

# **Climate Resilient Development** In Bundelkhand Region of Madhya Pradesh

# Mainstreaming Climate Change Adaptation in Policy and Planning



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Climate change is a global phenomenon and has varying impacts on each and every one of us. Significant climate shifts have already been observed over the past century<sup>1</sup>. The 1901 to 2007 period has seen a significant warming trend of 0.51°C per 100 years in India's annual mean temperature. During the same period, India's maximum and minimum temperature increased at a rate of 0.71°C and 0.27°C per 100 years respectively. In rural areas of India, over 700 million are directly dependent on climate-sensitive sectors like agriculture, forests, fisheries and natural resources such as water, fodder, and biodiversity for their livelihoods<sup>2</sup>.

Today uncertainties associated with climate variability poses great risks to the economic development all over the world. India has reasons to be concerned about climate change. Its large population depends upon climate-sensitive sectors like agriculture and forestry for its livelihood. Any adverse impact on water availability due to changes in Himalayan ecosystem, decrease in rainfall and increased flooding in certain pockets would threaten food security, pose risk to the natural ecosystems including species that sustain the livelihood of rural households, and adversely impact the coastal system due to sea-level rise and increased extreme events. This aside, achievement of vital national development goals related to other systems such as habitats, health, energy demand and infrastructure investments would be adversely affected. The long-term nature of climate change and the significant impact it can have on Indian agricultural systems requires future agricultural development policy and practices to include both short-term and long-term planning that incorporates climate change knowledge and understanding in order to adequately respond to the reality of a changing climate process referred to as climate change adaptation. This entails mainstreaming climate change adaptation in the current planning process in order to address the issues of growing vulnerabilities and livelihood security of poor and vulnerable communities.

### **Mainstreaming Climate Change Adaptation**

Mainstreaming climate change adaptation is an iterative process of integrating adaptation measures into policy-making, budgeting, implementation and monitoring processes at national, sectoral and sub national levels in view of climate change impacts. It is a multi-stakeholder effort grounded in the contribution of climate change adaptation to human well-being, pro-poor economic growth, and achievement of the Millennium Development Goals (MDGs). It entails working with a range of government and non-governmental actors, and other actors in the development field (UNDP-UNEP, 2011)

In India, mainstreaming climate change adaptation in the developmental planning is still in infancy. Mainstreaming requires cross cutting policy approach which will not only address climate resilient development in planning processes, but will also make the already existing policies climate smart. In order to achieve this, the decision makers first need to understand the impacts of climate change on various climate sensitive sectors such as natural resources, biodiversity, agriculture, health, socio-economic vulnerabilities, and on the overall economic development of the country. Madhya Pradesh is the second largest state of the country comprising of fifty districts spread across eleven agro climatic zones. The state is rich in natural resources and agriculture is an important driver of state's economy making it highly vulnerable to the risks of climate change. Several previous research outputs have fairly clearly indicated that Madhya Pradesh is among the most vulnerable states in India. Along with high physical vulnerability, the state is also extremely low on adaptive capacity. Bundelkhand, a semi-arid region of Madhya Pradesh, is particularly sensitive given the prevalent low levels of development and its high reliance on climate sensitive sector such as rainfed agriculture. Addressing the potential impacts of climate change in Bundelkhand region requires increased attention on improving the area's ability to adapt to a changing climate while simultaneously addressing current developmental issues.

Kothawale, D. R. Munot, A. A., & Krishna Kumar, K (2010), Surface air temperature variability over India during 1901-2007, and its association with ENSO, *Climate Research*, 42(2), 89-104

<sup>2</sup> Satapathy, S. (2011) 'Adaptation to Climate Change with a Focus on Rural Areas and India' Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, India Project on Climate Change Adaptation in Rural Areas of India

<sup>1</sup> 

This report analyzes the existing policy frame of India and the state of Madhya Pradesh and investigates the current schemes for gaps in convergence, identifying the need of planning support tools and monitoring indicators from a climate change lens. It also identifies the tools for mainstreaming climate change adaptation and recommends integrating these tools in the planning process for climate responsive policies.

# 1.1 Approach and Methodology

The report is based on understanding climate perspectives in planning through primary field consultations and secondary literature review. The approach has been applied to study the current situation of climate change adaptive planning at the state and national level. Desk research was conducted to collate lessons from secondary information and convergent project to study existing policy and institutional framework at national and state level. The report also briefly scanned the vulnerabilities in Madhya Pradesh part of Bundelkhand by means of secondary literature review and field consultations. To validate the ground realities, several primary consultations with line departments and local CSOs were conducted in the six districts of Bundelkhand. To represent community perspectives focussed group discussions were done with the farmers at village level in each district for situational analysis of climate adaptive planning. In addition, stakeholder consultations at regional, state and national level were conducted to identify tools and define a roadmap for mainstreaming of adaptation in the planning process.



Stakeholders from M.P Planning Commision, EPCO, scientific institutions, extension agencies and CSOs at the national level workshop

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The representatives included identified stakeholders from state nodal agency for climate change, technical and extension agencies and Civil Society Organisations.

# **1.2 Mainstreaming Climate Change** Adaptation

Addressing potential impacts of climate change in the country will require increased attention on improving the ability to adapt to a changing climate while simultaneously addressing other developmental issues. Many development policies, plans and projects currently do not take climate change into account due to lack of awareness and clarity on how to effectively develop and integrate adaptation options. Integrating adaptation into policy and planning provides an essential opportunity to make more climate-resilient development investments. Efforts have been put at national and state level to integrate scientific understanding of the changing climate into planning processes through usage of tools such as vulnerability assessment. However many decision makers and implementers still struggle to understand the policies, approaches and time lines required for effective planning for the uncertainties<sup>3</sup>. Some action has been taken up at national and sub-national level to address these concerns.

# 1.2.1 National Level

The landmark precedence was the **National Action Plan on Climate Change** (NAPCC) in 2008, by the Prime Minister's Council on Climate Change for climate change action in the country. The plan consists of eight national level missions including five that pertain to adaptation. To integrate climate action at subnational levels, various states were also directed to develop their own action plans under the framework of the NAPCC.

Planning Commission of India is also making efforts at the national level to integrate climate change concerns in development planning. Keeping these concerns in mind, the Steering Committee on Environment, Forests & Wildlife and Animal Welfare for the Twelfth Five Year Plan of the Planning Commission formed a Sub-Group on Climate Change (as part of the Working

<sup>3</sup> Dixit, A et al, Ready or Not: Assessing Institutional Aspects of National Capacity for Climate Change Adaptation, World Resource Institute

Group on Environment and Climate Change) in July 2011. The working group studied the vulnerabilities of various sectors to climate change and made recommendations on climate change for the 12th Five Year Plan.

### National Level Mission with the NAPCC

- National Solar Mission
- National Mission for Enhance Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission\*
- National Mission on Sustainable Agriculture\*
- National Mission for Green India\*
- National Mission for Strategic Knowledge\*
- National Mission for Sustaining the Himalayan Ecosystem\*

\*Directly pertain to climate adaptation

The 12th five year plan emphasises on adopting agricultural practices to address climatic conditions,

# Suggested Re-organisation of the National Action Plan for Climate Change

### A) National Missions

- 1. National Solar Mission
- 2. National Wind Energy Mission
- 3. The Energy efficiency Mission
- 4. Sustainable Habitat Mission
- 5. Sustainable Agriculture Mission
- 6. Mission on sustainable Himalayan Eco-systems
- 7. National Mission for a Green India

### **B)** Policy Thrust Areas

- 1. Advanced Coal Technologies
- 2. Energy Efficiency Improvements in Major Industries
- 3. Solid Waste Management Systems in Towns and Cities
- 4. Treatment of all Sewage before Release into the Water Bodies
- 5. Improved Urban Public Transport
- 6. Dedicated Freight Corridors along Major Routes
- 7. Climate Related Research through Scientific Departments

(Source: Planning Commission, GoI)

and managing water resources comprehensively and efficiently. The plan suggests that all levels of Government need to act together to combat the challenge of climate change, which is slightly different in practice. The planning at the national policy level includes recommendations of scientists and experts but as it reaches the local level the authorities are caught up more into the practical implementation of the schemes/plans and are mainly unaware of the concept behind the formulation of the particular scheme. The plans addressing climate change concerns at the national level are restricted to mere development plans at the bottom level. In a nutshell, apart from certain schemes and above mentioned initiatives that can be considered important for adaptation there is no known communication on climate change from the national level that reaches the grassroots, unless it is through civil society organisations and indirectly through schemes that address measures for climate change adaptation. The 12th five year plan also proposes that the national missions of the NAPCC need to be reorganised in accordance with the updated priorities.

