions, for example, opportunities exist to utilise the carbon sequestration function of trees and soils in forestry and agriculture, and critical industry and power infrastructure may be vulnerable to more intense and extreme weather events in the coastal zone. In Section D of the report several cross cutting issues such as these are examined.

## **Section B Sectors: Energy focused**

### **Energy**

#### **1.1 Background**

GoMP's main objective for the power sector is increasing power supply to its urban and rural population, and to facilitate economic growth. When the state of MP was divided into MP and Chattisgarh in 2000, separate integrated state utilities were created in the two states respectively. There was an uneven split with 78 per cent of energy consumption in MP and only 68 per cent of the generation capacity. Chattisgarh claimed ownership of assets located in its region and resulted in having a power surplus, whereas MP had a power deficit and also had to purchase power at higher costs.

Considering the situation, GoMP initiated a power sector reform in 2001. This received further impetus from the Electricity Act 2003, which is the cornerstone legislation for the power sector that provides for the legal framework for the efficient development of the sector. Five companies were established for generation, transmission and distribution. Over a period of time, GoMP addressed various issues as a part of the reform process and made substantial headway on different aspects including reducing transmission & distribution losses significantly. The challenges confronting the power sector today include (a) supply of coal, (b) a peak demand shortage and an energy requirement shortage, (c) funds for further power generation, rehabilitation & modernisation, (d) transmission for new projects & system augmentation and (e) distribution for feeder segregation. In addition, support is required for further loss reduction strategies (about 15 per cent achieved over the last 2-3 years) and to recover arrears from municipalities & town panchayats.

Presently, the state's electricity supply is coming from state's own generation capacity (75 per cent) and through purchase from the central grid (25 per cent). Of the state's generation capacity (about 6,000 MW), about 55 per cent is hydropower and the remaining 45 per cent is coal-based thermal. In the future, the ratio will change to having more coal-based power as many new coal-based thermal plants have been planned and there is not a commensurate increase in the hydel power development. GoMP has also signed 42 new MoUs and with a total capacity creation of about 55,000 MW. Of these, the construction of four power projects - total of about 3,000 MW - has already started. In the next 5 years, about 5,000 MW of additional capacity within the state is expected. Madhya Pradesh Power Generating Co. Ltd. (MPPGCL/ MP Genco) is a wholly owned company of the state Government engaged in generation of electricity. MP Genco operates and maintains its existing units, and is also constructing new power plants for increasing capacity.

Narmada Valley Development Authority (NVDA) and the Water Resources Department (WRD) are responsible for developing the hydroelectric power in the state. In the Narmada river, NVDA had developed large hydropower projects such as Indira Sagar HEP (1,000 MW) and the Omrakeshwar HEP (520 MW), and also small hydropower projects such as Tawa Project (13,5 MW). NVDA is also in the process of developing other mini and small hydro power sites on the Narmada river such as 15 MW Chindwara, 20 MW Raghavpur, 35 MW Rosra and 60 MW Basania. Generating hydropower in relation to the other rivers in the state - Son, Godawari (Pranhita) and Chambal - is the responsibility of the Water Resources Department. Together, NVDA and WRD are to tap the overall hydropower potential. The total hydropower potential of Madhya Pradesh from major and medium hydroelectric project has been assessed as 2775 MW. Out of this, 65 per cent power potential has already been developed or is under development at various stages. Thus 35 per cent hydropower

potential through major and medium hydropower projects is yet to be harnessed. Besides the above, most of the power potential from small and micro hydropower is yet to be tapped.

Apart from hydro-electric, MP has an installed capacity of about 160 MW of wind power, about 2 MW of solar power and about 20 MW of biomass-based power. As the assessed potential is significantly higher (wind – about 800 MW, solar – about 1000 MW and biomass – about 250 MW), there are plans to expand the renewable power generation capacity in the state. This is being done through the MP Urja Vikas Nigam (MPUVN), a Government agency dedicated to promote renewable energy in the state. MPUVN has also initiated work on promoting energy-efficiency in the state and has estimated an energy-saving potential of 500 MW. There are sectoral demand-side initiatives under way and also initiatives in industry clusters e.g. steel re-rolling in Indore, to promote energy-efficiency. Explorations are under way for realising the potential of coal-bed methane that are recognised to be present in the coal mines in the state.

### **1.2 Key concerns / issues**

The energy sector that is dependent on coal will be a large contributor to the carbon dioxide emissions. The current ratio of state-generated power is tilted in favour of hydroelectric power but the proposed plans will change that. In the next 5 years, about 11,000 MW of power will be generated for the state. Assuming that about 70 per cent, i.e. 7,500 MW will be coal based, the total carbon emissions will be 37.50 million tons of carbon per year. This is a substantial contribution and, therefore, will be the focus in the context of climate change. MP is also looking at developing Singarauli as a coal-based energy hub of India. Identified as the fourth largest coal mine in India, thermal power development in this area seems inevitable taking into account economic considerations. Not only in Singarauli but also in other districts - Narsinghpur, Khargone and Jabalpur - thermal power plants are being planned. Addressing the carbon emissions arising from the existing plants as well as the new ones will be a focus in the context of climate change. Given that a number of plants are being planned in Singarauli, there may also be critical local environmental and social concerns that need to be considered.

Promotion of renewable energy is a direct way of reducing emissions. Although there is a GoI subsidy scheme to promote renewable energy, this has not yet led to the realisation of the renewable energy potential. One of the reasons is the lower cost of generation from conventional power. This makes the price difference between conventional and renewable power fairly large, and hence the disincentive to go for renewable power. Through the MP UVN, there is a move to promote the commercial establishment of more wind, solar, biomass and also hybrid renewable sources of power. Realising the potential will be a key issue in the climate change context.

### **1.3 Response Actions**

Energy generation is vital for the state's economic development. Given that coal-based power can be generated at lower cost, it is the inevitable choice. Therefore, it is important to choose cleaner technologies and operate plants in a more efficient manner. Prior to proceeding with any new thermal power station in the short-term, technology alternatives should be carefully analysed for operational efficiencies. As these efficiencies are directly linked to carbon emissions, the most operationally efficient technology will also be the carbon-efficient one. For the medium-term (12<sup>th</sup> & 13<sup>th</sup> Plan), only the more efficient supercritical and IGCC technologies should be considered. Renovation & modernisation of existing plants should also be undertaken to improve operational efficiencies. The present drive to reduce transmission and distribution losses should be sustained. In terms of carbon

capture technologies, MP has a comparative advantage as it houses the pilot plant for carbon capture in its university premises in Bhopal. GoMP must draw lessons from this experience and keep its power sector up-to-date so that these technologies are gainfully employed once they become commercially viable.

Focused attention and importance should be given to realise the full renewable energy potential of the state, i.e. hydro, solar, wind, biomass-based power plants and hybrid combinations (e.g. wind-solar) as well. Policies and promotional measures need to be enhanced in order to realise this potential. For example, large energy-intensive industries, like the Manganese Ore India Limited initiative, should be mandated to establish renewable energy plants in the state. Overall, much greater awareness should be generated about these renewable technologies and their contribution to global concerns and local sustainable development issues. Also, the identification of usable coal-bed methane needs to be pursued and feasibility of tapping this potential needs to be further explored.

Through MPUVN and the various Discoms, demand side management initiatives should be substantially expanded to tap the energy-efficiency potential. There is an ongoing initiative between one Discom and the BEE – Bachat Lamp Yojana (BLY) – that has not yet made much progress. More focus needs to be given to its implementation and similar initiatives needs to be planned with other Discoms as well. Similar initiatives such as switching to energy-efficient lighting in all Government buildings need to be given an additional thrust.

There are a number of initiatives in the energy sector being undertaken in the state that are eligible for generating carbon credits either in the Certified Emission Reductions (CER) or Voluntary Emission Reductions (VER) markets. However, these initiatives are not being considered from that perspective. The Climate Change Cell should consider these initiatives from a CDM lens, particularly through the use of the small-scale methodologies and programmatic CDM, and explore whether these carbon credits can be generated through either the CER or VER markets.

The Central Ministry of Environment & Forests announced a non-binding emission intensity reduction target of 20-25 per cent (with 2005 as the baseline) in all sectors except agriculture. If this has to be met at the country level, all states will have to contribute to meeting this target. As a response action, GoMP should develop the baseline and also assess the implications on the energy sector in the state.

## 1.4 Summary

For the energy sector, the findings are included in the following table. These relate to the climate change context with the response actions and organisations, which have to follow-up.

Context	Response Actions	Organisations
Emission reduction	<u>Cleaner coal technologies:</u> Establish mechanisms for ensuring choice of energy-efficient generation technologies in the near term and further exploring the use of supercritical & IGCC technologies in projects proposed for subsequent 5-year plans.	MP Genco
Emission reduction	<u>T&amp;D losses:</u> Continue the ongoing initiative to reduce T&D losses.	MP Genco
Emission reduction	<u>DSM / EE:</u> Implement DSM measures to realise the energy savings potential in the state.	MP UVN & three MP Discoms

Emission reduction	<u>Wind, solar &amp; biomass:</u> Implement the plans made to realise this renewable potential.	MP UVN
Emission reduction	<u>Small and micro hydropower:</u> Provide a further impetus to realising the hydropower potential in the state.	MP Genco, NVDA and WRD
Emission reduction	<u>Coal bed methane:</u> Continue exploration initiatives and determine feasibility of using this methane as a source of power	MP Genco
Emission reduction	<u>CER &amp; VER markets:</u> Consider the use of smallscale methodologies and programmatic approaches for developing CDM projects. Also, develop an approach to tap carbon credits either from the CER or VER markets for the various initiatives being planned.	EPCO (Climate Change Cell)
Emission reduction	<u>Emission intensity targets:</u> Conduct a study to determine the implications on the proposed national emission intensity reduction targets on the state's energy plans.	MP Genco, three MP Discoms, MP UVN and EPCO (Climate Change Cell)

## Industry

### 2.1 Background

The industry sector in Madhya Pradesh can be broadly classified as mineral-based and non-mineral based. Madhya Pradesh is a major mineral producing state in India. Coal, limestone, manganese ore, bauxite, copper, dolomite, fire clay and slate are the main minerals occurring in the state. Malajkhand, the country's largest copper ore mine is situated in Balaghat district of Madhya Pradesh. The state also has vast reserves of limestone. These reserves are spread across the state, i.e. over the districts of Damoh, Hoshangabad, Mandsaur, Narsingpur, Rewa, Satna, Panna, Katni, Sagar, Dhar, Khargone, Jabhua, Balaghat, Sidhi and Morena. The state has rich deposits of manganese ore, mainly spread over the Balaghat, Chhindwara and Jabhua districts. Apart from coal that is used for thermal power, the state has substantial potential for mineral-based industries. Cement is a large industry sector. Madhya Pradesh is the third largest producer of cement in the country. It caters to 13 per cent of the national demands. The state is rich in cement producing minerals & the logistical advantages of these locations reduce the overall cement manufacturing and supply chain cost, helping the cement companies to get a higher return on investment. The state has the appropriate knowhow & knowledge pool to run cement plant. At present, several major groups like Birla Corporation, Vikram Cement, Prism Cement, J.P. Rewa, Diamond cements, Maihar Cement and ACC Cement are present and are growing manufacturing plants in Madhya Pradesh. Considering the present scenario & the availability of raw material, there is a scope of further investment of US \$2.5 billion in this sector in the state. The state is also the sole producer of diamonds in the country. The only working mines of diamond in India are in Panna district.

Apart from mineral-based industries, MP has become a major auto manufacturing base, a large producer of radial tyres, a consumer electronics hub, a rapidly growing textile and apparel hub and a growing gems & jewellery centre. The agro / food processing sector is a major focus / thrust in the state. It is a leading producer of oilseeds and also the largest soya-processing hub in India. Being strategically located in the centre of India, having a continuous supply of skilled workforce, having a peaceful industrial work atmosphere,

endowed with natural resources and a proactive, entrepreneur-friendly government have made the state an attractive industrial option.

MP's industrial base comprises about 600 large or medium scale units, and about 5,200 small-scale units. There are a number of industrial belts, e.g. Indore and Dewas, all across the state. A few of these are only small-scale units, e.g. Govindpura in Bhopal and another near Indore. In planning for the future, the state is promoting Special Economic Zones (SEZ) in various parts. There is an alumina-based SEZ (lead by Hindalco), a steel-based SEZ (lead by Eurobond), Food processing SEZ in Jabalpur, a multi-product SEZ in Pitampur and information technology SEZs in Indore & Gwalior. In addition to these SEZs, the state is developing 11 districts under the Delhi-Mumbai Industrial Corridor (DMIC). This is to make use of dedicated freight corridor between the two cities. Power and defence industry, food processing and cement are the likely constituents of industries in this corridor. Once established, all of these will become major energy consumers in the state. As these industries will have to pay for its power, it will be in their interest to be energy-efficient in terms of their choice of technologies and their operational practices.

