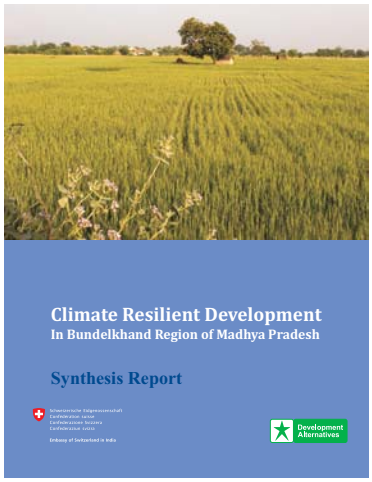
Climate Resilient Development
In Bundelkhand Region of Madhya Pradesh

Synthesis Report

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Embassy of Switzerland in India

Development Alternatives



Climate Resilient Development
In Bundelkhand Region of Madhya Pradesh

Synthesis Report

This report is prepared under the financial support by the **Swiss Agency for Development and Cooperation (SDC)** for the project **Sustainable Civil Societies Initiative to Address Global Environmental Challenges** in Bundelkhand region of India. The objective of the action oriented project was to enhance the adaptive capacities of vulnerable communities in Bundelkhand region, identify strategies for climate resilient development and mainstream climate change in development policy and plans.

Author
Ms. Harshita Bisht, Development Alternatives

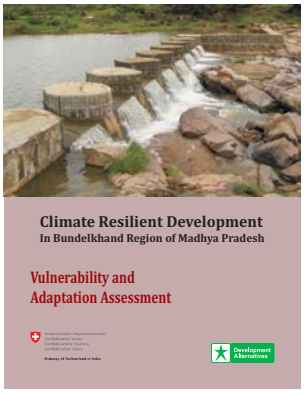
Overall guidance
Mr. Anand Kumar, Development Alternatives

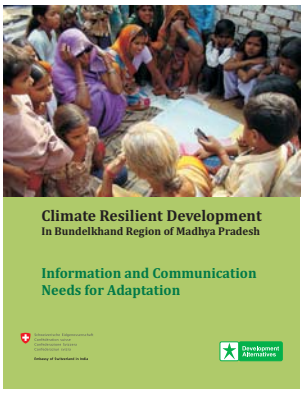
Reviewer
Dr. Shirish Sinha, Swiss Agency for Development and Cooperation

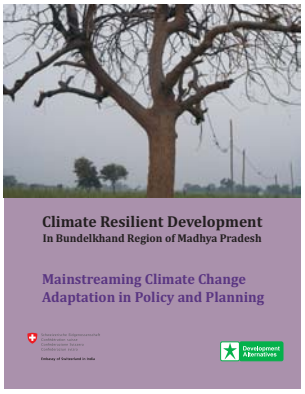
Acknowledgment
We place on record our gratitude to the Swiss Agency for Development and Cooperation (SDC) for providing the financial and institutional support and guidance to this task, Development Alternatives field team for providing field support, local communities of the project villages, local NGOs for their untiring work and enabling us to broaden our understanding of field realities, Environmental Planning and Coordinating Organization (EPCO) Govt of MP for coordinating and providing inputs in the state level workshops.

Design and Layout
Mr. Kamal Kumar, KK Graphics & Printers
Ms. Neha Gupta, Development Alternatives

Publications in this series:







Contents

1. Introduction

In recent years climate change has emerged as a new threat to the livelihood and food security of vulnerable communities all over the world. There are scientific evidences of climate change globally manifested through rise in temperature levels, increase in the incidence of extreme climatic events in the form of recurring droughts and floods, melting glaciers and sea-level rise. According to The Intergovernmental Panel on Climate Change (IPCC) 4th Assessment report, warming of the climate system is unequivocal which is now evident from observations of increase in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level. The report predicts that a temperature rise of 1-2.5°C may lead to reduced crop yields in tropical areas leading to food insecurity, increase in diseases such as malaria, and water stress increasing the vulnerability of communities to climate change.