**The Water Mission** needs to be merged with the new National Water Mission that is being formulated for the Twelfth Five Year Plan. The National Water Policy recommends taking the river basin / sub-basin as a unit for planning and management of water resources and proposes that departments / organizations at the Centre and the States be restructured and be made multi-disciplinary. It also proposes the establishment of Water Regulatory Authorities in each state and a national forum to deliberate upon issues relating to water and evolve consensus, cooperation and reconciliation amongst the various states<sup>4</sup>.

The Strategic Knowledge Mission should be reoriented and the development of green technology and research should be mainstreamed into various aspects of climate change into the main programmes of scientific departments, like earth sciences, space, science & technology, agriculture, health and biotechnology. This will ensure substantial funding as directed under the Twelfth Five Year Plan.

<sup>4</sup> http://chimalaya.org/2012/04/11/indian-pm-talks-aboutnational-water-mission-of-climate-action-plan/

The 12<sup>th</sup> five year plan makes a special mention to Bundelkhand region under Bundelkhand Special Package for Madhya Pradesh. During 2009-10 and 2010-11, 150 check dams, 192 contour trenches, 177 percolation tanks, 53 pond were constructed and other soil moisture conservation (SMC) activities were carried out in 49678 ha forest land. This led to recharging of the ground water in the adjoining area. The catchment areas were also reclaimed with vegetation by artificial seeding. The farming communities were also motivated to shift from rain-fed maize to soyabean crop (high protein and nutritive crop) in the project area of Chhatarpur and Tikamgarh districts. This project was implemented by the Forest Departments of the States and was funded under the **Bundelkhand Special Package**.

## 1.2.2 State Level

Based on the NAPCC framework, all the states are developing their state action plans on climate change which would be used for mainstreaming climate change.

The Environmental Planning & Coordination Organisation (EPCO), Government of Madhya Pradesh has prepared the Madhya Pradesh State Action Plan on Climate Change (MP-SAPCC) within the framework of NAPCC. The MP-SAPCC<sup>5</sup> report focuses on devising appropriate adaptation guidelines with the aim of strengthening the developmental planning process of the state to adequately address climate change concerns. The plan identifies ten sectors that it considered sensitive to climate change. Of these, forest, biodiversity, water resources, and agriculture are directly pertinent to the Bundelkhand region. For each of these sectors, the MPSAPCC provides key adaptive strategies. Examples for those relevant to Bundelkhand region are listed below.

Sector	Adaptive Strategy
Forestry/ Biodiversity	• "Prioritise soil and water conservation measures as part of sustainable forest management practices"
	• "Reduce over-dependence on forests for energy by supplementing with alternate energy sources"
	• "Enhance forest conservation, afforestation(with special emphasis on Compensatory Afforestation) and reforestation activities through viable models"

Sector	Adaptive Strategy
Water Resources	<ul> <li>"Promote recharge of groundwater with special focus on over exploited areas"</li> <li>"Encourage water management practices like water auditing, regulated exploration of groundwater, water recycling, etc"</li> <li>"Restoration of traditional water storing structures as groundwater"</li> </ul>
Agriculture	<ul> <li>"Promote soil and water Conservation technologies"</li> <li>"Enhancing dissemination of new and appropriate technologies and strengthening research"</li> <li>"Capacity building of communities on sustainable harvesting, water management.</li> <li>Use of fertilisers, sustainable agri- residue management etc"</li> </ul>

Consultations with EPCO and other key stakeholders highlighted that the MP-SAPCC is a dynamic document and will continuously be updated to reflect the needs of climate change adaptations in the state. During the framing of the state action plan, EPCO experienced several data constraints (gaps in the access of validated data).

At present EPCO is working on vulnerability assessments through research in the areas of:

- Regional Climate Models (RCMs)
- Vulnerability Assessments at the spatial, temporal and sectoral level
- Action plans on mitigation through GHG inventories

Furthermore, the MP-SAPCC will also require developing indicators for climate change adaptation monitoring and tracking. Updated information in these three areas will lead to the revision of the MP-SAPCC and will provide strong scientific validations for translating development plans into climate adaptive plans and help strengthen MP-SAPCC.

Ideally, to integrate climate variability concerns and enable adaptation, the objectives and strategies from MP-SAPCC should get integrated in state plans and be translated into schemes and initiatives of the state government. Currently this is not the case, although certain central and state sponsored schemes do address issues of climate variability and agriculture such as schemes on crop insurance, promotion of certain types of seeds and irrigation facilities. However, regional climate variability and specific interventions based on agro-climatic zones are not addressed in these plans and they remain top-down in their approach. State plans have become an aggregation of state line department plans, which in turn tailor their plans to fit in with resources available under central schemes.

The eleven agro-climatic zones of the state of Madhya Pradesh with varied levels of vulnerability to climate change require adaptation strategies designed to address the variability.

## 1.2.3 District Level

Consultations with the stakeholders at district level brought out the gaps existing in the planning process. Currently most states, including Madhya Pradesh have put in place District Planning Committees. However, as stated in the Manual for Integrated District Planning, the process is vertically aligned with one with line departments working in silos with little or no participation of the people/communities and a high degree of reliance on the District Commissioner/ Magistrate to tie these plans together<sup>5</sup>. Currently the primary focus in the process is on capacity building of District Planning Committees to ensure that this level of planning is participatory. While this may enable cross-sectoral planning to enable adaptation for climate change, district level planners especially at the Gram Panchayat level who have a critical role to play have poor knowledge of the impacts of climate change and how adaptation can be integrated into their priorities. Another gap that needs to be addressed is the climate resilient development of different agro-climatic zones within a district or a state. The planning process requires specific strategies that address the needs of sensitive agro-climatic zones such as Bundelkhand in particular.

The extensive fieldwork and consultations with line departments in the six Bundelkhand districts of MP brought out that scheme implementation and resource allocation at the local level is not efficiently distributed and that long term planning to address climate change, is not present. This deficiency is driven by a variety of factors including lack of climate change related information and communication capacity at the district and community level, insufficient scheme and policy outreach, and top-down budget allocation processes that do not necessarily reflect the needs on the ground. This is further aggravated by lack of convergence between the departments both at vertical levels (village, block, district, state and national) and at the horizontal level (between departments. For example (between agriculture and irrigation department) and planning agencies (e.g. district planning committee).

Although there is a framework to facilitate decentralised planning where information and plan formation flows from the ground to the state, the climate perspective is however missing. The framework develops perspective district plans for five years but climate adaptation is not highlighted in it. Also, the climate perspective requires a more long term vision, around twenty years which can be further broken into midterm plans - the five year perspective plans and ultimately the short term plans.