## **2.2 Key concerns / issues**

The mineral-based industries are energy-intensive. 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. The mineral-based industries have to work in hot conditions. With the likely increase in the average temperatures due to climate change, this will also become an issue in the future. The mineral-based industry, cement, is not only energy-intensive but also a direct emitter of carbon dioxide. Among the non-mineral based industries, soya processing is large and can be adversely affected due to rainfall / precipitation variations. MP has a few chemicals-based industry clusters, e.g. in Ujjain. It is likely that these industries emit chemicals, such as SF<sub>6</sub>, that have a large greenhouse gas potential.

## **2.3 Response actions**

In the mineral-based industries, the challenge in the industry sector will be to address both the global and local pollution problem in an integrated and coordinated manner. Cleaner production technologies, methods and practices need to be adopted on a high-priority. The waste heat recovery technology in the cement plant is a good example of what is being and should be pursued. Apart from energy-efficiency initiatives, industries should be encouraged to consider other greenhouse gas emission reduction initiatives such as waste-to-energy in distilleries (reducing methane emissions) as well. From level of individual industries, these should be extended to sub-sector specific or technology-specific or cluster-specific (within different geographies) plans. These need to be evolved and executed. As GoMP is aggressively promoting further industrialisation, the state's industry will become a large energy consumer and hence carbon emitter. Therefore, it is imperative that the GoMP ushers both the existing industries and the new industries in a climate-friendly energy-efficient path. The approach should be more promotional/voluntary rather than regulatory.

CDM can be used to provide incentives for reducing carbon emissions in industry. Given the prevailing uncertainty in relation to CDM projects and carbon markets, GoMP should consider using CDM for projects that bring about a large reduction of carbon emissions, i.e. above 100,000 tons of carbon emissions. As a number of CDM promotion programmes have already been taken, a more focused / targeted approach should be taken. Promoting programmatic CDM through sector-specific industry associations and / or in geographical clusters should also be explored.

Undertaking industry-level or sub-sector level initiatives need to be supported by policy level considerations. In this context, there is the Mineral Development Policy 1995 and the Industrial Policy 2004. Both these policies should be reviewed from a climate change perspective. The subsequent versions of these policies should incorporate climate change considerations.

Very recently, the Central Ministry of Environment & Forests announced a non-binding emission intensity reduction target of 20-25 per cent (with 2005 as the baseline) in all sectors except agriculture. If this has to be met at the country level, all states will have to contribute to meeting this target. As a response action, GoMP should develop the baseline and also assess the implications on the industry sector in the state.

## 2.4 Summary

For the industry sector, the findings that relate the climate change context with the response actions and organisations that have to follow-up is to be included in the following table:

Context	Response Actions	Organisations
Protecting industrial assets and emissions reduction	<u>Industrial Policy 2004 &amp; Mineral Development Policy 1995</u> : Integrate climate change considerations in these policies.	Industry Department & Mineral Resources Department
Emissions reduction	<u>CDM</u> : Target promotion of CDM that have large carbon reduction potential and programmatic CDM in energy-intensive industry sub-sectors and / or geographical clusters.	Industry Department & EPCO (Climate Change Cell)
Adapting to climatic changes	<u>Agro-based industry</u> : Conduct an analytical study on the implications of climate variability on agro-based industry such as soya processing and other food processing.	Industry Department, Consultants and Private Sector industries
Adapting to climatic changes	<u>Heat waves</u> : Undertake an analytical study on extreme heat conditions that prevail in the summer in the context of mineral-based industries, e.g. steel and aluminium smelters.	Industry Department
Emissions reduction	<u>Cleaner production centres</u> : Establish these centres for the various sub-sectors through industry associations and large companies. Focus of these centres should be on establishing the baseline for energy consumption, cost-competitive cleaner production technologies and processes, and targeted specific energy-intensive goals for each of the sub-sectors.	Industries Department, Mineral Resources Department, Industry associations & large companies
Emission reduction	<u>Emission intensity targets</u> : Conduct a study to determine the implications on the proposed national emission intensity reduction targets on the state's industrial promotion plans.	Industry Department

### **3.1 Background**

India is urbanising at the rapid pace and its cities have become the engines of growth at national and regional levels both. This is true of Madhya Pradesh as well. The state has 26 towns/cities with populations over 100,000 (2001 Census) including the capital Bhopal. The state is undergoing considerable change in terms of urban and economic growth, with the population of 60.4 million (Census 2001). Despite its reputation as a largely rural state, Madhya Pradesh has a large and growing urban population. The estimated urban population is 16.1 million, 27 per cent of the total, very similar to the all India proportion of 28 per cent. In line with expected trends in India, urbanisation in Madhya Pradesh is expected to intensify over the coming decades. The urban population is therefore likely to exceed 25 million by the year 2021.

MP is the third poorest in terms of the population living below the poverty line. Urban local bodies, like anywhere in the world, are constantly grappling with problems. It's fire fighting for city managers everyday. They have to face acute and varied pressures. There is a general perception that municipal authorities function poorly, and not to the satisfaction of the citizens. Urban local bodies have a number of tasks to perform without having commensurate financial and professional capacities. The need is for all urban players – citizens, local government, state government, national government, the private sector and civil society organisations – to work harder to solve urban problems and challenges. The responsibility for this sector falls under Urban Administration & Development Department (UADD). To keep pace with the growing demands of the urban area, the Department has been taking effective and adequate steps 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 Act of the 1990s empowered the Urban Local Bodies (ULBs) to function as local self-government. It is the responsibility of the UADD to make the ULBs self-sufficient and centres for good governance.

For its urban development, GoMP is using funds available in the GoI-funded schemes – Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Urban Infrastructure Development in Small & Medium Towns (UIDSMT) and Integrated Housing and Slum Development Programme (IHSDP). In addition, there are two externally aided projects that are currently ongoing. DFID-funded MP Urban Services for the Poor (MPUSP) is a five year (2006-11) programme with the GoMP and selected Urban Local Bodies (ULBs) to build their capacity to deliver better services for the poor. The programme will help cities to bring reform in their city governments, improve the ways in which ULBs work and develop community capacity to improve their access to services. The project has initially focused on four cities - Bhopal, Gwalior, Indore and Jabalpur. Apart from this DFID-funded programme, GoMP has also an ongoing ADB-funded programme, Urban Water Supply and Environmental Improvement in Madhya Pradesh. This project is expected to close by March 2011. The focus of this programme is to promote sustainable growth and poverty reduction in the same four project cities in Madhya Pradesh through improvement in basic services, modernisation of municipal administration and capacity building. Investments such as rehabilitating water treatment plants & sewage treatment plants, installing new water distribution lines and sewage lines, and installing new equipment for collecting, hauling and compacting of solid waste.

### **3.2 Key concerns / issues**

Energy consumption in cities and towns is a key concern. Though these emission concerns are relatively minor individually, they build up collectively and contribute to the overall



problem and are the key concerns of this sector. Yet another concern is methane generation – with its high global warming potential - from the municipal sewage and solid waste that is generated in the cities & towns. And, lastly, Alternative, less carbon-emitting fuel such as CNG exists only in two cities – Indore and Ujjain - in the state. Effort to move to a more carbon-friendly mass rapid transport system, e.g. Indore is piloting a Bus Rapid Transport system, is also only at a nascent stage. Given this scenario, the emissions from urban transport are bound to adopt an increasing trajectory, particularly in the large cities.

### 3.3 Response Actions

The response actions required of the urban sector are as follows: (i) promoting energy efficiency in the different aspects of their functioning, e.g. consumption in buildings and urban transport sector, (ii) capturing the methane – greenhouse gas with high warming potential - from the Municipal sewage and solid waste that is generated in the cities & towns, (iii) planning for mass rapid transport systems and/or alternative low carbon fuel options, and (iv) developing urban areas as carbon sinks through extensive tree plantations. As there are two externally funded programmes in the urban sector, these should integrate climate change considerations in its design and implementation. In the Annex, MP USP is used as a sample to show this can be achieved.

### 3.4 Summary

For the urban sector, the findings that relate the climate change context with the response actions and organisations that have to follow-up is to be included in the following table:

Context	Response Actions	Organisations
Emissions reduction	<u>Climate considerations in urban planning:</u> Review of the City Development Plans under preparation for 14 municipal corporation with a climate lens	Urban Administration & Development
Emissions reduction	<u>Inventorisation:</u> Undertake a carbon emissions inventorisation in the urban sector keeping in view that emission intensity targets – though non-binding – have been announced at a national level.	Urban Administration & Development and EPCO (Climate Change Cell)
Emissions reduction and adaptation	<u>Energy-efficiency in buildings:</u> Conduct a campaign to build awareness, and capacity to promote green buildings in cities. To develop a promotion plan of energy-efficiency in buildings through the adoption of the ECBC code	Urban Administration & Development
Emissions reduction	<u>Energy-efficiency in pumping:</u> Implement a few initiatives arising from energy audits pertaining to water supply and sewage pumping and to estimate carbon emission reduction arising from these improvements across the state.	Urban Administration & Development
Emissions reduction	<u>Reducing energy through decentralised sewage treatment:</u> Promote decentralised sewage treatment systems in cities as this will result in less pumping and therefore less energy consumption.	Urban Administration & Development
Emissions reduction	<u>Capturing methane:</u> Promote biomethanation or landfill gas generation projects for municipal solid waste as technologies are available to	Urban Administration & Development

	capture and use the gas.	
Emissions reduction	<u>Energy-efficient street-lighting</u> : Pursue with the CDM project on switching to energy-efficient street lighting that has obtained national government approval. Also, to initiate the implementation of the energy-efficiency initiatives in urban street lighting in selected cities.	Urban Administration & Development, EPCO (Climate Change Cell)
Emissions reduction	<u>Fuel-efficiency in bus fleets</u> : Improve the fuel-efficiency norms of government-owned urban bus fleets	Urban Administration & Development and ULBs
Emissions reduction	<u>Fuel-efficiency in urban transport</u> : Undertake a study in one or few cities on the fuel consumption practices and urban transport emissions.	Urban Administration & Development, ULBs and Transport Department
Carbon sink enhancement	<u>Lakes as carbon sinks</u> : Conduct a study of a typical urban lake in order to determine lake conservation approaches and linkages to developing these lakes as carbon sinks	Urban Administration & Development and Lake Conservation Authority
Carbon sink enhancement	<u>Tree plantation</u> : Initiate urban tree plantation with a view to realise the co-benefits – cooling effects as well as carbon sinks on a pilot basis and to establish a plan to scale-up across the state.	Urban Administration & Development and Forests Department
Emissions reduction	<u>Changing lifestyles</u> : Conduct campaign / communication initiatives in a selected city on how urban consumptive lifestyles are causing increased energy consumption and to scale-up such initiatives across other cities in the state.	Urban Administration & Development
Emissions reduction	<u>Alternative fuel</u> : Conduct a viability study to determine whether CNG can be used as a fuel for urban transportation in cities. Use the experience from the two cities - Indore and Ujjain – where CNG has been introduced.	Transport Department

## Section C Sectors: Impacts and adaptation focused

### Rural Resources: Agriculture

#### 1.1 Background

*MP is the 4<sup>th</sup> largest state with about 28% its area being occupied by forest and around 50% by agriculture. MP has the largest forest cover of the States- with approximately 95,000 square kilometres, approximately 30% of its total geographical area and 12% of the total area in the country. The area under cropping and pasture has grown, at the expense of fallow land, pastureland and forest area. Average rainfall is 1200mm falling principally in the monsoon season. Districts in the western and north-western parts of the state are considered to be susceptible to desertification and lack thick forest cover. Around 65% of total population are small and marginal farmers occupying 26% of land<sup>17</sup>.*

MP is predominantly a kharif crop growing state (kharif 55 per cent whilst Rabi approx 45 per cent. 41 per cent of crop production is cereals, 21 per cent pulses and oilseed 27 per cent- the remainder being vegetables, fodder and horticulture. Within India MP's significance as an agricultural state has increased recently. Agriculture in MP is mostly rain-fed: the total irrigated area of the state is 43 per cent and 70 per cent is rain fed- erratic and uneven distribution of rainfall is the major constraint for achieving targeted level of production<sup>18</sup>. The area under irrigation is less than the national average but fertiliser consumption is much lower (less than 40 per cent in 2001-2). On average 8 per cent of crops are lost to pests every year. In 2007-8 around half the land of the State was sown.

There are large areas of fallow and underutilised land: land is often kept fallow in the kharif season and with only once crop taken in the rabi season, so there are a high proportion of low value crops with low productivity and low consumption of fertilisers. When interventions are made to address low productivity the returns are noticeable.

Since its foundation in 1956 many national programmes to support agricultural development were promoted in the state with the introduction of high yielding varieties.

Productivity is higher with irrigation in Malwa and the Central Narmada Valley. More progressive, medium to large farmers are found in the CNV and Malwa regions, whilst in NCH, Kymore, Satpura and Chattisgarh plains and parts of Gird there are more forest dependent and poorer tribals and per capita income is lower than the state average.