India is particularly vulnerable to climate change and is likely to have varied impacts owing to its geographic diversity, stronger dependence on agriculture, and increasing exploitation of natural resources coupled with population growth and socio-economic challenges. According to India's Second National Communication, the annual mean temperature in India has shown a warming trend of 0.56°C per hundred years during the period 1901-2007. Accelerated warming has been observed in the recent period between 1971 and 2007 and is attributed to intense warming caused in the decade of 1998-2007. Although no significant trend in rainfall has been observed on an all India basis, increasing and decreasing trends have been observed on a regional basis within the country. Certain extreme precipitation trends have also been noticed in the country. All these concerns are indicative of the fact that climate change is likely to hamper the achievement of sustainable development in the coming future.

Climate Change stressors are likely to invariably impact the highly sensitive **semi-arid regions of India**. 53.4% of land in India is located in 74 districts of 13 states and is declared as drought prone region[1].

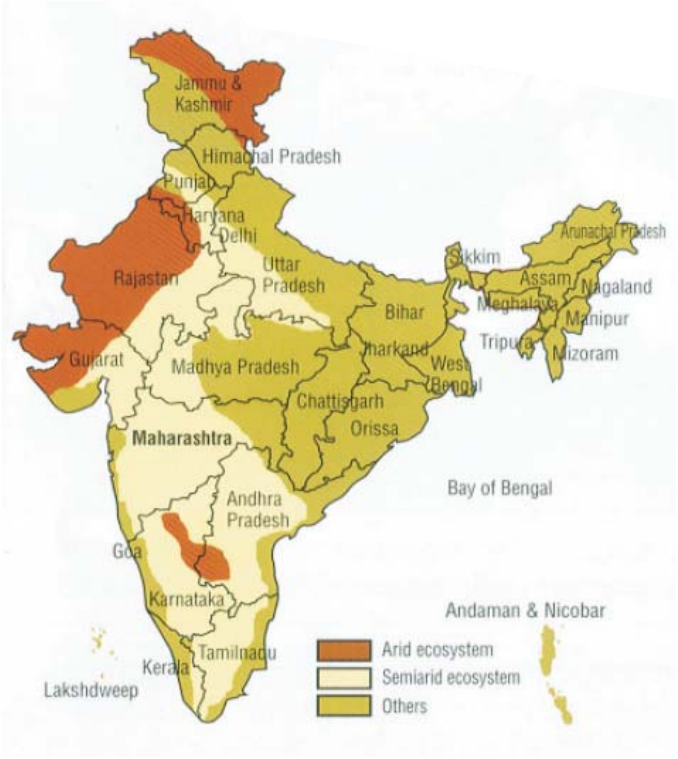


Figure 1: Arid and Semi-arid Regions of India
Source: Velayuthamet aI. 1999

1 IARI, 2002

These regions are highly vulnerable to climatic variability due to spatial and temporal variability of rainfall (Hulme et al., 2005) and extreme temperatures exhibiting intense solar radiation in the daytime. The rains are erratic and often come in a few heavy storms of short duration resulting in high run-off, instead of replenishing the ground water. The most defining characteristic of a semi arid region is persistent drought. Water scarcity is a well-established context for development in arid and semi-arid countries. These regions are highly vulnerable to the stresses of climate change. For many parts of the arid regions there is an expected precipitation decrease over the next century of 20% or more[2]. The changes in other parts of the world will impact the economy of arid and semi-arid regions too. The overall water stress will increase. Projected temperature increase will imply higher evaporation and drier conditions. Rain is also expected to reduce in frequency but increase in intensity. All these will result in frequent droughts and floods[3].

Communities in the semi-arid region are particularly vulnerable to climate change because of their dependence on climate sensitive sectors. At the same time they also have limited capacities to anticipate and effectively respond to climate variability. In the semi-arid regions of India, situation of farmer worsens due to low land productivities and small land holdings.

Bundelkhand region, situated in North – Central India is a notable example of semi-arid regions in India. The region is highly prone to the impacts of climatic variabilities. It is also one of the most underdeveloped regions of the country with poor human development indices. Administratively the region comprises of thirteen districts – seven districts of Uttar Pradesh viz Jhansi, Jalaun, Chitrakoot, Lalitpur, Banda, Mahoba and Hamirpur and six districts of Madhya Pradesh viz., Datia, Tikamgarh, Chattarpur, Damoh, Sagar and Panna.