Primary consultations with the state level and district level government officials brought forth that though planning at the policy level takes climate change concerns into consideration but when it reaches local level the authorities are more into practical implementation of the schemes/plans and are mainly unaware of the concept behind formulation of the particular scheme. Focus group discussions with village farmers and Gram Panchayat heads in different villages in Bundelkhand revealed that little is done in the way of planning for rainwater harvesting at their level due to lack of awareness. One such example is of the Kapildhara Yojana, under which irrigation facilities are provided to the beneficiary families including digging of new wells, ponds in fields for water recharging, check-dam, stop-dam, and digging of small ponds. The beneficiaries of the scheme are those farmers on whose lands there is no irrigation facility. From the consultations with village communities, feedback suggests that Kapildhara Yoina has been implemented in the region and has benefited the farmers to some extent. Various wells have been constructed in a large number of villages under Mahatma Gandhi National Rural Employment Generation Scheme (MNREGS) and have reduced the burden of water availability to the farmers. But due to the diminishing ground water levels, these wells have low water levels in peak summer months and fail to

<sup>5</sup> Para 1.2.5 of the 1<sup>st</sup> chapter of the Manual for Integrated District Planning, Planning Commission, Government of India

<sup>5</sup> 

solve the purpose. Despite of development, various water conservation practices such as ground water recharging are still inadequate. It indicates lack of sustainable planning, which needs to be integrated in the long term planning to support communities who live in water scarce conditions.

# 2. Assessment of Climate Change Impacts and Vulnerabilities

In order to design policies and plans in the light of climate change, it is essential to understand vulnerabilities to the risks posed by climate change. This requires the foundation of a strong vulnerability assessment based on strong scientific evidences to convince the policymakers for mainstreaming adaptive planning in the current policy and planning framework. The scientific data based on climate projections have to be effectively translated to argue the direct and indirect impacts on the socio- economic development.

# 2.1. Madhya Pradesh

Madhya Pradesh (MP) has been identified as one of the most vulnerable states in India from impacts of climate change<sup>6</sup>. Here the impact of climate change is increasingly pronounced because of a predominantly agrarian economy and considerable poverty<sup>7</sup>. In India the most important climatic factor is the summer monsoon because it plays a critical role in sustaining various economic, social and environmental factors. As of 2011, the total population of the state stands at 72.6 million with 72.3% being rural<sup>8</sup>. Agriculture is the main stay of the state and accounts for 45% of the States' Domestic Product and employing 70% of the rural labour force. The net sown area at 150.78 lakh ha. is 49% of the geographical area of MP of which 19.65% is is net irrigated area. (MP, resource Atlas-2007, MPCOST). The state also accounts to 7% of food production in the country.

Some of the **climate change vulnerabilities** in the state of Madhya Pradesh are summarised below:

• According to the Madhya Pradesh State Action Plan on Climate Change (MP-SAPCC), the average surface daily maximum temperatures, in the period 2030s is projected to rise by 1.8-2.0°C throughout Madhya Pradesh and the daily minimum temperature is projected to rise between 2.0°C to 2.4°C during the same period. The eastern half of the state is expected to experience more warming than the western half.

- According to the MP-SAPCC, trends of average monsoon rainfall data from 1961 to 2002 indicate an inter-annual variability of average monsoon rain fall in the 41 year period. The rain fall trend shows a declining trend of rainfall for Madhya Pradesh.
- A study carried out for observations spanning 50 years in the Central Indian region including MP, indicates that the extreme precipitation events which are above 100mm are increasing in terms of their intensity and frequency, with low and moderate events becoming more and more infrequent<sup>8</sup>.

# Other potential Impacts of climate change<sup>10</sup>:

- With 31% of area in MP being under forest cover, changing climate may affect the composition and distribution of types of forests impacting livelihoods of millions in the state.
- It will also have adverse impacts on irrigation and hydropower projects besides reducing the availability of water for other purposes
- About 70% of the rural population of Madhya Pradesh is engaged in agriculture and agribased activities. Some of the climate change impacts on agriculture could be:
  - Extreme events like frost, excess rain and high temperatures can cause huge losses to productivity. Extreme events such as hailstorms and storms can damage crops during flowering and fruit bearing stages. Rainfall deficit and droughts can significantly impact agriculture production, which is predominantly rain fed.
  - □ Animal husbandry can potentially be impacted through an increase in vector

<sup>6</sup> GoMP Climate Change Cell (2012) 'Draft Madhya Pradesh State Action Plan on Climate Change' http://moef.nic.in/downloads/public-information/MP-SAPCC.pdf

<sup>7</sup> Hedger, M. and Vaideeswaran, S. (2010) ' Scoping Study for Madhya Pradesh State Climate Change Action Plan' DFID, India (IDS)

<sup>8</sup> Government of India (2011), *Census of India, 2011; Provisional Estimates.* 

<sup>9</sup> Goswami B. N., Venugopal V., Sengupta D., Madhusoodanan M. S., Xavier K. (2006) 'Increasing Trend of Extreme Rain Events Over India in a Warming Environment', *Science* 1 December 2006: Vol. 314. no. 5804, pp. 1442 - 1445

<sup>10</sup> GoMP Climate Change Cell (2012) 'Draft Madhya Pradesh State Action Plan on Climate Change' http://moef.nic.in/downloads/public-information/MP-SAPCC.pdf

<sup>7</sup> 

borne diseases, reduced productivity, and impacts of heat and water stress.

□ Health of the population is likely to be aggravated by climate change and indirectly through changes in the ranges of disease vectors (e.g., mosquitoes), water-borne pathogens, water quality, and food availability and quality. Increased heat waves and cold waves will also impact the health of the vulnerable population in MP. and indirectly through changes in the ranges of disease vectors (e.g., mosquitoes), water-borne pathogens, water quality, air quality, and food availability and quality.(MP-SAPCC, 2012)

A recent study<sup>11</sup> on potential impact of climate change and adaptation in India, which has a special focus in Madhya Pradesh, indicates that the population of Madhya Pradesh is vulnerable to climate change, particularly as it has high dependency on agriculture for livelihoods. As per the report, "there is a projected increase of monsoon rainfall of up to 28% and the projected temperature increase of 4.3°C over Madhya Pradesh by the 2080s ".

# 2.2. Bundelkhand

The Bundelkhand region of Madhya Pradesh given its fragile geophysical condition is significantly sensitive to climate change. Bundelkhand region comprising seven districts of Uttar Pradesh and six districts of Madhya Pradesh<sup>12</sup> is one of the most backward regions of the country. Out of these six districts of MP, four districts namely Chattarpur, Damoh, Panna and Tikamgarh receive funds from the Backward Regions Grant Fund Programme (BRGF) under the aegis of Ministry of Panchayati Raj. Agriculture is the main source of livelihood of this region. Bundelkhand is a hard rock area with limited or inadequate ground water resources, lacks infrastructure and access to improved technologies. The region being largely rain fed is perturbed with variable precipitation trends. Drought conditions are frequent in the region. The continuous drought years in Bundelkhand has severely affected

11 Indo-UK Collaborative Project on Vulnerability and Adaptation Assessment of the Madhya Pradesh, 2011 agriculture productivity and subsequently weakened livelihood systems in some parts of the region.

## **Trends of Climate Variability**

Climate data from 1980 to 2005 period has indicated an increase in the mean maximum temperature in Bundelkhand region by 0.28° C as compared to the baseline period of 1960-1990. Analysis of the simulated data generated by PRECIS Regional Climatic Model predicts that the temperature throughout the year is likely to be higher, in the range of 2 to 3.5° C by mid century<sup>13</sup>. The major precipitation season is expected to shift by one month (from July to August). The shift in monsoon causes delay in sowing which in turn delays harvesting and in drier conditions the potential yields would be lesser.

The climate science data developed by IITM revealed the climatic change exposure of Bundelkhand region by the end of the century<sup>14</sup>. The data was developed using the PRECIS model run over three time slices (2020s, 2050s and 2080s) using 1970s as base period. The study focussed on two major indicators of climate change- rain fall and temperature in the region. The results from the model predicted variability in climate by the end of the century. The annual average surface temperatures are projected to rise by 1-2°C, upto 3°C and upto 5°C towards 2020s, 2050s and 2080s respectively especially in the northern part of Bundelkhand. Projected rise in lowest minimum temperature is more as compared to rise in maximum temperature. In near future there may not be much change in seasonal monsoon rainfall, however the rainfall may increase by 5-10% towards 2050s and upto 20% towards 2080s with respect to base. July rainfall is likely to decrease but other months show an increase in rainfall by the end of the century. The number of cyclonic disturbances may decrease in future but the systems may be more intense with increase in associated rainfall by 10-15 mm. Moreover, the number of rainy days may decrease, but may be more intense in the future.