#### **Box 1 Impacts of climate change on cereal production in South Asia**

Recent studies reviewed in the IPCC 4AR suggest that substantial decreases in cereal production potential in Asia could result from climate change but there will be significant regional differences. Crop simulation studies based on future climate scenarios indicate that substantial losses are likely in rained wheat and maize. In South Asia the drop in yields in non-rainfed wheat and rice will be significant for a temperature increase of beyond 2.5 deg. Overall the net cereal production of South Asian countries is expected to decline at least by 4-10% by the end of the century with the most conservative

<sup>17</sup> State Plan 2009/10 p56

<sup>18</sup> State Plan 2009/10 p56

climate scenarios in South and South-east Asia and possibly by 30%.  
Source: IPCC 4AR

## 1.2 Key Concerns /Issues

Agriculture is critical: it holds the key to all-round growth and rapid reduction in rural poverty levels in Madhya Pradesh. There is tremendous pressure: in 2000, there were around 10 lakhs of people unemployed, and with an additional 3.5 lakhs entering the workforce each year, it has been estimated that 5.5 lakh new livelihoods need be created each year to achieve full employment in 5 years<sup>19</sup>.

There has been observational evidence that rainfall is becoming more erratic and intense, seasonality has changed. Climate change is likely to intensify and increase occurrence of drought- the extreme event that has so far had most impact on MP. Coupled with rising temperatures, soil moisture levels will be placed under more stress. These factors will exacerbate existing pressures on rural livelihoods.

There are already soil productivity problems which need attention. The intensity of monsoon rainfall causes soil erosion, notably in the Chamaal ravines but also in than alluvial soil areas. In the black cotton soil areas salinity has increased due to excessive irrigation and poor drainage for example in Tawa, Hoshangabad district and also Malwa and Nimar. Repeated cultivation of soybean is resulting in decline in soil fertility and there is also concern about loss of the states endemic genetic resources- for example the expanding soybean area has resulted in loss of germplasm of wet-season legumes, oil crops and coarse grains<sup>20</sup>.

## 1.3 Responses

Growth strategies for agriculture for the most part potentially align well with promoting resilience to climate change in a sustainable way. However there are tensions which show through analysis of the State of the Environment report compared to some aspects of the State Annual Plan for Agriculture. The main strategies of the Agriculture Department are: promotion of soil and watershed conservation measures through integrated farming systems and watershed development programmes (agro-forestry, social forestry, wasteland reclamation)- this meshes well with targeted approaches to target the rural poor.

Obviously the extension of irrigation is critical for increased crop production and this is often associated with a more intensive production system which can cause problems with run-off from fertilisers for ground water contamination. For these reasons, the MP State of the Environment Report suggests that:

*"Ensuring agricultural productivity requires soil and water conservation measures, using the watershed management approach in undulating and dry land areas and tank rehabilitation in all areas. Only after these steps has been taken should farmers be encouraged to use improved varieties of seed, and fertilisers including a judicious mix of organic manure and integrated pest management techniques. The focus on agriculture should aim at reducing the dependence on irrigation and enhance agriculture productivity through improved technologies".*<sup>21</sup>

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<sup>19</sup> SOE p66

<sup>20</sup> SOE p69

<sup>21</sup> P68 SOE

The State Plan has an ambitious set of activities for the improvement of agriculture: including: modernisation of agriculture: biotechnology, farm mechanisation, information technology, and seed replacement; promotion of the more intensive systems: increased use of fertilisers, increased cropping area and cropping intensity, crop diversification, cultivation of cash crops, improve core infrastructure roads and power, increased irrigation work with Public Private partnership in betterment of agricultural extension services diversification from low value crops to high value crops- with renewed emphasis on horticulture: encouragement of supplementary sources of income for small and marginal farmers- dairying, animal production, horticulture, fisheries and apiculture to supplement incomes <sup>22</sup>.

There are helpful synergies with potential climate change strategies. The State Agriculture Plan implementation strategy can be used for increasing awareness on climate change as it envisages increased support to extension workers and training, increasing the number of communicators, revamping training practices, support to self help groups and women farmers; and ensuring the involvement of Panchayat Raj institutions.

In addition the promotion of insurance is a climate change adaptation strategy<sup>23</sup>. The State is encouraging all farmers to get their crops insured under the National Agriculture Insurance Scheme which has been this has been operating since 1999-2000 and implemented though the Agriculture Insurance Company of India Limited. Also credit availability at lower cost, particularly for the poor and marginal farmers would increase the competitiveness and reduce vulnerability.

In addition there are key institutions which can be used to enhance climate change training and research: the State Institute of Agricultural Extension and training; and SIAET – which gives training to farms; the State One Agriculture University (JNKVV) and a number of KVK ad ICAR research institutes which are providing the research extension and training support to enhance the productivity of crops; germplasm conservation; crop improvement programmes; seed breeders.

It will be vital to get the balance right: helping poor farmers in ways that can work as climate change sets in. Ensuring that increased the production of a range of crops for the development of agro based industries are those which have resilience for drought and heat. (The GOMP has already focussed on food and agro parks for facilitating establishment of such industries).

#### 1.4 Summary

Context	Response Actions	Organisations
Climate change impacts: Food security pressures will increase globally and in India	Qualitative and quantitative scenario development to assess long term implications for development of agriculture in MP	EPCO climate change cell and Farmer Welfare and Agriculture Development, Water Resources Department

<sup>22</sup> see p65 State Plan

<sup>23</sup> Although it does not necessarily work well for the poorest groups. Objectives are: insurance coverage and financial support: this provides financial support in the event of crop failure due to natural calamities, pests and diseases and stabilise farm incomes in disaster years; to encourage progressive farming practices.

	Continued liaison work with NCCP and the National Mission on Sustainable Agriculture	with donors- DFID, UNDP
<p><u>Climate change impacts</u> Increase variability in rainfall, with increased floods and droughts and change in soil moisture levels.</p> <p>Increased temperatures will change seasonality and add to evapo-transpiration</p>	<p>Development of in-state capacity to understand, use and disseminate information within the state on climate change models, and downscaling for ongoing interactions with GoI and national institutions, such as IITM</p> <p>Assessment of vulnerability and resilience of different parts of the State to climate change. A associated database could be established of problem areas to identify trends and priority targets</p>	<p>EPCO and Farmer Welfare and Agriculture Development, Water Resources Department with donors- DFID, UNDP</p> <p>National institutions, IITM</p>
Development and implementation of adaptation practices	<p>Develop cross-sectoral working with water and rural development initiatives (see below).</p> <p>A register of successful and remedial actions developed in the WPWSRP, MPRLP, DPIP could be established to build up good practice</p> <p>GoMP and donors to consider consolidation of institutional capacity of livelihoods and water resources programmes to facilitate take-up across MP.</p>	<p>Farmer Welfare and Agriculture Department</p> <p>Forest Department</p>
Training for dissemination of awareness and actions for climate change	<p>Priority actions could involve: Establishment of training programmes for extension officers through Universities Training programmes for farmers in water efficiency. Establish training hubs for dissemination of information on climate change.</p>	<p>Farmer Welfare and Agriculture Department</p> <p>State Institute of Agricultural Extension SIAET –State One Agriculture University (JNKVV) and KVK and ICAR research institutes</p>
Research	<p><u>Increase knowledge and capacity:</u> Increased analysis of weather data to identify trends in climate variability</p>	<p>Farmer Welfare and Agriculture Department</p> <p>State Institute of</p>

	<p>Improved monitoring, surveillance of diseases then devise new farming technique.</p> <p>Review of indigenous genetic cops to develop seed store of germplasm</p>	<p>Agricultural Extension and training; SIAET – State One Agriculture University (JNKVV) and KVK and ICAR research institutes</p> <p>Forest department</p>
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## Rural Resources: Forestry

### 2.1 Background

MP has most forest cover of all the states and a long history of scientific forest management through documented planning "working plans". Forest resources are rich in the central, eastern and southern parts- the western area is susceptible to desertification<sup>24</sup>. Around two-thirds is reserved forest and one third is protected forest comprising four forest types: Tropical Moist, Tropical Dry, Tropical Thorn, Subtropical broadleaved Hill forest. Key species are: teak, sal and bamboo. The State Government recognises the value of these "ecological factories" which is the main source of livelihoods of rural and tribal populations living in and around the forests, and with a large number of Non Timber Forest Products being which produce fuel, fodder, fibre and timber, collected for income generation. The forests of MP are rich in biodiversity and support 22 per cent of the tiger population of the country. As many as ten million people live in the 22,000 villages located in the vicinity of the forests, majority belonging to the scheduled tribes who are largely dependent on the forests for subsistence and daily needs.

#### What do poor people get from trees and forests?

- Subsistence goods such as fuel wood, medicines, wood for building, rope, bush meat, fodder, mushrooms, honey, edible leaves. Roots and fruit
- Goods for sale arts and craft, timber and other wood products
- Income from employment both in the informal and formal sectors
- Indirect benefits such as land for other uses, social and spiritual sites, environmental services, watershed protection and biodiversity conservation

*Source: State Action Plan 2009-10 p86*

The forests of MP are rich in biodiversity and support over 20 per cent of the tiger population of the country- with 9 national parks and 25 wildlife sanctuaries. These provide the basis for an important tourism and emerging ecotourism industry

### 2.2 Key concerns/ Issues

Forests can provide buffering and a resilience dimension to climate variability and extremes and are a critical sector for attention in MP. Population explosion and development needs have already degraded forests. The State Government has banned felling of trees in selected areas to facilitate natural re-generation which has resulted in a reduction of revenues from forests. The State Government is concerned that to conserve and regenerate forests for maintaining the ecological integrity is a huge burden on the state- banning felling reduces revenues and at the same time requires an increase in costs for forest protection<sup>25</sup>.

A climate change cell has been created in the forest department So far efforts have been made to access revenues from the forest offsetting market through the CDM. However as there are title issues, this is problematic and the voluntary off-setting market is being explored. Forests are an emerging area of national and international policy. The NAPCC provides for the Green Mission which advocates bringing one-third of the country under forest cover. MP's forest programme could potentially match well with India's approach to REDD- (Reducing Emissions from Deforestation in Developing Countries) associated with the

<sup>24</sup> State Plan 2009/10 p56

<sup>25</sup> State Plan 2009/10 p10



UNFCCC. India supports the REDD plus approach arguing for compensating countries not only for reducing deforestation but also for conservation, sustainable management of forest and increase in forest cover <sup>26</sup>. India now advocates a mechanism outside the purview of the CDM with national accounting for REDD, together with a mix of market and fund based approaches. With funds for maintaining carbon stocks but selling of carbon credits for change in stocks due to a decrease in deforestation or degradation. Agreement on the immediate establishment of a REDD-plus mechanism was agreed in the Copenhagen Accord, and it was also agreed this could be funded from the "Copenhagen Green Fund".

In addition, it has been proposed to use 20 per cent of NREGS fund for plantation activities which could mean that resources for afforestation and management of degraded land<sup>27</sup>. There is also considerable potential to reduce fuelwood use for cooking with benefits to health and a reduction in deforestation. There may be other sources of UNFCC associated funds available, for example, the Clean Development Mechanism, available to support technical change here.

What is needed is for MP to prepare itself for REDD plus and other potential additional funding schemes with formulation of projects. It already has the resources of the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) to deploy to start the step up in activities.

## 2.3 Responses

The State Government is actively trying to conserve the forests involving community participation under the Joint Forest Management programme. Efforts to conserve and regenerate forests are regarded as huge burden on the State Government Potential vulnerability to climate change. The major thrust, 65 per cent of spending, is to implement the Forest Working Plan prescriptions- to improve the health of the forest and comply with GoI and Supreme Court recommendations. There is also considerable emphasis in the plan on the rehabilitation of degrade forests land and development of fuel wood and fodder reserves.

To reduce the pressure biotic pressure- needs to develop necessary infrastructure, provide alternative sources of energy and develop necessary skills in inhabitants of these villages to ensure their active cooperation in protection and development of forests. Therefore an integrated scheme for the development of forests and forest dwellers been proposed. Under this scheme, development of infrastructure, promotion of energy saving devices, training and workshops for awareness raising proposed: Infrastructure developments proposed include: construction of stop dams, ponds, culverts, biogas plants, ICS.

The Notification of Scheduled tribes and other traditional forest dwellers (recognition of Rights Act 2006 has necessitated launching an intensive awareness programme to appraise forest dwellers and foresters about their role, rights and responsibilities- workshops to be organised on an extensive scale.

## 2.4 Summary

Context	Response Action	Organisations
Potential resources available for forest	Increase reforestation and afforestation activities in degraded forest areas.	Forest Department,

<sup>26</sup> TERI 2009 Is India ready to implement REDD plus?