Bundelkhand is a complex, diverse, rain-fed, risky, vulnerable, socio-economically heterogeneous, culturally unique, agrarian and backward region of India. It is a hard rock area with limited or inadequate groundwater resources and lacks infrastructure and access to improved technologies. Bundelkhand region of Madhya Pradesh is a semi-arid geography, which is significantly sensitive to climate change due to its internal weak conditions. The region being largely rain-fed, it is perturbed with variable precipitation trends. Drought conditions are frequent in the region, leading to unstable socio-economic conditions. The varying temperature conditions influence the crop productivity in summers as well as in winters (due to frost). Monsoon is a critical determinant of the sowing time, which has been varying drastically in the past few years, causing big loss to the farmers due to the paucity of correct and timely information. The ecosystem stability is at a loss due to deforestation, resource exploitation, and low water recharge and so on. Maintaining and enhancing productivity in agriculture is one of the major challenges faced, due to loss of soil fertility, increasing cost of production owing to the largely rain-fed nature of agriculture in the state.

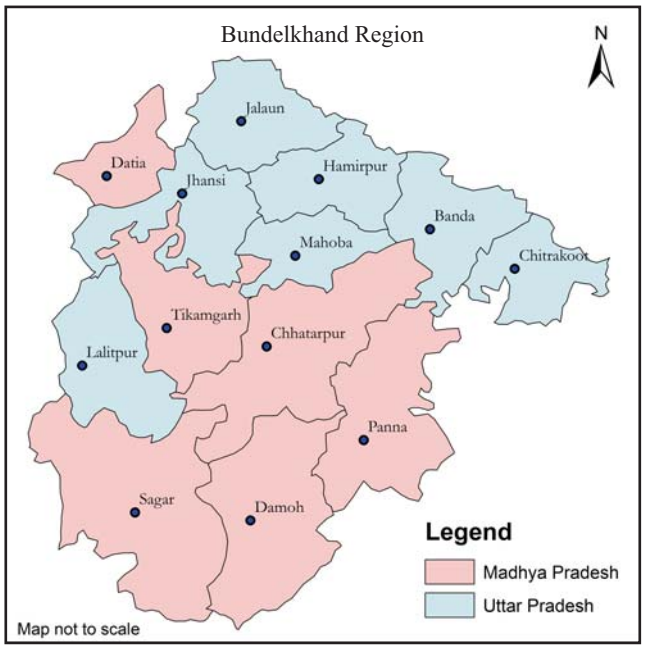


Figure 2: Semi arid Bundelkhand region of central India

2 The Arab Water Council.Vulnerability of arid and semi-arid regions to climate change Impacts and adaptive strategies

3 ibid

2. Climate Resilient Development in Bundelkhand

Climate resilient development aims to build the resilience of vulnerable communities against the serious ecological, economic, and social challenges posed by climate change. To address the concerns of semi-arid region of Bundelkhand, the policies and programs also have to be seen all the way through a climate lens. The need for this has been well spelt out in India's first National Communication (2004) to the United Nations Framework Convention on Climate Change (UNFCCC) and India's National Action Plan for Climate Change (2008). It is also reflected in the Uttar Pradesh and Madhya Pradesh State Action Plans for Climate Change and the special financial package designed by the Central Government for drought mitigation in the Bundelkhand region.

Based on the directions of the NAPCC, the MP State Action Plan on Climate Change (MP-SAPCC) integrates climate change concerns in sectors such as agriculture, horticulture, animal husbandry, fisheries, water resources, forests, biodiversity, rural development, energy, renewable energy, health, urban habitat and transport, industries, and environment. The prevailing conditions of backwardness and acute poverty have also led the central and state governments to take notice of Bundelkhand. As a result special packages have been prepared to address the issues of this region. The Bundelkhand Relief Package (2008), is primarily targeted for drought mitigation in Bundelkhand. The major agenda covered under this package comprises optimization of water bodies through rainwater harvesting and proper utilization of river systems, canals and other territorial water bodies. The package is diversified and covers various sectors within agriculture such as watershed management, animal husbandry, fisheries, horticulture etc. Thus, the package has great potential for mitigating the impacts of climate change on agriculture, water and other natural resources of the region.