<sup>12</sup> Bundelkhand region of Madhya Pradesh comprises six districts viz. Chattarpur, Damoh, Datia, Panna, Sagar, Tikamgarh.

<sup>13</sup> IITM, Pune, India, Second National Communication to The United Nations Framework Convention on Climate Change, MoEF, Government of India, 2002.

<sup>14</sup> The climatic projections were shared by the IITM in the National workshop on "Climate Resilient Development for semi arid region A case of Bundelkhand region" organized by Development Alternatives and Swiss Agency for Development and Cooperation (SDC)



Figure 1: Time series of monsoon rainfall 1951-2007 for Bundelkhand region of M.P (IITM Pune)



Figure 2: Change (° C) in Annual average Surface Temperature towards 2020s, 2050s and 2080s (IITM, Pune)

Figure 3: Monthly rainfall change (%) in QUMP simulations towards 2020s, 2050s and 2080s in individual monsoon months and season as a whole (IITM, Pune)



Figure 4: Simulated rainfall intensity (mm/day) and projected changes through 2020s, 2050s and 2080s (IITM, Pune)



Figure 5: Simulated number of rainy days and projected changes through 2020s, 2050s and 2080s (Source: IITM, Pune)

### Vulnerability Assessment of Bundelkhand

The parched geography of Bundelkhand is one of the most underdeveloped regions of the country being low on human development indices. In addition to undulating terrain and climatic variabilities the drought prone region suffers from high socio economic vulnerabilities marked by increased climatic sensitivities and low adaptive capacities. The semi-arid geography of Bundelkhand is highly perturbed with variable climatic conditions intensified by undulating topography, resource exploitation, weak socioeconomic conditions, lack of access to improved technologies and frequent migration. It is largely rainfed and is perturbed with drought conditions frequent in the region leading to unstable socioeconomic conditions and food insecurity. The economy of Bundelkhand is predominantly agrarian; agriculture, livestock rearing and seasonal out migration provides for more than 90% of the rural income in Bundelkhand. The growing population and parallel increase in demand for natural resources has left the agricultural and water resources in the region susceptible to increasing climate change risks affecting the livelihoods of the communities. As the climate change impacts are likely to be faced most severely by such vulnerable regions of developing countries like India, there is an urgent need to integrate adaptive strategies at the local level and work towards strengthening national capacities.

## **High Sensitivity of Natural Resources**

The thirteen districts of Bundelkhand region consists of 7.08 million hectares of ravines and undulating terrain making the region prone to high run off and increased loss of soil fertility<sup>15</sup>. About 21.4% of Bundelkhand region (8.8% of Uttar Pradesh and 26.2% of Madhya Pradesh) consists of forest cover and scrubs. Additionally, population growth, increase in cultivable land, increased extraction of fuel wood, anthropogenic pressures and climatic variabilities have overall affected the quality of forests in the region. Losses in the agricultural produce due to variable climate have further increased people's dependency on forests for other livelihood options. The Bundelkhand region is rocky and has high percentage of barren and uncultivable land. According to the Wasteland Atlas of India 2005, approximately a total of over 11,000 sq km, comprising over a sixth of the area of Bundelkhand (M.P and U.P) falls under four broad categories of wasteland.



Barren and undulating terrain of Bundelkhand

Wastelands found in Bundelkhand can be grouped as: land affected by shallow, medium or deep gullies; wastelands with or without scrub in lowlands or uplands; degraded notified forest lands and barren, rocky and totally uncultivable land. Over half the total wasteland of the region is wasteland with or without scrub; half of which is in Chhatarpur district. Around a quarter of the total wasteland is degraded notified forest land, found mostly in Bundelkhand upland (Chhatarpur, Tikamgarh, Panna) and Sagar and Damoh plateaus.

## High Water Stress in Bundelkhand Region

Sensitivities in Bundelkhand are aggravated further due to water stress in the region. It is mainly due to inadequate and erratic rainfall, high run off rates and poor water retention capacity of the soil. Loss of traditional water management practices and insufficient water harvesting structures have further added to the stress. The average annual rainfall of Bundelkhand region of Madhya Pradesh is 990.9 mm falling within a range of 767.8 to 1086.7 mm. The region witnessed continuous meteorological, hydrological and agricultural drought for six years in the period 2003-2009. According to the Inter-Ministerial Report on Drought Mitigation Strategy for Bundelkhand Region (2008), the semi-arid region of Bundelkhand experienced meteorological drought in the years 2004-05 and 2005- 06 in the districts of Tikamgarh and Datia. In 2006-07 the region experienced overall 37% shortfall in rainfall with 5 out of 6 districts receiving deficit rainfall ranging from

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<sup>15</sup> Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

27% to 47%. The overall shortfall in precipitation went up to 46% during 2007-08 with all the six districts having more than threshold deficit of 20% for declaring meteorological drought.

Increasing temperatures have also led to high evapotranspiration rates which when greater than the received precipitation leads to loss of soil moisture and reduction in ground water recharge and surface water levels. Vulnerability assessment of the region reveals that the region is also facing the brunt of depleting groundwater resources.



Declining groundwater table in the region

In the six districts of Bundelkhand region the actual filling of 19 reservoirs (storage capacity- 950 MCM) progressively reduced from 52% in 2004 to 10% in 2007. Drying up of 70% of the tanks, ponds and dugwells and fall in ground water table in the region clearly indicated hydrological drought situation. About 44.7% of net sown area (NSA) is irrigated by canals, dug wells, shallow tube wells, lift irrigation and other flows. Major portion of this, i.e 31.7% of NSA is irrigated by ground water. The irrigation heavily relies on availability of water through rainfall which further increases the sensitivities to climate change<sup>16</sup>. A large portion of irrigation depends on extraction of ground water through diesel based pump sets which is heavy on the pockets of small and marginal farmers. With ground water levels falling and lakes and ponds drying up, the overall water availability for irrigation has drastically reduced. Furthermore, the area witnesses inefficient water management practices such as inadequate rain water harvesting, flood irrigation and insufficient groundwater recharging structures.

# Increased Vulnerability of the Agricultural Sector

Bundelkhand being predominantly agrarian has over 80% of its population dependent on agriculture, livestock rearing, forest produce and outsourcing of income by seasonal migration after the rabi sowing season. Agricultural production consists of more than 56% of cereals, 32% of pulses, 8% of oil seeds and 4% other crops. Out of the total number of land holdings, 68% belong to small and marginal farmers who have less than two hectares of land. Majority of these farmers are highly dependent on monsoon rains and modern agricultural practices for efficient water use have not been adopted<sup>17</sup>. Bundelkhand region faced its worst ever drought from 2004 to 2009 with a rain deficit of about 66%. According to the report of an interministerial central team, headed by Dr. J. S. Samra of National Rainfed Areas Authority (2008), the region could not cultivate 40% of the farms leading to about 30% reduction in food grain production. More than 20 lakh livestock were abandoned. Around 40% of the region's population had migrated out in search of work. These incidences of drought and high vulnerabilities indicate the negative impacts of climate uncertainties on food security of the region.

Consultations with farmers further revealed that unavailability of seeds, fertilizers and pesticides further cripples their situation. They face crisis due to increased agricultural inputs when compared to agricultural outputs and benefits.