<sup>27</sup> TERI 2009 Is India ready to implement REDD plus?

services- carbon sinks and sequestration	<p><u>Protect existing forest stocks to act as carbon sink with stronger conservation</u></p> <p><u>Assess existing and innovatory sources of funding, for forest conservation, forest management, and afforestation including GoI- CAMPA, and UNFCCC REDD plus</u></p> <p><u>Undertake studies on potential for traditional and new biomass energy technologies</u> <u>Work to establish new systems of support for community users.</u> Aim to create new marketing structures for users traditional forest products to improve incomes and livelihoods to reduce pressures on forest destruction</p> <p>Increase planting on non-forest land</p>	<p>Forest Development Authority</p> <p>Indian Council of Forestry Research and Education Agriculture Department</p> <p>Rural Development Department</p>
Increases in temperature and changing rainfall patterns will affect forest growth, and regeneration in all parts of MP.	<p><u>Improved tree planting and forest mgt. to work further in watersheds increase water storage, reduce soil erosion and improved climate reliance in agricultural areas</u></p>	<p>Forest and Environment Department</p> <p>Farmer Welfare and Agriculture Department Water Resources Department</p>
Increased risk of forest fires	<p><u>Undertake studies on indigenous trees species to assess their vulnerability to climate change. Develop heat resistant genotypes in tree nurseries</u></p> <p>Assess fire management strategies</p>	Forest Department
Climate change impacts will affect forest diversity	<p><u>Assess additional threats to biodiversity and wildlife and see if climate change adaptation and explore whether funding from carbon sequestration funds might be accessed</u></p>	Forest Department Consultants
Forest and climate change policy impacts is fast growing policy area	<p><u>To obtain access to updated knowledge on climate change science and policy developments and make this available for foresters, forest guards, range forest officers. Bring in trainers to develop modules for forest training institutes</u></p>	Forest Department Indian Council of Forestry Research and Education DFID and other donors

## Water

### Box 2: Impacts of climate change on water resources in South Asia

*Climate change-related melting of Himalayan glaciers could seriously affect river run off*

*and eventually will lead to a decrease with consequences for downstream agriculture. Over exploitation of groundwater has resulted in a drop in its level leading to ingress of sea water in coastal areas. The projected decrease in the winter subcontinent rainfall will reduce total seasonal precipitation over December, January and February implying lesser storage and greater water stress. Intense rain periods are anticipated occurring over fewer days which implies increased frequency of floods during the monsoon will also result in the loss of rainfall as direct run-off, resulting in reduced groundwater recharging potential. Knock-on effects: gross per capita water availability in India is expected to decline from as low as -1830m<sup>3</sup>/yr in 2001 to 1140m<sup>3</sup>/yr in 2050. Source: IPCC 4AR sect 10.4.2.3*

*India's NATCOM1 Identified that there were serious potential impacts from climate change on water stress and reduction in the availability of rainfall. Historic climate variability with floods and droughts, and extreme events have caused widespread destruction and loss of life so there is a need to understand what might happen better by improving the reliability of climate change projections at the regional level, and to develop and implement adaptation strategies involving water conservation, changing land use and cropping patterns flood warning systems and crop insurance. NATCOM1 also identified the need for intensive development of ground water resources, exploiting both dynamic and in-storage potential.*

### **3.1 Background**

Water is a pivotal sector for climate change policy in most places and this applies even more so in MP. There is a large potential utilisable resource- despite droughts. This has already meant that one river – the Narmada – is being utilised in a national policy framework. No allowances are yet made for climate change in current infrastructure or strategic planning. However, there is already considerable experience of institutional change and re-structuring and devising the policy interventions necessary – notably through the ongoing MP Water Sector Restructuring Project (WSRP) which is upgrading infrastructure, and improving institutions, management capacity, data management and improving research and training and overall enhancing agricultural productivity.

#### ***MP rivers and water resource***

MP is endowed with substantial fresh water resources though they are distributed unevenly across the state. It has 6 of the 14 major river systems of India and three others: the 9 major rivers of the State are: *Mahi, Narmada (extending from the northeast to the west), Tapti, Chambal, Betwa, Son, Ton, Waingaga, Ken, Sindh and (Pench)*. These flow down and out to the five bordering states- (see Map).

Overall MP has a very significant water resource (81.5 MAF (million acre feet)) which provides water for drinking, irrigation and power generation. It is estimated that around 49.7 MCM can be harvested for irrigation purposes to irrigate 60.9 lakh hectares whilst 50 lakh ha could be irrigated from ground water overall, increasing the percentage of net sown area under irrigation from 40 per cent to 75 per cent. In 2001/2 32 per cent of the net area sown was irrigated so there have been improvements. Overall 10 major, 105 medium and around 3850 minor schemes have been completed so far. Work is underway on a further 10 major, 15 medium and around 1500 minor schemes are in progress with some modernisation schemes also underway. The work of management and maintenance of irrigation is entrusted to the Water Users Associations- 1700 were elected in Feb 2006 for 5 years.

### ***Groundwater***

Groundwater is an important resource for rural and urban development for drinking, agriculture and industry. As the rivers are seasonal groundwater is often regarded as a more reliable resource 70 per cent of rural drinking water and 30 per cent urban water supply is groundwater. Around 45 per cent of ground water is developed compared to water available and 66 per cent of what is utilisable<sup>28</sup>. Replenishable groundwater resources are estimated to be 5.09 million hectares of which only 0.81 is being utilised- however they are not evenly distributed across the state. In general blocks in the western part of the state are over exploited and classed as critical. However around 70 per cent of blocks are drawing safe levels of water compared to availability. And there is potential for development of the resource in western MP. Good records are available from the State Ground Water Board. Water use efficiency in irrigation is generally very low and there are major concerns regarding resource depletion. In many districts groundwater is being drawn down at an alarming rate encouraged by highly subsidised or free electricity<sup>29</sup>. Continuous efforts are made to reduce the gap between potential and actual irrigation<sup>30</sup>.

### ***Existing infrastructure***

Many of the key components of the water infrastructure in the state have large capacity to cope with climate variability. The inter-basin transfer has balancing reservoirs which can be operated during spate conditions. Planning is on the basis of historic data derived from 20-30 years of the Institute of Meteorology. Due to increased intensities in rainfall with flash floods in the last decade, the Data Centre has been able to provide improved information (on an hourly basis) and channel design standards have been upgraded<sup>31</sup>.

A total of 650 major, medium and minor schemes are being modernised in the Chambal Sindh, Betwa, Ken and Tons river basins- they have gravity irrigation delivery systems from storage reservoirs and low lift pumping systems constructed over 20 years ago. In the major systems there is usually adequate water availability but the conveyance systems are unable to carry design discharges due to siltation and deterioration of the conveyance systems. Both medium and minor schemes suffer from similar defects as the major schemes although on a reduced scale. In most cases there is no measurement of water to the field there is limited or no flexibility in water deliveries which arrive with unreliable frequency. Canal regulation is poor or non-existent and structures in poor condition. Farmer's interference with the distribution systems and structures is prevalent since there is lack of equity and reliability in irrigation water deliveries. No detailed topographies and cadastral surveys have been carried out for the medium and minor schemes and most designs have been based on inadequate data. Many of the canal distribution systems could be feasibly replaced by low-pressure HDPE pipelines or networks.

## **3.2 Key Concerns/ Issues**

Water is seen to be under serious threat in MP in terms of quantity and quality:

- There is increasing demand for water for human consumption, agriculture and industry, coupled with some recent declines in rainfall have led to supply problems. Surface run-off during heavy rainfall of sewage, and fertilisers causes pollution.

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<sup>28</sup> MP State of the Environment Report (SOE) p202

<sup>29</sup> Source SOE p64

<sup>30</sup> State Plan p114

<sup>31</sup> Personal communication- Tiwari

- Post-monsoon flow in most rivers is used for irrigation which further reduces flows-rivers get converted into a series of small ponds.
- Dam construction, whilst providing ways to regulate flows in times of flood, can also cause siltation, disrupts fish migration, and can disrupt river flow, aggravating conditions which can lead to water borne diseases.
- Water use efficiency in irrigation is generally very low and there are major concerns regarding resource depletion. There should be a reduced dependence on irrigation and enhance agriculture productivity through improved technologies
- In many districts groundwater is being drawdown at an alarming rate encouraged by highly subsidised or free electricity<sup>32</sup>. Continuous efforts are made to reduce the gap between potential and actual irrigation<sup>33</sup>.
- The total storage of rainfall through major and minor irrigation dams is quite small the tradition of building small check dams and storage ponds in low lying land has declined in the past 50 years<sup>34</sup>
- A systematic survey of large dam safety was undertaken in 2007 by the dam safety directorate. Flooding is controlled by the series of dams which have the potential to store the flood water; however current design standards are 100 yrs of historical data.
- While the GoMP has done a good job of initiating water harvesting and water shed development, investments are required to treat land and a much larger level of investments will be needed to ensure that a significantly higher proportion of rainwater is captured and used. Whilst overall fertiliser consumption is low it is heavily applied in some areas and high concentrations have been found in all groundwater<sup>35</sup>.
- There are important lessons which can be learnt from the experience in the Narmada Valley. There may be a number of lessons which can be drawn for the future and planning for climate change as which is likely to impact considerably on the hydrological resources and its management. The water resources of MP may be drawn upon as part of a national strategic strategy in the future- it was the GOI that drove the implementation of the Narmada Valley Development Plan. For this reason the GoMP needs to ensure it develops specialist technical capacity to understand the developments in climate change science and projections.

The outstanding challenge is to review current approaches and incorporate policy for climate change.

### 3.3 Responses

The main active relevant area, apart from the Narmada Valley Development Agency– see below – is the MP Water Sector Restructuring Project (WRSP). The World Bank is funding it (Rs 1919 crores) between 2006-2011. It is aiming to improve the productivity of water and integrate 654 schemes (completed prior to 1986) spread over 30 districts of 5 river basin (Betwa, Chambal, Sindh, Ken and Tons). There are proposals for interstate link projects (Ken-Betwa, MOU signed) and the Parawit Kalsindh-Chambal links are under consideration with other states<sup>36</sup>.

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<sup>32</sup> Source SOE p64

<sup>33</sup> State Plan p114

<sup>34</sup> SOE p69

<sup>35</sup> SOE

<sup>36</sup> State Plan p114

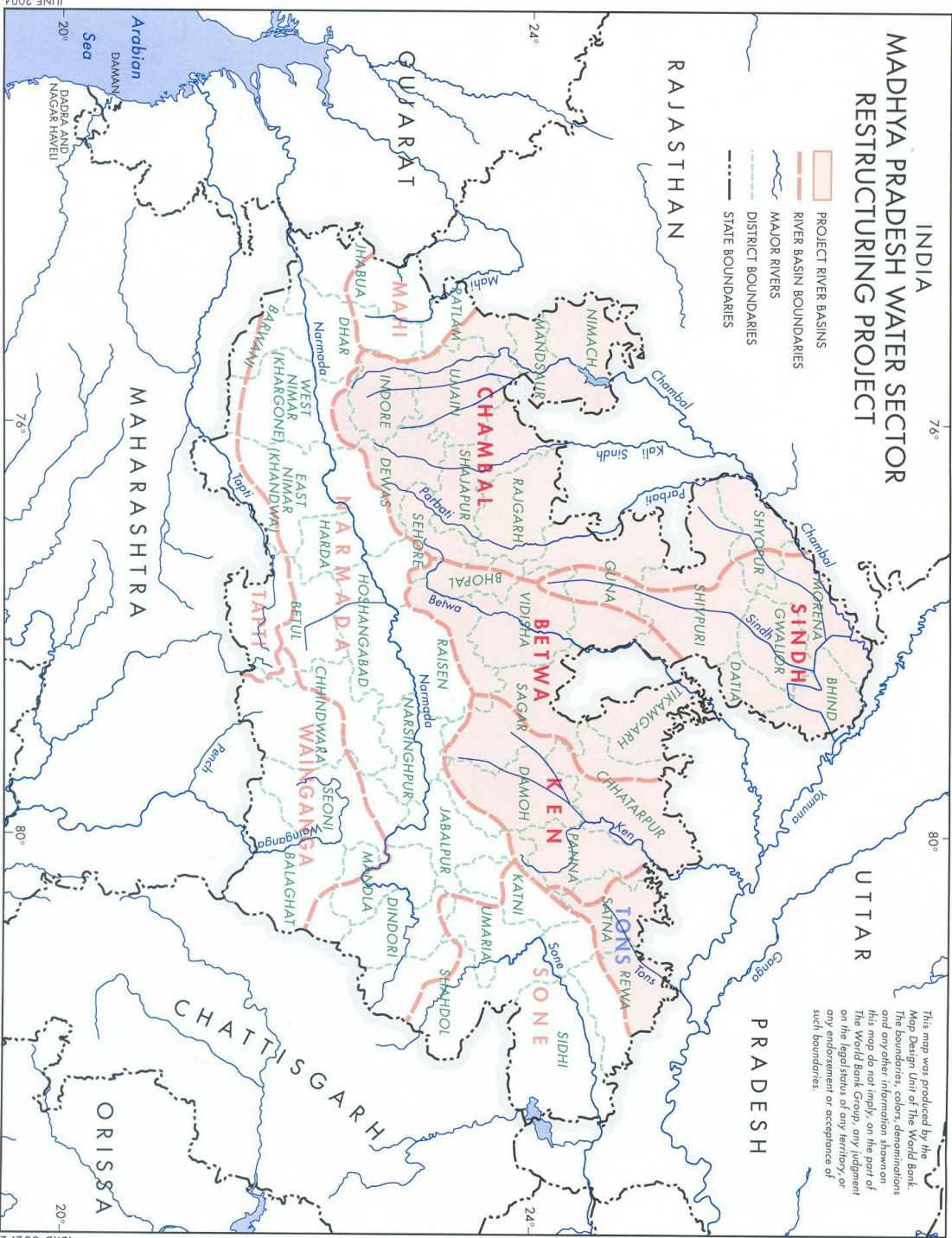
The MP WSRP is improving the overall management of water resources as well as irrigation service delivery, modernising about 650 minor, medium and major irrigations schemes covering an area of about 620,000 ha in the five focus basins. This focus has been adopted primarily because of the large number of older schemes in these basins that are in need of rehabilitation and to keep the project to a manageable level<sup>37</sup>. As several river basins in MP cover rivers that flow in to Bangladesh, the World Bank- the funding agency- has also opted to concentrate on the Indian river basins<sup>38</sup>.