In the context of the development deficit that Bundelkhand region faces, formulating a climate resilient development strategy requires a systematic approach. Reflecting on the experience of the SCSI project and working with vulnerable communication of the region, the climate resilient development strategy includes - **vulnerability & adaptation needs assessment, mapping information & communication needs and mainstreaming adaptation into planning process.**

2.1 Vulnerability and Adaptation Assessment

The undulating topography of Bundelkhand is marked with recurrent droughts, crop failures and increasing uncertainties of life-giving monsoon. Agriculture forms the backbone of the rural economy in the region with almost 75% of people dependent on agriculture and animal husbandry for their livelihood. Farmers face crisis due to increased agricultural inputs when compared to agricultural outputs and benefits. 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 as modern agricultural practices for efficient water use have not been adopted[4].

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 increase loss of soil fertility[5].

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.

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

4 DA-Swiss report on "Resource Vulnerability of Semi-Arid Bundelkhand and Recommendations for Policy Response - a brief analysis ", 2012

5 Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

(Chhatarpur, Tikamgarh, Panna) and Sagar and Damoh plateaus.

Large areas of uncultivable wastelands in Bundelkhand

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 quality of forests in the region. Losses in the agricultural produce due to the variable climate have furthers increased people's dependency on forests for other livelihood options.

Increasing extraction of woods from forests

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 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.

Climate data from 1980 to 2005 period has indicated an increase in the mean maximum temperatures in the Bundelkhand region by 0.28°C, as compared to the baseline period of 1960-1990[6]. Increasing temperatures have also led to high evapo-transpiration 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.

Communities travel long distances to collect water from limited number of water sources

In the six districts of Bundelkhand region of Madhya Pradesh the actual filling of 19 reservoirs (storage

6 IITM, Pune; India Second National Communication to the United Nations Framework Convention on Climate Change, MoEF, Govt. of India, 2012.

capacity- 950 MCM) progressively reduced from 52% in 2004 to 10% in 2007. Drying up of 70% of the tanks, ponds and dug-wells 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[7]. 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.

Depleting ground water resources in the region

Increased Vulnerability of the Agricultural Sector

Bundelkhand region 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[8]. Bundelkhand region faced its worst ever drought from 2004 to 2009 with a rain deficit of about 66%. According to the report of an inter-ministerial 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.

Farmer forced to migrate due to increasing losses in agriculture production

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[9].

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

7 Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

8 DA-Swiss report on "Resource Vulnerability of Semi-Arid Bundelkhand and Recommendations for Policy Response - a brief analysis, 2012"

9 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Vulnerability and Adaptation Assessment of Bundelkhand Region , 2013

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[10].

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 force 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[11]. 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[12].

Water scarcity and unbiased socio-economic conditions decreases the adaptive capacities of women in the region

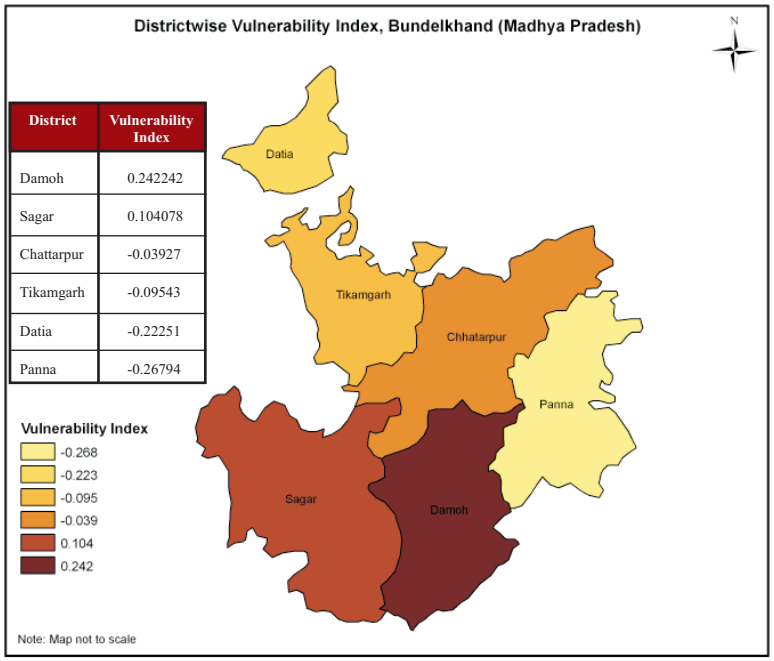


Figure 3: Vulnerability indices of 6 Bundelkhand districts
(Source: Vulnerability and Adaptation Assessment of Bundelkhand Region of Madhya Pradesh, 2013)