High sensitivity of the farmers due to increasing vulnerability of the agriculture sector in the region

<sup>16</sup> Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

<sup>17</sup> DA-Swiss report on "Resource Vulnerability of Semi-Arid Bundelkhand and Recommendations for Policy Response - a brief analysis, 2012"

In the last 25 years the region faced challenges due to promotion of cash crops, changing agri-cycle, degradation of forest, over exploitation of ground water and damage to traditional water bodies. As a consequence this has led to drying up of natural land moisture. The problem was aggravated due to excessive water pumping from ground using tube wells leading to drying up of natural water sources. Now the water level in tube-wells has gone down up to 600 - 750 feet in some parts of the region. Lack of forest and rootless terrains causes water to flow with high velocity on Bundelkhand land, slowly turning the land into ravines. There is a downfall in number of rainy days in entire region and the state as well. In the year 1999 there used to be 52 rainy days during the year now that has gone down to 35 rainy days in a year<sup>18</sup>.

## Socio- Economic Vulnerabilities: High Sensitivity and Low Adaptive Capacities

The dry topography of Bundelkhand is coupled with underprivileged socio economic conditions. The incidence of poverty in the state is among the highest in the country, with people living below the poverty line increasing from 44.6% in 1993-94 to 48.6% in 2004-05. This is more so in rural than urban areas (53.6% in rural areas as against 35.1% for urban areas in 2004-05). Agricultural losses and frequent droughts forces the vulnerable communities to migrate to the cities. The drought period of 2003-2009 witnessed a migration of 40% of region's population. About 50% of the indigenous cattle population is unproductive. Hardly 0.5% of cattle population is cross-bred as compared to 15% of the national average<sup>19</sup>. Lack of fodder availability and water has reduced the interest of the communities in livestock rearing which has further lowered their adaptive capacities. Water for drinking and for other household purposes is fetched from far off sources by the women of the households adding to their normal work load in the drought prone circumstances of Bundelkhand. The region is also starved with timely information and technological interventions.



Water scarcity and unbiased socio-economic conditions increases the burden on women in the region

<sup>19</sup> Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008



# **3. Information and Communication Needs for Mainstreaming Climate Change Adaptation**

Successful implementation of climate smart policy or scheme requires climate risk communication as one of the most important tools for climate change adaptation. To facilitate implementation of adaptation measures it is important to communicate appropriate and relevant climate change information to the audience at the right time. Climate change communication, thus forms the backbone of climate change adaptation and adaptive planning. Therefore, there is a strong need for climate change communication which will not only create awareness but can also provide information and prepare communities thus inspiring behavioural change.

There are several technical and institutional barriers for robust climatic information reaching at the grassroots. During consultations with various stakeholders, the following factors emerged as significant obstacles for climate resilient development in Bundelkhand region.

- Institutional barriers to meteorological information: The institutions that provides hydrological and climate data Indian Institute of Tropical Meteorology is separate from the institution responsible for declaring floods or drought namely Indian Meteorological Department (IMD). This institutional division is problematic because the government and civil society needs verification for data interpretation before beginning adaptation action and declaration of flood or drought to enable release of state or federal relief funds for action.
- Complexity of scientific information on climate change: Another shortcoming for climate projections is the scientific complexity in the data generated. Simplified scientific data (which can be translated into impacts of climate change on crop productivity, water resources etc.) is still not easily available to institutions and communities. Scientific knowledge about vulnerability, climate change impacts and adaptation options needs to be translated into a language that decision-makers understand. It also needs to be converted to timescales appropriate for the decision-making process.
- Need of area specific localised climatic predictions: Data related to climatic variables

are available only for a single point within a district making it difficult to provide localised information to farmers. Even downscaled temperature rise projections are currently only available at spatial resolutions that consist of two to three districts. The PRECIS model used to develop climatic projections mostly uses a  $50 \times 50$  km resolution with a major setback of high level accuracy. Currently researches in climate predictions are dealing with limited accuracy and lower levels of confidence.

- Limited and unreliable statistical data records: The unavailability of data is a barrier to recommending robust adaptation options. The first challenge concerns information data collection and sharing. Studying the vulnerability of poorly developed regions like Bundelkhand requires strong foundation of reliable data such as statistical figures on agriculture productivity, water resources, demographics, socio economic conditions, market situation, migration etc, over spatial and temporal scales. The collection of this information is a complex process, as coordination among sectors, departments, officials as well as among knowledge sectors that do not ordinarily interact is essential. With accurate scientific data and planning for adaptation, advocacy among stakeholders, will be easier to achieve.
- Absence of localised agromet information: Centres providing agromet services at the local level are still absent. KVKs (Krishi Vigyan Kendra) have installed agromet devices in some model villages. However, the information provided by such installations is highly restricted and does not cater to the needs of other villages in the district.
- Inefficient delivery mechanisms and weak implementation at bottom level: Information and knowledge being generated through research on climate change adaptation has had limited success in being taken up at the local level; especially amongst those most vulnerable to the impacts of climate vagaries. Although several adaptation measures have been implicitly included in many parts of the planning process (i.e. watershed management

plans, irrigation schemes, agricultural development schemes), inefficient delivery mechanisms at the ground level and communication gaps have led to weak implementation of schemes at the most crucial bottom level. For example, the agriculture departments of each district have prepared agriculture contingency plan to advise farmers on appropriate adaptation responses in situations of a delayed or deficient monsoon. Advice includes implementing measures such as switching to drought resistant and short duration crop varieties, using improved crop management techniques, and practicing soil nutrient and moisture conservation measures that can help to mitigate potential impacts of different rainfall situations.

From ground level consultations, however, there is evidence that dissemination of this information to the grassroots farming communities is limited for several different reasons. Outreach is limited due to staff limitations within extension agencies. There are simply not enough extension agents, such as Rural Agriculture Extension Officers (RAEOs), at the grassroot level to address the information needs of the entire area for which they are responsible. Each RAEO is in charge of providing extension to around one to five villages, but these agents often do not adequately serve these communities because of lack of dedication and adequate skills.

• Lack of information centres at grassroot level: There are simply not enough information centres at the grassroots level. For many farmers, their only option to receive beneficial information and scheme assistance is to travel directly to the appropriate extension agency. Unfortunately, the spatial distribution of the locations where farmers can access information directly such as Krishi Vigyan Kendra (KVK), Agricultural Technology Management Agency (ATMA), or Agricultural and Irrigation Department offices is widespread. Often, farmers find that the cost (both in time and money) of travelling to these locations is not worth the perceived benefit that they will receive from their efforts.

Additionally, in order to receive assistance in many cases, farmers feel that they must navigate many administrative obstacles such as lengthy paperwork and procedures. This combined with long travel distances, further reduces farmers' interest in seeking these benefits. The other option which farmers avail is that of interpersonal communication with the 'identified' progressive farmer for dissemination of information which may be skewed and imperfect. There is ample scope of information loss and bias.

It has been revealed in the study that village teacher, shopkeeper (cloth merchant) and local leaders have also been accessed for information. This leads to complications as the information dissemination may not only be erroneous but also be partial and the person in question may withhold information. Sometimes it happens that the village leader (school teacher, unemployed youth, government officials etc.) gets information from both government and non-government organisations and spreads that in the villages. There lies a problem in this model as the village leader does not always want to reveal the full information. Sometimes villagers' get information directly from government and non-government organisations but this is very rare. Also this process is limited to higher class and higher caste rich villagers<sup>20</sup>. Moreover, information related to different farming inputs are sometimes disseminated through companies, seed or fertiliser sellers with the hidden agenda of maximising their sales.