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<sup>37</sup> [www.mp.gov.in](http://www.mp.gov.in) MPWSRP pages

<sup>38</sup> Personal communication

# INDIA MADHYA PRADESH WATER SECTOR RESTRUCTURING PROJECT



JUNE 2004

More detail on the MPWRSP is provided below. The essential components for delivery of water resources in a world that has a changing climate are being established:

- A technical institution with professional staff State Water Resources Agency (SWaRA). Provision has been made for ongoing training and professional development.
- A comprehensive data resource centre which is linked to State Water Resources and Data Analysis Centre. Its work is underpinned by a strong underlying data station system in the hydrological and meteorological network: gauge and discharge, standard rain discharge, automatic rain gauge, full climate stations, ground discharge sedimentation and water quality- potentially there is average daily rainfall for districts available since the 1960s<sup>39</sup>.
- An autonomous State Water Tariff Regulatory Commission SWaTReC is reviewing and monitoring water sector costs and revenues for rationalised setting of bulk water fees. This can help reduce waste and improve demand management.
- Integrated water resources basin management (IWRM) is being piloted- a widely recognised tool for a holistic approach to balancing water resources and demand with stakeholder engagement.
- Asset modernisation and rehabilitation is being tackled. In general the irrigation systems are in a dilapidated condition after years of neglect which hinder their effective operation. The productivity from water throughout the state is ranked as one of the lowest in the whole of India.
- Linkages are being made with state education and research institutions to improved agricultural support services, strengthening of researcher/extensionist- farmer-market linkages, and involve effective collaboration of GoMP line departments.

### 3.4 Summary

Context	Response Action	Organisations
Climate change impacts: Drought Lack of water for irrigation	<p><u>Research and Preparedness:</u> need cross sectoral approach (including agriculture) to improving climate change modelling understanding in the Go MP. Need to have in state capacity to understand climate change models, and work with: downscaled climate change projections and regional circulation model; add climate change scenarios to Water Data Analysis Centre and Hydrology Information Systems.</p> <p>Identify districts and blocks most vulnerable to climate change</p> <p>Studies on improved management of surface water resources and how to increase efficiency of water use; Undertake studies on groundwater</p>	<p>Water Resources Department State Ground Water Board.</p> <p>MP WSRP</p> <p>Water Resources Department and Farmer Welfare and Agriculture Department, SC and ST Welfare, Social Welfare State Water Resources Agency (SWaRA)</p>

<sup>39</sup> Personal communication P K Gupta Senior Hydrologist



	<p>resource and recharge with climate change. Maintain groundwater monitoring systems.</p> <p>Apply awareness raising lessons form MPLRP with Gran Panchayats, farmers training camps and CSOs</p> <p>Apply lessons of Narmada Valley and MP WSRP</p>	<p>State Water Resources and Data Analysis Centre</p> <p>Jawaharlal Nehru Krishi Vishav Vidyalalya (JNKVV)</p> <p>NVDA</p>
<p>Drought (see Industry and Urban)</p> <p>Lack of water for irrigation</p>	<p>Conservation, augmentation and preservation of water resources at all scales</p> <p><u>New infrastructure:</u> provision of additional freshwater storage structures</p> <p><u>Increase water harvesting:</u> provision of additional freshwater storage structures; restoration of old water tanks</p> <p><u>Improved watershed land management systems</u> and Integrated Water Resources Management plans</p> <p>Assess scope and implications of further inter basin connections</p> <p><u>Demand management and optimisation of water use:</u> Investigate new regulatory structures with entitlements and prices to adopt water efficient, and innovatory technologies; identify water wastage and leakage</p>	<p>Water Resources Department</p> <p>Farmer Welfare and Agriculture Department</p> <p>State Water Resources Agency (SWaRA)</p>

### Box 3 MP Water Sector Restructuring Project

- The project focuses on improving water resource management and service delivery to maximise the water productivity in almost 5000, 000ha of designed potential in five focus basins, of which only half of the areas currently gets serviced- over 60% of the holdings have less than one ha. At the current level of water productivity even a 3 ha farm can only support half of its family in the project area to be above the poverty line. Agricultural intensification and diversification with horticulture, livestock and fisheries are targeted with improved delivery in irrigation and drainage supported with asset modernisation programmes,
- A State Water Resources Agency (SWaRA) has been established to provide state level capacity for inter-sectoral water allocation, planning and management based on comprehensive and socially and environmentally sustainable river basin

plans. SWaRA gives advice to the State Water Utilisation Committee. SWaRA is assisted by the State Water Resources and Data Analysis Centre which is the focal point to collate, verify and analyse and store data relevant to water resources management in each basin. The existing surface and groundwater data centres are being upgraded to analyse data from a multi-sectoral perspective and to provide basic information such as hydrologic, socio-environmental and natural resource profile of the ten basins/ sub basins of the state frequency or occurrence of an event, GIS based atlas of rainfall of different frequency and duration, atlas of water quality and quantity and information on intersectoral demands.

- MP got 600 rainfall stations with 40 years of daily data- all now computerised and validated. Since 1998 some stations have hourly data. Main users are industries as a basis for thermal power- a number of companies are coming to establish hydro and thermal sites. There is a hydrological data user group established with 285 people registered; other users are PhDs and researchers. Automated climatology stations are being planned.
- Basin Development and Management boards are being piloted to operationalise the concept of integrated water resources management (IWRM) with decentralised development and management in the Sind and Tons basins. Decision support systems are being piloted on 2 sub basins including modelling for socially and environmentally sustainable optimal water resources management. This is to provide capacity for GoMP to evaluate water quality, quantity issues, surface water and groundwater availability and options for the use of these resources given various scenarios of efficiency improvement, market forces intervention. State of the Basin reports will be prepared to present the inter-sectoral water related data, information and maps in a basin context reflect stakeholder consultations and outline key issues to be addressed and various options to address them. These products are expected to play an important part in the multi-stakeholder process for the development of a shared vision of the future development and management.
- Modernisation and capacity building of MP water resources department to be carried out with support for formal courses and study tours in addition to in-house training and seminars by invited national and international experts. , provision of consultant and training support; modern equipment- improvement technical, financial and operational management capacity, and public awareness- including connections with national and international professional associations.
- Another component tackles asset modernisation. This component proposes to rehabilitate and modernise the irrigation assets in five northern river basins. The irrigation systems are being given a technical and managerial upgrading combined with institutional reforms aimed at substantially improving resource allocation and water delivery to farmers.
- There is a component for agricultural intensification and diversification which will involve improved agricultural support services, strengthening of researcher/extensionist- farmer-market linkages, effective collaboration of GoMP line departments (Water resources department, Department of Agriculture, Department of Horticulture, Department of Animal Veterinary Services) and

Jawaharlal Nehru Krishi Vishav Vidyalaya (JNKVV), Jabalpur and greater involvement of the private sector. The aim is to lead to increased cropping intensity improved productivity, expansion of areas, crop diversification etc. Initiatives will include promotion of the NADEP method of composting and vermiculture to reduce dependence on chemical fertilisers and promote sanitation and hygiene.

- Jawaharlal Nehru Krishi Vishav Vidyalaya (JNKVV) will be supported to prepare GIS based thematic maps of soils crops etc for the Sind and Tons basins, and adaptive research trials will be undertaken by three Zonal Agricultural research stations (Morena, Ujjain and Indore) and five regional agricultural research stations (Mandsur, Ratlam, Bhopal, Gwalior and Rewa)

Source: Information on MPWSRP on [www.mp.gov.in](http://www.mp.gov.in)

#### **Box 4 Narmada Valley Schemes**

The Narmada is the fifth largest river in India- it is known as the lifeline of Madhya Pradesh. Its potential for irrigation and hydro-electricity has been captured through a series of dams which have been constructed and are underway. The Government's Plan is to build 30 large, 135 medium and 3000 small dams to harness the waters of the Narmada and its tributaries. (See Map over)

Within the State Government of Madhya Pradesh, the Narmada Valley Development Authority (NVDA) plans water resources in the valley and implements projects.

The controversy over large dams on the Narmada River has been long and complicated and it is not appropriate or necessary to revisit the history. However- the past is likely to cast a long shadow over future planning for climate change. There may be a number of lessons which can be drawn for the future and planning for climate change as which is likely to impact considerably on the hydrological resources and its management.. There may not be the appetite in MP for conceiving and implementing additional major projects which involve large scale infrastructure works. However, as understanding of climate change unfolds, and the impacts on the monsoon become clearer evident, and with possible declines in production in major food crops, the water resources of MP may be part of a national strategic strategy- it was the GoI that drove the implementation of the NV Development Plan. For this reason the GoMP needs to ensure it develops specialist technical capacity to understand the developments in climate change science and projections.

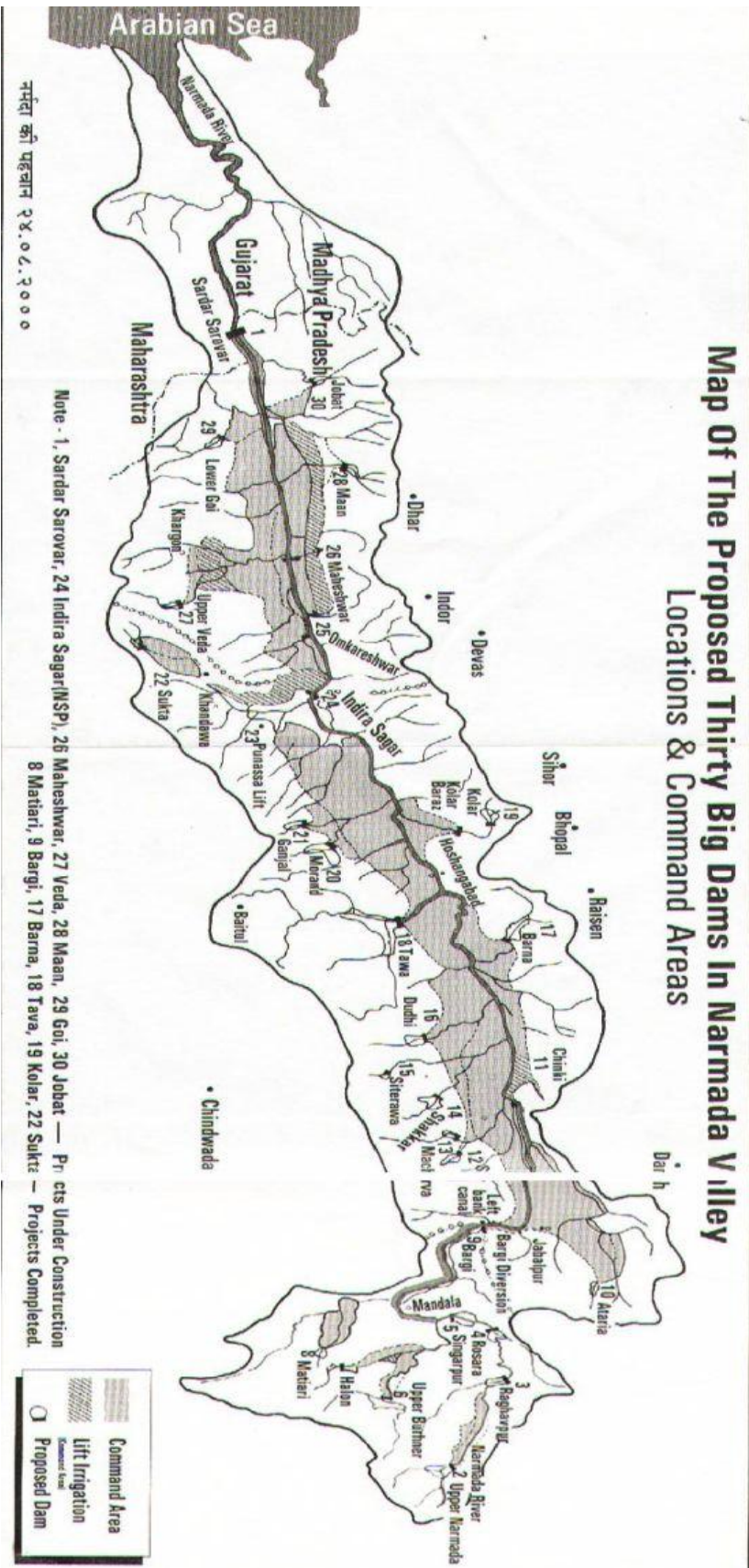
It is not thought that of the plans, engineering works, or resettlement and rehabilitation of the NVDA have incorporated any allowance ins for increases or declines in run-off with climate change. Obviously where there are benefits from additional irrigation and power to the affected villages and families these will increase their assets and resources and help provide greater resilience to climate change. The central Narmada Valley is a relatively prosperous area within the state. However there have been many cases where

peoples' assets have diminished not increased and they will be less well-placed to cope with climate change<sup>40</sup>.

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<sup>40</sup> Report of the Independent People's Commission, Without Land or Livelihood. The Indira Sgar Dam: State Accountability and Rehabilitation Issues. October 2004

## Map Of The Proposed Thirty Big Dams In Narmada Valley Locations & Command Areas



## **Social Development: Health**

### **4.1 Background**

As one of the poorest states in India, MP has challenging human development issues to address which climate change is likely to exacerbate, not diminish. It has many vulnerable poor groups: the largest concentration of SC/ST in India- the bulk of whom are small, marginal and landless labourers and form two-thirds of the poor. As per official estimates, 37 per cent (approximately 23 million) of its population live below the poverty line. Poor education, poor health, precarious livelihoods and poor infrastructure make for a cycle of deprivation which is very difficult to break.

Education is far from providing a route out of poverty: school infrastructure is very deficient: 48 per cent of middle schools do not have their own building; nearly 21 per cent of primary and 40 per cent of middle schools do not have drinking water and 45 per cent do not have toilet facilities<sup>41</sup>. Literacy levels are low, particularly in the rural areas according to the last available statistics. Whilst considerable progress was made with literacy between 1991-2001- the basic literacy rate went up from 45 per cent to 64 per cent with female literacy increasing from 29 per cent to 50 per cent. However, the state has recorded improvement on educational outcomes. The recent ASER report has indicated significant improvements at primary and secondary levels, although quality improvement remains an area of concern. A large number of women in their reproductive ages are however still illiterate and it appears this will remain to be so which poses a challenge as critical human development initiatives for the child (social as well as governmental) are focused on the child<sup>42</sup>.

### ***Health and gender***

The health situation in MP is very poor and there is a long list of statistics to show this. The latest estimate for longevity, measured as life expectancy at birth was 59 for males and 58 for females, the lowest for all states in India and notably worse for females<sup>43</sup>. There are underlying issues about the contrast between the status of men and women in MP and around women's empowerment. High rates of child malnutrition (60 per cent), high levels of anaemia and malnutrition among women continue to be a problem in MP. Almost 50 per cent of the women are illiterate. Women also face the brunt of violence – MP accounts for a high rate of crime against women. Madhya Pradesh has accounted for 10.2 per cent of total crimes reported in the country National Crime Record Bureau aid in "Crime in India 2007" report, with large numbers of victims from the socially excluded groups and women.

Over the last five decades, India has built up a vast health infrastructure and manpower at primary, secondary and tertiary care in government, voluntary and private sectors<sup>44</sup>. Improvement in the health and nutritional status of the population has been one of the major thrust areas for the social development programmes of the country. This is being achieved through improving the access to and utilisation of Health, Family Welfare and

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<sup>41</sup> HDR 2007 p125

<sup>42</sup> HDR 2007 p121

<sup>43</sup> HDR p126

<sup>44</sup> Indian National Health Plan

Nutrition services with special focus on under served and under privileged segments of the population.

#### **4.2 Key concerns/ Issues**

All dimensions of climate change are likely to impact on health over time. Changes in two key variables: temperature and rainfall distribution and intensity are likely to change disease patterns for serious diseases such as malaria and dengue fever. Some reports suggest that incidence of malaria may already be changing. Food production may be adversely affected aggravating hunger and malnutrition and reducing adaptive capacity. In addition it is expected that climate change will increase the intensity and frequency of extreme events such as heat waves and may increase the intensity of cyclones. The World Meteorological Organisation has estimated that the number of heat related fatalities could double globally in less than 20 years. At national level it has been recognised that changes in the incidence of malaria may be one of the most important clearly identifiable impacts of climate change<sup>45</sup>. The First National Communication on Climate change also recognised that the complexity of factors about varying vulnerabilities of different demographic and geographic sections of the population as well as uncertainties around adaptive measures make anticipation and planning difficult for the health sector. For this reason, stress was laid on improvements to environmental practises, preparation of disaster management plans, improving public health infrastructure and disease surveillance and emergency response capabilities will lay a sound foundation to cope with climate change. It can be noted that the more recent NAPCC includes health within the ` Strategic Knowledge Mission on climate change.

For example, the Integrated Disease Surveillance Program (IDSP) is intended to be the backbone of public health delivery system in the country could be linked to meteorological data.

In addition to direct impacts on people, there are also aspects of the health delivery systems (buildings, transport disruptions for medical personnel and drug distribution which may be vulnerable, with increased temperatures and flooding. In summary key problems are:

- Increases in incidence of vector borne and water borne diseases
- Occupational health hazards
- Heat stress
- Nutrition related health hazards

These issues may not be addressed as:

- General awareness is not adequate with respect to climate
- Routine preparedness is in place in disaster prone areas but needs strengthening of delivery and monitoring systems
- There is a lack of triangulation and analysis of data at different levels
- State specific action plan does not exist

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<sup>45</sup> INC p115

- Integration of health and other departments may be weak.

Development outcomes, particularly in the health sector, continue to lag well behind the national average. Infant mortality, particularly females and maternal mortality rates are among the highest in the country and much worse in rural areas (104 in 2001 compared to 56 for the urban areas)<sup>46</sup>. Child health and nutrition indicators rate among the worst in the world. The third round of the National Family Health Survey registered an increase in children under 3 years old who are underweight from 54 per cent to 60 per cent the highest in India<sup>47</sup>. There is a serious gap in the provision of primary health services compounded by the unwillingness of doctors to work in the rural areas. The Family Welfare Evaluation Survey in 2003 revealed that immunisation rates are "abysmal"<sup>48</sup>. The state also has high levels of child labour and ILO was supporting the 3 districts in implementing integrated child labour strategies.

### 4.3 Responses

As the Draft State Plan for Health puts it, *"In spite of the best of efforts by Government institutions, the people of the state are not satisfied and the health status, though improved, is far below when compared on the national scale (as reflected by the health indices)."* For every 100 rupees spent on health, 75 rupees come from private sources. Benefit incidence analysis shows that nearly half of the public health subsidies accrue to the top 20 per cent of the population. There are serious questions about the economic access and quality of health care in private sector, particularly in the rural areas. The problem is compounded as government does not have an effective monitoring, surveillance or control function with regard to private health care<sup>49</sup>.

#### **The core aims of State Policy are:**

- Health care to be Gender sensitive
- Health care to address; health promotion, prevention, treatment (curative) and rehabilitation.
- All health care resources including NGOs and private providers would be utilised for health care provision.
- Public fund would primarily focus on rural and urban poor (specific aim to reduce IMR and MMR).
- Focus will be on communicable diseases (diseases of poverty), reproductive health conditions and preventive actions to reduce chronic diseases e.g. Cardiovascular diseases, cancer, mental disorders, diabetes (secondary prevention), hypertension (secondary prevention) etc.
- Address the increasing incidence of injuries by prevention and treatment.
- Prevention of disaster, to the extent possible, and preparedness for disaster management as and when necessary

<sup>46</sup> HDR p129

<sup>47</sup> MP TAST 2009

<sup>48</sup> HDR p131

<sup>49</sup> draft State Health Policy



*Source: draft State Health Policy*

There is a Technical Assistance Support Team supported by DFID which is helping to deliver the MP Health Sector Reform Programme to improve healthcare, organisational structures and management and increased use of quality health services.

Discussions with this team have suggested that the critical interfaces with climate change for the State Climate Change Plan are on:

1. Monitoring and surveillance of changes - this will need further investment in existing systems as there is a lack of baseline data. This could tie in with efforts to construct a composite Health Index with child weights, district wide malnutrition rates and life expectancy. It would be consistent with the Rural Health Mission programme. It might be possible to re-construct some historic data through insurance records.
2. Similar reconstruction of baseline data would also be useful for vector and water borne diseases (dengue and malaria) connected to the Integrated Disease Surveillance programme
3. Implications of heat waves on hospital and health infrastructure was an issue which ought to be investigated- already temperatures of 45- 48 *degrees C* were being witnessed- possibly change could be driven by ISO certification.

There was considerable concern voiced about the health issues associated with drought. It was suggested that the impacts of climate change will not increase vulnerability uniformly so there needed to be a more differentiated approach to the delivery of services. It was suggested that currently drought relief programmes were not working adequately and there needed to be a better integrated response to such emergencies.

#### Climate change dimensions

With so many immediate human crises to tackle, putting climate change on the table may seem to be a distraction. However there are four key points to make:

1. Investments in development infrastructure in terms of physical developments, should be planned flexibly so that climate change impacts can be accommodated. For example, to make sure that school buildings and health facilities can cope with intense rain, and the expected higher temperatures.
2. Investments in human capacity development, training and education should where appropriate incorporate climate change dimensions.
3. Some health problems, notably malaria, may increase with climate change- it is vital to start to develop a baseline of information so the situation can be monitored.
4. There is a critical nexus of problems in MP around drought which is likely to increase in frequency and duration with climate change due to higher temperatures and changes in rainfall distribution. Apart from direct impacts on malnutrition and health, drought can result in temporary migration which disrupts health programmes for example for pregnant women<sup>50</sup> and education for children.

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<sup>50</sup> Interview with JICA MP Reproductive Health Programme

MP has already developed some integrated approaches through the livelihood programmes which are directly relevant for climate change. The aim has been to alleviate rural poverty and unemployment by creating social and economic infrastructure, providing self-employment to poor and wage employment to marginal farmers and landless labourers- help reduce seasonal and permanent migration to urban areas.

Rural development programmes have been planned and implemented through decentralisation to Panchayati Raj institutions. Common features of the DPIIP and MPRLP which are relevant for tackling climate change are: are support to land management schemes which increase soil moisture levels or access to water supplies, social protection schemes and support for small businesses which increase household assets and capacity to cope with climate shocks, and renewable energy developments, for example to improve cooking fuels. (Indoor air pollution associated with the combustion of biomass fuels is a serious health problem.).

#### 4.4 Summary

Context	Response Actions	Organisations
Climate change impacts on health sector infrastructure and strategies	<p><u>Preparedness</u>: Assess Health Sector Plan for vulnerability to climate change and identify priorities for action.</p> <p><u>Institutional change</u>: Establish links with climate change actions in relevant areas (industrial pollution, urban sanitation)</p> <p><u>Awareness-raising</u> of health service professionals about climate change</p> <p><u>Enhance resilience</u> of infrastructure of health institutions to meet climate change. (heavy rainfall and heat stress) Develop ISO and other standards</p>	<p>Public Health and Family Welfare Department, MP TAST</p> <p>SC and ST Welfare, Social Welfare</p> <p>Public Health and Family Welfare Department, MP TAST</p>
Increased intensity and frequency of disasters incl. heat waves	<p><u>Strengthen delivery and monitoring systems</u> of health system preparedness in disaster prone regions</p> <p>District authorities to develop heat wave disaster plans for application when severe heat periods occur</p>	Disaster Management Institute
Changing disease patterns e.g. malaria	<p>Link IDSP with meteorological data</p> <p>Start integration of climate change into State Health Plan by integrating</p>	Public Health and Family Welfare Department, MP

	surveillance of malaria with climate data	TAST
Greenhouse gas emissions reduction from biomass stoves	Develop CDM projects to introduce improved cooking stoves Need for continuing donor support to create institutional capacity	EPCO CC cell with Panchayat and Rural Development Department

### **Box 5 DPIIP District Poverty Initiatives Project**

This has been funded by the World Bank and is being implemented in 14 poor and backward districts- it has adopted an integrated approach to poverty alleviation- by strengthening the process of decentralisation at village level- it targets socially and economically disadvantaged people especially women and families of the SC/ST and marginalised farmers/

DPIIP operates in 53 blocks of 14 districts-selected on poverty and backwardness criteria on the HDR report. Governance and management at State level is through the Society for Poverty Alleviation Initiatives chaired by the Chief Minister. In each district there is project support unit with topic coordinators- and at block level a project facilitation team each covering 20-25 of the 3000 villages. Before starting in each village there is full background appraisal, and entry points are established- after mobilisation baseline survey- participatory process of identification of disadvantaged groups in the village-wealth ranking, in degree of poverty, Common Interest groups (CIGs) established around a common activity which will become building blocks of grass root level devolution and democracy members have got a background. CIGs get grants- 10% of each CIG is taken to create along term village fund managed by the Village Development Committee- the VDC will decide the terms of lending to members. CIGs has initiated public private partnerships (PPP) for sourcing of product, knowledge, new technologies and services to achieve better livelihoods;

A variety of linkages around agric product marketing, handicraft marketing and the nationalised banks have provided scaling up and of CIG activities.