<sup>20</sup> Panda D. K. (2007), 'Power of Information in the Indian Rural Set Up an Analysis' http://www.vrionline.org.uk/ijrs/April2007/Information%20 dissemination%20in%20rural%20India.pdf

# 4. Operationalizing Mainstreaming of Climate Change Adaptation into the Policy and Planning

Subsequent to the analysis of vulnerabilities and gaps in the existing planning, process for climate change adaptive planning requires identification of mainstreaming tools. Since, climate change may disproportionately affect different sectors of economic development and may hamper the achievement of national and sub national, social, and economic and development goals, it is critical to cope with long term implications of change by incorporating climate smart vision in the development process. Currently, decision makers need to understand the need of climate adaptive planning through cost benefit analysis of potential losses from climate change risks and the perceived benefits of climate resilience development in the long run. In addition, key findings in the field of climate change adaptation suggest that any climate change adaptation cannot be taken in the light of climate change alone<sup>21</sup>. There are several examples of climate change risks being incorporated into existing policies, programs or decision-making processes related to resource management. community development. livelihood enhancements, sustainable development and risk management. Practical climate change adaptation initiatives are invariably integrated with other programs, and often aim to enhance adaptive capacity $^{22}$ . All these findings indicate the close interrelationship between climate change adaptation and long term development planning for the socio-economic development of a country. Mainstreaming climate change adaptation means increasing the ability to cope with risks of climate variability in future.



adaptations in the planning process

Understanding about climate change adaptations at different levels of decision making in government is important. In order mainstream climate change adaptations into development plans and policies it is very important to understand the deep relationship between climate resilience and development. For example, climate change, raising temperatures and over exploitation of water resources is likely to deplete ground water resources in the future. In order to fulfil the water needs of communities in the future, digging of wells or mere installation of hand pumps will not be sufficient. The planners will have to consider water management practices by prioritizing options such as aquifer mapping, groundwater recharge through rainwater harvesting, water auditing, water budgeting etc. This will require adaptive planning with consideration of precipitation received, infiltration rate, runoff and recharge rate or in other words climate resilience development. Therefore, keeping the long term planning in mind, mainstreaming climate change adaptation at this point in time will be a cost effective alternative in future.

# 4.1. Identification of Relevant Actors in Mainstreaming Climate Change Adaptation

For absolute integration of climate change adaptations in the planning process, it is inevitable to involve all the key stakeholders for holistic planning strategies. **The key actors should include:** 

<sup>21</sup> Huq, S., Reid, H., 2004. Mainstreaming adaptation in development. Institute for Development Studies Bulletin 35, 1521.

Morduch, J., Sharma, M., 2002. Strengthening public safety nets from the bottom up. Development Policy Review 20, 569588.

<sup>22</sup> Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, *16*(3), 282292. doi:10.1016/j.gloenvcha.2006.03.008

- Officials from different levels of governance: sectoral and line departments, state level decision makers, planners from the decentralised planning process i.e. the local stakeholders from district, block and gram panchayat level.
- Scientists and researchers working on different aspects of climate change. The participation should include researchers from a wide spectrum of interdisciplinary studies analogous to the nature of climate change. Emphasis should be laid on the cross cutting nature of climate change thus including key actors from the fields of climate science, meteorology, agriculture, disaster management, geology, renewable energy, social science, economics and such sectors which are directly or indirectly related to climate change and its adaptation.
- Apart from the policy makers and scientists the adaptations in climate cannot be mainstreamed without the representation of community voices directly vulnerable to climate change. Therefore participation of non-governmental organizations and civil society organisations is equally important in the process. This ensures participatory approach for climate change mainstreaming because such organizations directly working at the grassroots corresponds to the ground realities thus contributing in the bottom up planning process.
- One of the major hurdles in the adoption of climate change mainstreaming is the availability of funds and resources. The involvement of funders and donor agencies such as bilateral and multilateral donors is of utmost important. Apart from this, representatives of the private sector can act as an important component in the mainstreaming process.
- Even though much is talked about climate change, however a large number of stakeholders are still unaware of the general concept of climate change. Therefore, there is a strong need for a connecting link between all the stakeholders. Environmental journalists and media personnel can act as an important medium to sensitize the issues of climate change mainstreaming. Besides this, they can also initiate a two way dialogue by enabling a

balance between top down and bottom up planning processes.

• Additional Rural Agriculture Extension Officers (RAEOs) are needed to reduce the number of villages and area designated to each officer. This will allow better outreach of climate adaptation information and schemes. Alternatively, civil society groups can also be utilized to assist in outreach in areas where RAEOs are not able to adequately serve.

# **4.2. Mainstream Climate Change Adaptations in the Planning Process**

Drawing from the UNDP-UNEP framework for mainstreaming climate change adaptations into development planning, this report suggests the following approach for Bundelkhand region of Madhya Pradesh:

# 4.2.1. Identification of Entry Points

This necessitates the clear understanding of development processes in the light of climate change adaptation. This calls for a cost benefit analysis of the impacts of climate change and long term benefits of the adaptation measures. It also provides scope for the identification of "no regret" adaptation measures which are beneficial irrespective of climate change implications. Multi cropping, mixed farming and livestock systems, conservation and sustainable use of natural resources are some examples of "no regret" adaptation measures which build resilient livelihoods without impacting climate change. The sensitization should initiate with preliminary assessments for understanding the social, developmental, governmental, institutional and political contexts of climate change adaptation (climate policies, need for convergence, current levels of mainstreaming, budget allocation and fund requirements etc). Due to the cross cutting nature of climate change adaptation and mainstreaming the linkage should be established between various line departments (for e.g. irrigation, water resources, forest, agriculture, disaster management departments) with a central body such as State Planning Board or Finance Department in the core of the association. Though, it will require building the technical and financial capacities of the line departments so that a better harmony for inter-sectoral convergence is achieved.

One of the most important tools for mainstreaming is

the identification of key actors such as investors, civil society organizations, representatives of community and private sector and scientific institutions who can contribute in the mainstreaming process right from the design phase. Adaptation mainstreaming also requires specific awareness raising and partnerships, in particular among climate specialists, planners and financers. Similarly, mainstreaming climate change adaptation also calls for the involvement of abovementioned key actors in crafting the strategies of national and state action plans on climate change, National Communications (NATCOMs), National Adaptation Programs of Action (NAPA), etc.

## **Possible Entry Points for Mainstreaming** into National Development Planning

Planning level	Entry Points
National	Poverty reduction strategy paper
cross-sector	National development plan
ministries	MDG-based national development strategy
	National budget allocation process or review (e.g. medium-term expenditure framework, public expenditure review)
Sector ministries	Sector strategies, plans and policies (e.g. agricultural sector plan)
	Preparation of sector budgets
	Public expenditure reviews
Subnational	Decentralization policies
authorities	District Plans
	Preparation of subnational budgets

Source: UNPEI 2009A

Based on the mandate of the particular climate responsive policy and the institutional review analysis the potential ministries, departments or agencies can be identified as implementers<sup>23</sup>.

The guidelines should be defined for integration of climate concerns into the planning process. This should follow steps to introduce instruments of

decentralisation. An operational capacity and framework have been developed, with structures and procedures in place, enabling decentralised planning across the state of Madhya Pradesh which could further take up the issue of climate change in planning and implementation processes.

# 4.2.2. Integration with the Policy Processes

This deals with the integration of climate adaptive planning in the policy processes. In order to achieve this goal, a support of strong scientific and collative verification is required to convey the message to the key actors effectively. This will not only measure the correlations between climatic indicators and economic variables but will also help to study the trend analysis for future projections. Additionally, substantiation can be achieved by on ground evidences and lessons generated by pilot projects<sup>24</sup> or case studies during the efforts of developmental organisations.



Lessons generated during the SCSI demonstration of climate resilient practices

This can be achieved by scientific robust vulnerability assessments, socio economic analysis, cost benefit analysis of climate change risks and adaptation measures respectively. However, the real situation is not so easy. All these studies require data records over a range of spatial and temporal scales. As discussed in the previous section, currently there are various barriers in the attainment of reliable data. Therefore, there is strong need for investments in the field of climate change adaptation at all levels of development (e.g. scientific researches, capacity building to overcome institutional gaps, pilot studies for developmental projects). Initiatives taken at the local level at pilot

Mainstreaming Adaptation to Climate Change in Agriculture 23 and Natural Resources Management Projects (2010), Guidance Note 1: Engaging Key National Institutions in the Adaptation Agenda.