A variety of new investments have been produced: more wells, tube wells, land management improvements; increases in animal husbandry, new village industries and services- brick kilns, carpentry, tourism, shoe making. Hair cutting and a variety of trading activities- groceries, tiles, spices, pottery, leather photo copier shops- and infrastructure drinking water, schools, water storage and conservation, electrification and sanitation

In the next phase more attention will be given to self-help groups set up savings and credit schemes.

*Source:*

### **Box 6 MP Rural Livelihoods Project (MPRLP)**

MPRLP is particularly focused on delivering socio-economic empowerment to women and the selection of villages participating has been based on low female literacy rates (around 21%). Activities are undertaken in five themes; strengthening the Gram Sabah (supporting the state initiated decentralisation processes); improving livelihoods; social protection; gender and equity and informing policy. The state project management unit is headed by the project coordinator: overall guidance is provided through the district project support unit with a team of subject matter specialists. The project facilitation teams are responsible for the projects at the village level.

The Gram Sabha are being enabled to do village resource planning, selection of beneficiaries through wealth ranking and monitoring livelihoods activities supported by a livelihoods promoter. It controls the Gram Kosh fund which is utilised by community on a discretionary basis for maximising opportunities for sustainable livelihoods and community asset building. MPRLP has provided training on financial management, employment, local markets, non timber based forest produce trading and marketing, increase in organic farming, paddy growers biogas plants, self help groups. The focus has been on agriculture and livestock management - tree planting on field bunds 2900 villages- for windbreaks soil carbon, income sources. NREGs helped with new wells and channels. Also micro-enterprise development- community based weavers, handicrafts- NREGs new looms. Increase capacity and skills.

For example in one village (Maniya village in Mandla district- a monthly pension for vulnerable people has been introduced) more crops for example turmeric. Shahdol district has launched community kitchens to provide food security for the poorest- 8 community kitchens overall

#### **Achievements:**

Improved access to health facilities, and agric advisory services, use of improved seeds, double cropping for 12000 additional farmers. Additional irrigation, increases in income of 30% of pop in targeted villages, crop production, reduction in migration, less dependent on money lenders, bio fuel plants, micro enterprises, local markets- in phase 1.

Now in second phase reaching 30000 villages. Supported by DFID

Phase 2- there will be greater emphasis on micro finance and social protection- more work with NGOs Priorities: micro-finance social protection effective implement of NREGS, promotion of alternative sources of energy, prevention of migration from project villages, large scale plantation of aonia and bamboo.

For poverty alleviation and improving home environments for health has been improving energy security for livelihoods, through the installation of biogas plans in remote rural areas- 200 households which have cattle and land resources- a further 3000 by the end of 2010 and a total 12,000 by the end of 2012. The programme has involved training in construction, management and maintenance of biogas plants- training of masons- 170 and 2500 women users. 100 livelihood promoters and been trained and equipped with a

tool kit. This is to be scaled up in the second phase. It has also had the effect of politicising women who stood successfully in local elections. There are also programmes of smokeless stoves and solar PV stoves have been devised.

*Source:*

## **Section D: Cross Cutting Aspects and Assessment**

### **1.1 Overview**

This section contains a rapid assessment of cross-cutting aspects: energy and low carbon development; adaptation, generic institutional and planning dimensions; MP state institutional and planning dimensions and next steps.

This sector-driven approach has benefits in that it is comprehensive and will enable the sector specialists to engage and refine the potential actions in their areas to identify actions. But it was an ambitious decision with the resources available to start across the whole climate change action agenda. The study has overviewed not just those sectors which are likely to be impacted by climate change due to historic and projected global emissions, but also to those energy-using sectors in MP which are developing and contributing to the emissions. It has produced a very substantial programme of actions which need to have a timescale and perspective of delivery over the next set of plans.

Climate change provides challenges around both fronts for development in the state: in the rural and urban areas. The state is marked with a complex social structure, a predominantly agrarian economy, a difficult and inaccessible terrain, and scattered settlements over vast area that together pose several formidable problems to service delivery systems. Climate change has the potential to undermine existing efforts to tackle the mountain of poverty removal in the state and the complex social development problems faced. Drought, lack of investment to produce year round cropping, a degrading forest resource will all be exacerbated by climate change and make the problem of delivering more and better livelihoods more difficult. Economic growth around the state's mineral resources is likely to continue and provide engines of growth providing problems associate with rapid urbanisation and providing more power from coal can be tackled. There are significant opportunities at this time to ensure pathways allow for advanced energy efficient technologies and infrastructure that can provide the basis for sustainable development. For the majority of its population who have no or little contact with the commercial energy sector- and need access to energy for economic and social development, there may be new opportunities to tackle long standing problems with a new focus on these issues at national and international levels. There are opportunities to link up with the GOI NCCP Missions of policy development on: enhanced energy efficiency; sustainable habitat; conserving water; and, a Green India.

Both of these climate change challenges around the urban and rural nexus, could benefit from having a strategic integrated cross-sectoral approach devised at state level, with reference to the national and global frameworks a the next stage.

### **1.2 Government of MP strategy**

The Chief Minister has unveiled a holistic vision of development centred around “seven resolutions”, of which five are directly relevant to climate change:

- **infrastructure development;**
- **making agriculture a more lucrative profession;**
- **enhancing industrial investment;**
- **empowerment of women;**
- **expansion of education and health facilities;**
- a firm law and order situation; and
- good governance for the common man.

The government has gone ahead to implement this agenda by identifying seven working groups – each working group composed of experts from different backgrounds – which would formulate an action plan for implementation of the seven resolutions.

### **1.3 Key Donors activities relating to climate change**

DFID partnership with state of MP started in 2000 and its engagement has expanded since. DFID has been supporting the Madhya Pradesh power sector since 2002 and worked in close partnership with the ADB by providing technical assistance for power sector reforms (PSR). The second phase of DFID’s support to PSR began in December 2005. DFID started working in the health sector in MP in 2004 through the Decentralised District Health Management Programme (2004-2007). This has evolved into the current MP Health Sector Reform Programme (HSRP). DFID started the Madhya Pradesh Rural Livelihoods Programme (MPRLP) in June 2004 in a few villages which gave way to MPRLP Phase II in 2007 which has wider scope and mandate. Since 2007, DFID has also launched the MP Urban Services for the Poor to foster better service delivery in 4 cities in MP now scaled-up to 14 towns. The Strengthening Performance Management in Government (SPMG) programme started in 2007, it has contributed to the strengthening of financial management systems and planning in GoMP.

To help meet MP’s needs and priorities, the following actions will strengthen economic and social development:

- Better targeting, monitoring and evaluation of schemes aimed at the weaker sections, particularly the tribal population and women
- Strengthen supply side mechanisms for basic service provisions including better health and nutrition, water and sanitation, esp. at the district, block and primary levels
- Integrating health and nutrition services to build convergence in service delivery
- Foster transparency in terms of entitlements, demand side accountability and greater civil society engagement
- Empowerment of women and socially excluded groups by facilitating greater involvement in governance, opportunities for financial inclusion and through better targeting. Provide them with safe environment by strengthening policing, improved access to justice and protect them from violence.

With a stronger social development base, the implementation of climate change adaptation actions is likely to be more successful. DFID, given its commitment to the climate change agenda, is also keen to assist MP to develop a suitable strategy and

action plan to respond to the challenges posed by climate change. This would include coordination with the MoEF-DECC supported project on climate change adaptation in agro-ecological zones of MP. This project is just starting with the selection of two districts from entirely different agro climatic regions Datia and Tijamgarh districts in Bundelkhand agro climatic region and Dhar and Ujjain districts in Malwa agro climatic region.

#### UNDP

UNDP are setting up a project with the State Government to integrate climate change concerns in various sectoral policy and programs to reduce vulnerability and increase adaptive capacity. The project aims to enable a State level action plan on climate Change and evolve strategies to combat impacts of climate change. The specific objectives of the project are, (i) Developing MP Climate Change Cell into a Knowledge Management Centre to effectively manage the knowledge related to climate change (ii) Development of State level Climate Change Strategy and Action Plan and (iii) Mainstreaming of Climate Change Concern into policy and programmes. The specific activities during the first year are:

1. Constitution of Core Group in EPCO and multi disciplinary Advisory Group on Climate Change (AGCC)
2. Launch workshop to get buy-in of stakeholders and to validate the process for SCCSAP preparation by the AGCC
3. Capacity building and Exposure visit of Core team members of MP Climate Change Cell
4. Commission Review Studies of Existing State Policies and Programs and one Scoping Study from Climate Change perspective to Institutes like IIFM / Individual experts
5. Identification of an agency and outsourcing organisation of stakeholder Consultation Workshop
6. Conducting 8 Sectoral Consultation Workshop at state and divisional level

#### **1.4 Cross-cutting approaches to low carbon development:**

For long-term economic development opportunities in MP which has a growing industrial sector which needs to be globally competitive, it might be advantageous to devise a strategy which promotes the most cost-effective and efficient technologies across the sectors. The following table provides a useful reference point.

#### **Box 6: Energy technologies: Opportunities<sup>51</sup>**

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<sup>51</sup> As opposed to income level, geographical location is a more important determinant of the ability to produce some renewable energies (the exception is likely to be those that use waste as an input).

Abatement Opportunities	Availability in Middle income countries	Availability in Low income countries
<b>Efficiency gains</b>		
Lighting	✓✓	✓
Insulation	✓	✓
Motor systems efficiency	✓✓	✓
Clinker substitution by fly ash	✓✓	✓
Efficiency improvements other industry	✓✓	✓
Residential electronics and appliances	✓✓	✓
Retrofit residential	✓✓	✓
Cars full hybrid and plug-in hybrid	✓✓	✓
Building efficiency (new build)	✓✓	✓
Nuclear	✓	✓
Coal CCS new build	✓✓✓	✓
Iron and steel CCS new build	✓✓✓	✓
Coal CCS retrofit	✓✓✓	✓
Gas plant CCS retrofit	✓✓✓	✓
<b>Use of carbon assets</b>		
Crop land nutrient management	✓✓	✓✓✓
Rice management	✓✓	✓✓
Reduced slash and burn agriculture	✓	✓✓
Reduced pastureland conversion	✓	✓
Reduced intensive agriculture conversion	✓	✓
Pastureland afforestation	✓	✓✓✓
Grassland management	✓	✓✓✓
Organic soil restoration	✓	✓✓✓
Degraded land restoration	✓✓	✓✓
Degraded forest reforestation	✓✓	✓✓
<b>Renewable energy supply</b>		
Electricity from landfill gas	✓✓	✓
1 <sup>st</sup> generation biofuels	✓✓	✓✓✓
2 <sup>nd</sup> generation biofuels	✓✓	✓
Small hydro	✓✓	✓✓
Waste recycling	✓✓	✓
Geothermal	✓✓	✓✓
High and low penetration wind	✓✓	✓✓
Power plant biomass co-firing	✓✓	✓✓
Solar CSP	✓✓	✓✓✓
Solar PV	✓✓	✓✓✓

Source: Adapted from McKinsey (2009)

## 1.5 Adaptation to climate change

The table below sets out a typology of adaptation practises that has been established through the research literature<sup>52</sup> and provides potentially some integrating themes for the sectors. Many of the sectors have similar activities such as research, awareness raising and capacity-building and these could be delivered at state level in an integrated way.

Adaptation Strategy	Description
Changing Natural Resource Management Practices	Emphasises new or different natural resource management practices (e.g., for managing water, land, protected areas, fisheries) as

<sup>52</sup> See Burton Willows and Connell and Mcgray *et al*



	adaptation strategies.
Building Institutions	Creates new or strengthens existing institutions (e.g., establishing committees, identifying mechanisms for sharing information across institutional boundaries, training staff responsible for policy development).
Launching Planning Processes	Sets in motion a specific process for adaptation planning (e.g., developing a disaster preparedness plan, convening stakeholders around vulnerability assessment findings).
Raising Awareness	Raises stakeholder awareness of climate change, specific climate impacts, adaptation strategies, or the environment in general.
Promoting Technology Change	Promotes implementation or development of a technology new to the location (e.g., irrigation technology, communications technology).
Establishing Monitoring/Early Warning Systems	Emphasises the importance of creating, implementing, and/or maintaining monitoring and/or early warning systems.
Changing Agricultural / forest utilisation practices	Focuses on new or different agricultural / forest utilisation practices as adaptation strategies.
Empowering People	Emphasises literacy, gender empowerment, or the creation of income generation opportunities as a basis for adaptation.
Promoting Policy Change	Promotes establishing a new policy or adjusting an existing policy.
Improving Infrastructure	Focuses on creating or improving built infrastructure (e.g., roads, sea walls, irrigation systems).
Providing Social Protection	Creates, modifies and promotes insurance, credit, asset transfers and safety nets (NREG).
Other Strategies	Adaptation in disaster relief, eradication of climate-related diseases, assisted migration schemes etc.