<sup>24</sup> DA- Swiss Sustainable Civil Society Initiatives to Address Global Environmental Challenges

<sup>19</sup> 

scale can set a strong case for bottom up planning thus communicating community concerns and voices to a global audience<sup>25</sup>.

The policies and programs have to be seen all the way through a climate lens. This also entails assessing the relevance of climate change for developmental goals. The planners and implementers have to realize that if no measures are taken to deal with the climatic losses in the present the distress could then make coping costlier in the future.

Madhya Pradesh is one of the most climate change conscious states in the country. Several initiatives are taking place at the government level (MP-SAPCC, Bundelkhand Package, efforts made under Integrated Watershed Management Programme - IWMP or National Initiative on Climate Resilient Agriculture -NICRA), however gaps in the institutional mechanisms have negated these efforts of the government. Therefore, it is of utmost importance that climate change thinking is streamlined at each level of planning and implementation process. For climate change mainstreaming the delicate balance of top down and bottoms up planning has to be maintained where participation of each actor (right from planners at policy level to implementers and communities at the ground level) has to be kept in mind. This can be achieved by targeting policy processes at three levels.

**National Level:** For effective integration of climate change adaptation the mechanisms and policies have to be enabled at the national level e.g. **national development plans** with strong central coordination. The coordination is possible if the authority lays in the hands of core/central ministry e.g. National Planning Commission, Ministry of Finance, for synchronization and decision making power over the sectoral ministries e.g. agricultural, water resources, forestry<sup>26</sup>. This will provide visibility to climate adaptation thinking at the national dialogue, thereby opening gateways for percolation of this thinking to the sub national and sectoral levels. Furthermore, it also gives an opportunity to the country governance to share this

dialogue with other countries, thus managing the relations (e.g. shared water resources, multilateral environmental agreements relevant to adaptation, and donor relations)<sup>27</sup>.

Long term planning needs to be integrated into the planning process. Adequately addressing climate change issues will require planning for twenty years down the road along with five years and (more commonly) one year plans currently being developed. Therefore climate adaptive planning should be reflected into the midterm plans, the five year perspective plans and ultimately in the short term plans.

Climate change has no institutional home. Planning agency is the best home for mainstreaming climate change adaptations. Climate resilient development needs to be co-terminus with the planning cycle. Therefore, budget line should reflect climate change issues.

Sectoral Level: This entails the involvement of line ministries or different sectors in planning framework for instance ministries of climate sensitive sectors such as agriculture, fisheries, rural development, health and energy and development sectors such non government organizations and scientific research organizations. Mainstreaming adaptation at sectoral level means to facilitate above mentioned national objectives over a given time span, prioritize the main approaches to be employed and implement associated policies to reach the targeted objectives<sup>28</sup>. This will lead to budget allocation with respect to adaptation needs and translation of strategies into concrete measures. Synergy between adoption of robust adaptation options and inclusion of these options in the policy dialogue can significantly contribute to dealing with the uncertainties of climate change.

Mainstreaming climate change adaptations requires an integrated approach so as to enable convergence between government departments (e.g. Agricultural and Irrigation Departments) and planning agencies (e.g. District Planning Committee) and across their various governmental levels (e.g. village, district, and state, national). Encouraging convergence between

<sup>25</sup> UNDP-UNEP Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners (2011)

<sup>26</sup> Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects (2010). Guidance Note 5: Furthering an Enabling Institutional Environment.

<sup>27</sup> OECD (Organisation for Economic Co-operation and Development). 2009. Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance. www.oecd.org/dataoecd/0/9/43652123.pdf.

<sup>28</sup> ibid

government departments means to include effective cross departmental committees with a climate change vision.

In order to make climate responsive policies, both adaptation and mitigation needs should be considered. Sometimes these strategies are interchangeable, therefore a collective approach is required to streamline adaptation and mitigation options. For example biogas option is not only mitigation but also an adaptation option. Similarly, sustainable agricultural land management practices, such as agro-forestry, mulching, and soil and water conservation techniques, can combine to both mitigation and adaptation benefits while increasing agricultural productivity.

**Sub National Level:** The vulnerabilities of climate change differ with different ecological regions, agro climatic zones, human development indices, livelihood source and other such factors. Thus the strategies decided at national and sectoral level have to be shaped at sub national level. Here bottom up planning approach is of utmost important. Therefore, climate change adaptation should also be mainstreamed at decentralised planning level. Synergy between

## Adaptations in Decentralised Planning Process

Decentralised Planning accounts for involvement of local level representative institutions in the formulation of plans for development as well as their implementation using the participatory approach. Article 243 ZD, Constitution of India, calls for the District Planning Committee (DPC) for each district in different states of the country. It is mandated that a DPC, would prepare draft development plan for the district by consolidating the plans prepared by the village Panchayats and the Municipalities in the district. Decentralization for climate change adaptation should incorporate:

- Institutionalizing and scaling-up the principle of user by establishing formal linkages between central governments and local institutions for effective community based natural resource management;
- (ii) Enabling coordination between climate risk management services provided by central agencies and local needs; and
- (iii) Fostering integration among line ministries at the local level.

adoption of robust adaptation options and inclusion of these options in the policy dialogue at the local level can significantly contribute to dealing with the uncertainties of climate change. In the state of Madhya Pradesh, government departments are making efforts to incorporate recommendations from the grassroots by establishing ground up planning process. The information from the gram panchayat flows to the block level, it then reaches the district level and finally to the State Planning Board respectively. If implemented correctly the bottom-up approach will prove to revolutionize the planning process in the region.

Additionally, to address the growing concerns of agriculture dependant rural areas of Bundelkhand, rural development plans should be targeted. Rural development plans are short to medium term (15 years) plans providing guidance for development at a decentralised decision-making level. The mandate of these plans is small-scale, community-driven, and represents somewhat autonomous development plans targeted at a particular sector (e.g. health, education) or problem (e.g. food security, water quality). Rural development plans are thus very important for mainstreaming climate change adaptation<sup>29</sup>.

## **Decentralised Planning in Madhya Pradesh**

MP was the first state to decentralise and establish threetier Panchayati 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 (Scoping Study for Madhya Pradesh State Climate Change Action Plan)

Currently the decentralised District Planning (DDP) framework in Madhya Pradesh provides for sectoral distribution of activities in order to facilitate grassroots planning and promoting convergence. The identified six planning sectors are Education, Health, Livelihood, Energy, Infrastructure and Social Security. In order to mainstream climate change in planning, the scope within the livelihoods, energy and infrastructure should be further enhanced to incorporate climate change

<sup>29</sup> UNDP-UNEP Mainstreaming Climate Change Adaptation into Development Planning: A Guide for Practitioners (2011)

resilience and adaptation measures and preparing District Action Plans on Climate Change and linking them with the DDP hence integrating climate change in a comprehensive way in the development planning process. The climate change resilient activities and natural resources management should be incorporated at the village level in the planning processes. These activities along with matching schemes and fund allocations would be reflected in the 'Village Master Plan' (one of the major output of DDP). This village plan would also serve as an information and communication tool. As mentioned in this report, limited outreach of the agriculture extension officers could be supported by the **Technical Support Groups** (TSG) at the gram panchayat level constituted under DDP to facilitate village planning. These TSGs should be trained on climate change issues and resilient strategies as these TSGs play a crucial role both in planning as well as in implementation. Therefore there is a need to incorporate climate perspective in technical support group training manuals to ensure reach of climate understanding and its translation at the grassroots.



Locale specific knowledge package should be developed since the requirements and priorities vary at each district. Development+ (development plus) schemes are required to subsequently address the issues of climate change. Even today climate change concerns are externalities for the government officials. It needs to be internalized by incorporation of climate smart vision in the planning and implementation process.

More systems for provision of simplified and relevant data for farmers are required to enable robust adaptation options. Currently this role is being played by 'interface' organisations and new investments by the government and donors are needed to strengthen and expand the ability of such institutions to integrate a wide range of information for climate change adaptation and translate this information into more decision relevant forms. In places where such institutions are absent there is a need for government and donors to consider creating institutions/ organisations to fill this niche.

Data base should be generated for different users for data accessibility and knowledge flow. This will contribute in building up of strong scientific evidences through vulnerability assessments, risk assessments, climate change projections, impacts of climate change and allied sectors etc.

There is also a need to disseminate findings from local research being conducted by KVKs to farmers who are not beneficiaries of extension programmes. Additionally, the profile of ATMAs should also be improved so that farmers find it more accessible. Finally, there is a need to develop a more robust system to ensure that meteorological information useful for adaptation is reaching grassroots in a timely and cost effective manner. community radios can contribute effectively to all these processes.

# 4.2.3. Implementation and Monitoring of Climate Adaptive Planning

This is one of the most crucial steps for climate change adaptation mainstreaming and is also the weakest link right now adding to the struggle of climate resilient development in Bundelkhand region. For the successful execution of predefined strategies, implementation of robust adaptation measures at bottom level is of paramount importance. After the right planning process is in place, it is mandatory that the institutional capacities are built to ensure effective implementation of the planning vision. For strengthening the institutional mechanisms the mandate of climate responsive policies should be effectively communicated to key actors especially the implementers. They need to understand the adaptation policies and the intention with which they have been designed. This will require them to deliver the outcomes in a climate responsive manner.

Another requisite which is vital for the internalisation of climate change adaptation is the budgetary allocation with a cross cutting inter-sectoral approach in mind. For this the prerequisite is the analysis of expenditure review in the light of climate change. The review should examine the extent to which climate risks are adequately considered in budget allocations and expenditure decisions<sup>30</sup>. It should be noted that climate risk considerations should be considered during decision making and budget planning process. International donors and development funders play a very crucial role here by providing budgetary support mechanisms<sup>31</sup>. However, discussions with the state level government officials in Bundelkhand area during primary consultations revealed the concerns that it is very difficult to invest in something that is highly uncertain in itself. Concerns like these have puzzled decision makers and planners several times. It is therefore, important to implement studies on economics of climate adaptation, including estimating the costs of extreme events and of adaptation interventions.

Another alternate to deal with the future uncertainties is adoption of **low regret** and **no regret** adaptation measures. Fortunately, many measures provide a host of development benefits in addition to fostering climate change adaptation. They can be implemented even in the presence of remaining uncertainties about future climatic conditions. No-regret adaptations are measures that would be justified under all plausible future scenarios, including the absence of manmade climate change. No-regret adaptation is not affected by uncertainties related to future climate change because it

<sup>30</sup> Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects (2010), Guidance Note 4: Developing Readiness for Institutional Capacity Development and an Enabling Policy Framework.

OECD (Organisation for Economic Co-operation and Development). 2009. Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance. www.oecd.org/dataoecd/0/9/43652123.pdf

helps address problems associated with current climate variability, while at the same time, builds adaptive capacity for future climate change.

Investment decisions for such interventions can be taken up without assessing project risks due to uncertainty on future climate e.g. enhancing provision and dissemination of climate information as well as access to early warning systems by local communities living in flood and/ or drought prone areas.

Low-regret adaptation yields large benefits under relatively low risks e.g. promotion, including research and extension, training, marketing etc. of drought resistant cultivation in areas where drought risk is projected to increase. This type of investment is likely to yield positive returns under many future climate scenarios, but incorporates a small risk in unlikely cases when drought risk decreases in the project area in next decades. Both no-regret and low-regret options can be **"win-win"** options when they enhance adaptive capacity (i.e., they reduce climate vulnerability and exploit positive opportunities), while also contributing to the achievement of other social, environmental or economic outcomes. Some of their examples are<sup>32</sup>:

- Investments in development, particularly those that enhance the capacity of a society to adapt to climate change
- Enhancing climate information and access to early warning systems for local communities living in flood- and/or drought-prone areas
- Promotion of drought-resistant crop varieties in areas where drought risk is projected to increase
- Reducing pollution and destruction of natural habitats
- Water conservation
- Enhanced public health system

Therefore, "win-win" adaptation options are measures that contribute to both climate change mitigation and adaptation and wider development objectives, e.g., business opportunities from energy efficiency measures, sustainable soil and water management, etc., they constitute adaptation measures that would be justifiable even in the absence of climate change. For example, many measures that deal with climate variability (e.g., long-term weather forecasting and early warning systems) may fall into this category<sup>33</sup>.



Sustainable agricultural practices- win win adaptation option

Subsequently, the capacities of decision makers and implementers also have to be increased so that they can learn to prioritize climate change adaptation currently which is not the case in the study area. At the same time parallel monitoring and impact evaluations can enhance the efforts at the grassroots level.

Regarding the issue of financing for climate change the concept of Environmental Performance Index (EPI) has been recently introduced which will act as a measure of environmental well being of the state and funds for this component would be devolved accordingly. While calculating the financial assistance to a state according to the Gadgil Formula, 60% weightage is given to the state's population, 25% to per capita income and 7.5% to special problems of the state. The remaining 7.5% weightage is given to state government's performance on issues like revenue generation, fiscal management, population control and action on female illiteracy. Change is now being introduced in the components of the state performance criterion. Environment performance will account for 2% of the state's performance. It will be based on evaluation of five parameters: air quality, water quality, waste management, forest cover and climate change $^{34}$ .

<sup>32</sup> Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects (2010). Guidance Note 6: Identifying Appropriate Adaptation Measures to Climate Change

<sup>33</sup> http://climatechange.worldbank.org/content/adaptationguidance-notes-key-words-and-definitions

# 4.3. Conclusions

There is an urgent need to reinforce the linkages between climate change planning and its implementation at the ground to ensure maximum effectiveness. Efficient delivery mechanisms need to be designed so as to ensure the sustainable execution of concrete options at the bottom level. Thus, building up the internal capacities of implementation authority at the local level is required. This can be ensured by building the capacities of bottom level planners and interface extension agents so as to enable ability to adopt climate resilient development. Frequent trainings, exposure visits to model villages and regular monitoring of the government officials can highly contribute in ensuring sustainable execution of robust climate change adaptation at the grassroots.

Addressing these current problems while simultaneously addressing climate change concerns for future requires strengthening the planning and implementation at all levels (village, district, and state, national) of the government system in order to ensure efficient allocation of funds and communication of development policies. This will require identification of different stages in the policy development and implementation process to integrate potential intervention and revise pre-existing strategies using the climate change lens.

Additionally, monitoring and evaluation of funds is essential to ensure effectiveness. This will make sure that the policies are percolated down to the grassroots in their original form and efficiently delivered to climate sensitive communities. Institutional mechanism should give importance to the primary evidences collected through various developmental studies or pilot projects and the findings should be integrated into the planning strategies.

For climate adaptive planning the right balance of topdown and bottom- up approach in the planning process should be maintained. The challenge is not only to deal with existing vulnerabilities but also to cope up with the additional threats posed by climate change in coming future. This can be facilitated by:

- **Connect** (with communities directly facing the brunt of climate change)
- **Communicate** (to inform the decision makers about the need of climate smart planning)
- **Collaborate** (between departments for streamlining adaptation options)

Thus, despite of several gaps, there is an immense scope of successful implementation of climate adaptive planning in the decision making process of Madhya Pradesh. The central state of India is one of the leading states of the country with respect to climate change. Mainstreaming climate change adaptation at the design stage can revolutionize the scenario of climate resilient development in the country. For the development of parched geography of Bundelkhand, the state should not only consider financial resources but should prioritize human and natural resources for overall economic development of the country. All these recommendations for mainstreaming climate change in policy and planning can be anticipated, to result in climate resilient development in Bundelkhand region of India.

<sup>34</sup> Recommendation shared by the State Planning Commission, Govt. of Madhya Pradesh, in the National workshop on "Climate Resilient Development for semi arid region A case of Bundelkhand region" organized by Development Alternatives and Swiss Agency for Development and Cooperation (SDC)



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