## 1.6 Generic institutional and planning dimensions

Moving from this scoping study to devising an implementable action plan and then organising its delivery will be a major challenge. More detailed planning work and analysis will be necessary. This report is the first step. The following actions in particular need to be undertaken: institutional and capacity assessment and improvements in planning.

### ***Institutional capacity assessment***

A preliminary identification has been made of institutional and planning capacities within MP through discussions with some key officials and project staff. There is a need to

assess these more precisely and then monitor to plot progress. It is suggested that a systematic capacity assessment as to manage these risks and vulnerabilities is undertaken identifying key institutional and planning gaps at the state level and their inter linkages with national and local level planning. This assessment can then be repeated regularly and progress monitored. The following table shows one system which allows for self-reporting by departments<sup>53</sup>.

SELF ASSESSMENT AGAINST CLIMATE CHANGE RISK ASSESSMENT <sup>54</sup>						
	Level 1	Level 2	Level 3	Level 4	Level 5	
	Getting started	Awareness and Understanding	Implementation and progress	Implemented in all key areas	Embedded and Improving	
Leadership						
Policy and Strategy						
People						
Partnerships						
Processes						

## 1.7 Next steps

There are several building blocks to work from:

- Leadership with CC cell in EPCO
- Some champions and actions underway in other departments
- Access to key institutions: IIFM, Agricultural Universities, State Water Data Analysis Centre, Hydrological Information Centre
- Active donor engagement DFID, UNDP, GTZ
- GoI NATCOM1, NACPCC, State Action plan letter

The State Government has entrusted Environmental Planning and Coordination Organization (EPCO) to act as the facilitator in MP by designating it as the State Nodal Agency for all the issues pertaining to Climate Change. A climate change cell has also been established in EPCO to work on these issues. EPCO has already developed some expertise and momentum on climate change. As an autonomous organisation of the State government EPCO enjoys easy access to all government stakeholders in the State to facilitate and co-ordinate environment and climate change related works in the State. It will also be critical to work through the implications of action at all scales of governance. MP's decentralised approach to its service delivery will support development of climate change strategies at all levels. Key actions are:

- Establish a route map- which involves ongoing support for EPCO,
- Identify CC champions in each department (CC cells)
- Embed an effective cross-departmental committee.
- Ensure climate change roles and responsibilities are clear in each Department and Agency

<sup>53</sup> Derived from UK Treasury risk assessment by UK National Audit Office

<sup>54</sup> This approach to capacity assessment was derived from the UK Treasury

- Raise awareness and capacities down through Districts and Panchayats  
Increasing access to CC projections
- Obtain State level capacity to interface with climate change science and to act as an intermediaries across Government departments and decentralised levels of Government
- Undertake specific scientific studies on key gaps e.g. changes in distribution and intensities of rainfall
- Create baselines to monitor change and interventions
- Create professional and scientific networks within and to connect them externally
- Create easy to read summaries of climate change information
- Create information on technology solutions, economic tools and policy measures
- Create trainers and then networks of trainers
- Work with existing institutions and systems 3 audiences: scientific and technical staff generalist policy-makers; and field officers

This report can provide the basis for a review of the planned activities in the UNDP project which will build the momentum on the issue.

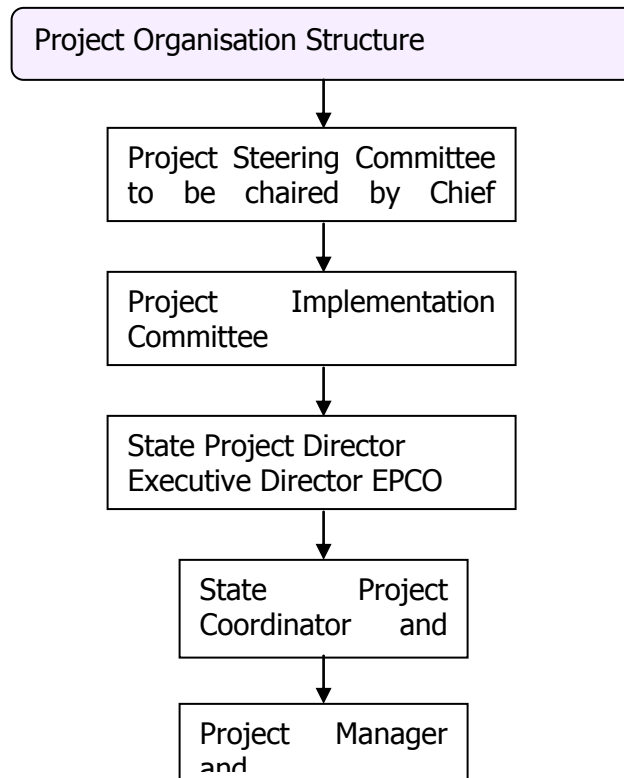
## Annex 1: List of meetings with individuals and organisations

Name	Designation	Organisation
Mr Alok Shrivastava	Principal Secretary	Housing and Environment Department
Mr Satya Prakash	Principal Secretary	Industry
Mr Manoj Govel	Executive Director	GoMP EPCO
Mr Rattan Purvar	Secretary	Department of Forests
Mr Lokendra Thakkar		GoMP EPCO
Manohar Patil	Assistant Engineer	GoMP EPCO
Mr B K Patel	Superintending Engineer	GoMP Urja Vikas Nigam
Dr R K Jain	Member Secretary	Go MP Pollution Control Board
Dr Rajiv Pandev	Scientist EIA Division	Indian Council of Forestry Research and Education
Ravindra Saxena	Addl principal Chief Conservator of Forests,	Joint Forest management, Forest Development Authority and Forest Villages, Go MP
Mr Satish Kumar Gupta	Joint Director	Directorate of Institutional Finance GoMP
Mr Prajapati	Engineer in Chief	Department of Water Resources
Mr Satyam	Chief Conservator of Forests	Department of Water Resources
Dr R Singh	Expert Public Health and Hospital Management	MP Technical Assistance Support Team (TAST)
Mr P K Tiwari	Project Director	Project Implementation Coordination Unit
Mr S. K Shrivastava	Director of Hydro Meteorology	State Water Resources Agency (SWaRA) Groundwater Data Centre
Dr J Jain	Resource Scientist	State Water Resources Agency (SWaRA) Groundwater Data Centre
Mr P K Gupta	Senior Hydrologist	State Water Resources Agency (SWaRA)
G S Sachdev	Deputy Team Leader	MP Technical Assistance Support Team (TAST)
Mr L M Belwal	Project Director	MP RLP
Neerja Upadhyaya	Renewable Energy Coordinator	MP RLP
Manoj Saxena	Monitoring Coordinator	DPIP
Ronan Wadhwa	Communications	DPIP
Mr Saurabh	Assistant Director	Disaster Management Institute

Kumar		
Amit Anand	State Programme Officer MP	UNDP
Dr P R Deo	State Programme Coordinator	United Nations Population Fund
Ramit Basi	Development Facilitator	GO UN Joint Programme on Convergence, Delhi
Dr Richard Slater	Team Leader	MP Urban Services for the Poor
Ms Deepti Mukherjee	Director	ADB Urban Water Supply and Sanitation Project
A Fareed Uddin	Project Operations Manager	JICA/ MP Reproductive Health project
Dr Aboli Gore	Consultant- HRM	JICA/ MP Reproductive Health project
Mari Tsuda	Project Coordinator	JICA/ MP Reproductive Health project
Amod Khanna		Toward Action and Learning
Ranen Banerjee	Program Manager	Strengthening Performance Management in Government, PWC
Rakesh Jha	GRID Energy Utilities and Mining	PWC
Yogesh Kumar	Director	SAMARTHAN
Ashish Mondal		ASA`
J B Lal, Proloy Bagchi		Bhopal Citizens Forum

## Annex 2: UNDP Project Organisation Structure:

In order to conduct the project in an efficient and successful manner Project Steering Committee (PSC) under Chief Secretary of GoMP and Project Implementation Committee (PIC) under Principle Secretary, Housing and Environment Department is proposed to be constituted. The composition and broad functions of these committees is as follows.



### Project Steering Committee:

A Project Steering Committee (PSC) under the chairmanship of the Chief Secretary, Government of Madhya Pradesh will be constituted with ACS/P.S./Secretaries /HODs of concerning stakeholder departments, experts, selected NGOs/CBOs, UNDP and ED EPCO on board. Principle Secretary H. & E. Department would be the convening member of the PSC. The Project Steering Committee would provide overall policy guidance and bring in ownership amongst the concerning departments and stakeholders. PSC will meet once in six months.

### **Annex 3: Integrating climate change considerations with externally funded programmes – List of possible areas in DFID-funded MPUSP as a sample.**

1. Review of the City Development Plans with a climate lens: There are 14 Municipal Corporations for which City Development Plans are being prepared. While this activity may have commenced, these are yet to be finalised. Reviewing these city development plans with a climate lens can be done. This will be useful in re-orienting city developing planning towards a low-carbon and climate resilient development path. As this is likely to be the way of the future, this activity will lead to useful experience that can be gainfully captured in the form of a toolkit for a more universal audience.
2. Carbon emissions inventorisation: Emission intensity targets – though non-binding – have been announced at a national level. For the country to demonstrate performance, it will be required to establish systems to generate, collect and collate data on carbon emissions from various sectors. This will be required for the urban sector as well. Keeping 2005 as the baseline level, the reduction in carbon emissions in this sector will have to be reported. By undertaking this activity in the 4 focus cities, MP USP can gain the experience and assist in streamlining the method for the state as a whole.
3. Green buildings: Cities and towns are the large consumers of power and therefore should be the focus of energy-efficiency demand-side management. The movement towards green buildings needs to be aggressively ushered into the state. The 4 focus cities under MP USP can be used to make a beginning. A massive campaign to promote green buildings in these 4 focus cities can be done. This should include architects, builders, contractors and other stakeholders involved in the building construction sector. Subsequent to that, orders need to be passed for retrofitting Government buildings and designing new Government buildings with energy-efficiency considerations. Estimation of carbon emission reduction arising from these green buildings can also be done.
4. Water supply and sewage pumping: Pumping of water and sewage are energy-intensive. Based on the recent energy audit done and associated analysis / review, a few initiatives to implement energy-efficiency initiatives can be undertaken in MP USP. Estimation of carbon emission reduction arising from these improvements can also be done.
5. Sewage treatment: Decentralised sewage treatment will result in less pumping and therefore less energy consumption. Also, generating sewage gas in a structured manner will result in reduced methane emissions. These improvements can be studied and / or piloted under MP USP. Estimation of carbon emission reduction arising from these improvements can also be made. The potential across the state can also be calculated.
6. Garbage treatment: Biomethanation or landfill gas generation projects are technologies available to capture and use the gas. This will lead to reduction of methane emissions. These improvements can be studied and / or piloted under MP USP. Estimation of carbon emission reduction arising from these improvements can also be made. The potential across the state can also be calculated.

7. Street lighting: This consumes substantial power as well. There is a Project Design Document (PDD) prepared by EPCO for reducing carbon emissions through switching to CFL for street lighting. This PDD has also obtained the Host Country Approval recently and will be proceeding for registration with the UNFCCC's CDM Executive Board. Using the background information provided in the PDD, implementation initiatives can be done under MP USP. These implementation initiatives should also be integrated with those being planned by the DISCOM under the BEE's CFL promotion scheme. Estimation of carbon emission reduction arising from these improvements can also be made. The potential across the state can also be calculated.
8. Government-owned urban bus fleets: Improving the fuel-efficiency of bus fleets is a no-regrets option. Better maintenance of the buses and better driving practices can bring about these improvements. Under MP USP, a few such urban bus fleets can be identified and a programme to realise these fuel-efficiency improvements can be implemented. The fuel-efficiency improvements will result in carbon emission reduction that can be calculated. The potential across all the urban locations can also be determined.
9. Emissions from urban transport sector: The potential for reducing overall fuel consumption in urban locations has not yet been fully considered. Therefore, realising emission reduction has also not been considered. A study can be conducted – taking any one city as a sample - in order to determine fuel consumption practices and urban transport emissions. The study would also lead to identifying actions that the city can undertake to reduce emission levels.
10. Urban lakes as carbon sinks: Cities in MP such as Bhopal and Jabalpur have lakes, which can serve as carbon sinks. First-level study of a typical urban lake can be undertaken to determine lake conservation approaches and linkages to developing these lakes as carbon sinks.
11. Urban tree plantation: Trees serve as carbon sinks. Planting and maintaining trees in cities and towns has co-benefits: (i) produce the cooling effect that cities / town very much need and (ii) reduce the net carbon emissions generated by the city / town. Taking a city as a sample, a tree plantation plan can be prepared under MP USP. The net carbon emission reduction realisable can also be estimated. Subsequent to that, actions to implement the plan can be initiated.
12. Urban lifestyle issues: In a relative sense, urban lifestyles are more energy consumptive than rural lifestyles. While the overall direction of Government policies, plans and programmes would have to move towards being less consumptive in time, public campaigns can be initiated in parallel – particularly with the youth (colleges and schools) – to deglamourise consumptive lifestyles. Having such a campaign / communication initiative in one city can lead the way in what needs to follow across the state.