10 Findings shared by IITM, Pune for Indo UK Collaborative Project on Vulnerability and Adaptation Assessment of the Madhya Pradesh, 2011

11 Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

12 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Vulnerability and Adaptation Assessment of Bundelkhand Region , 2013

Assessment of Climate Change Adaptation

Development Alternatives learning's from the grassroots clearly indicate that changes in practices especially with respect to crop varieties, seed varieties and diversification to agro-forestry, vegetable farming and even livestock grazing systems will be useful to maintain (even enhance) livelihood security in the face of climate variability. Sustainable agriculture practices such as ridge and furrow method, raised bed cultivation, dry and line sowing, contour cultivation, and system of rice and wheat intensification among small and large scale farmers are efficient adaptation options successfully tested on the ground and should be popularised for upscaling. Similarly, to deal with the water stress in the region water management practices should be promoted. The water conservation measures should be implemented by the utilization of traditional water harvesting structures in addition to modern mapping and GIS tools. In terms of strategies, demonstration, exposure and capacity building are keys to the shifts in practices towards greater climate resilience.

The experiences from the grassroots indicate that there is potential and possibility of shifting/ modifying the practices to enhance the efficiencies of resources being used (especially water), which will enhance economic returns as well as the resilience of farming communities against climatic variability. It has been experienced that promotion of efficient irrigation, soil conservation methods and agro-forestry involving demonstration plots and exposure visits of farmers have proved to be successful. No cost options such as change in sowing dates have been shown to minimize losses or to actually increase the yields of agricultural crops. Such measures need to be tested at a pilot level for research purposes and then if found feasible, be scaled up.

Although single interventions have limited impacts; putting together different available technical options coupled with institutional strengthening demonstrate significant impacts. Farmers are ready to adopt **'demonstrated beneficial practices'** even if these are not formally validated by research / Government institutions. There is also a strong recommendation for establishment of "Farmers Adaptation Clubs/Clusters" to bring farmers together to respond to the threats of climate change by connecting them to local markets.

These robust options need to be up-scaled by means of an adaptation drive which not only amplifies their adoption but also disseminates their reach to far off and interior villages of Bundelkhand. Finally, for effective implementation of the adaptation measures it is vital to imbibe these options in both long term and short term strategies.

2.2 Information and Communication Needs for Climate Change Adaptation

The second element of climate resilient development involves integration of information of climate risk. To facilitate implementation of adaptation measures it is important to communicate right kind of climate change information to the right kind of audience at appropriate time. Climate change communication thus forms the backbone of climate change adaptation and adaptive planning. Additionally, up scaling locally designed adaptation measures and indigenous knowledge of communities requires the involvement of climate change communications in relevant policies and institutional mechanisms. Another concern that needs to be addressed is the facilitation of association between communities, scientists and policymakers who can help serve and support community needs in innovative and simplified manner.

Learnings from Bundelkhand reveal that a clear understanding of sustainable adaptation and climate resilient development is missing at grassroot levels in the region. Helping the local communities to understand, access, and utilize climate change related information is still a huge challenge. This is further hindered because efforts creating climate change awareness are met with low interest levels among the communities. This is partly due to inappropriate nature of the awareness efforts and partly due to the cynicism that has developed among the communities towards any sustainable solution without immediate benefits. New means and interesting ideas of outreach to the communities are thus required to propel them towards adopting sustainable adaptation measures. So far there are several technical and institutional barriers for making robust climatic information available to the grassroots. The factors stated here act as significant obstacles in the climate resilient development of Bundelkhand region.

Data related to climatic variables are available only for a single point within a district making it difficult to provide localised information to farmers. Similarly, researches in climate predictions are currently dealing with limited accuracy and lower levels of confidence. Another shortcoming of future climate projections is

the **scientific complexity** in the data generated. The 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 impacts and adaptation options needs to be translated into a language that decision-makers understand and converted to timescales appropriate for the decision-making process.

An additional limitation is the availability of **limited and unreliable statistical data records**. It limits the development and research studies in the region. 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, planning for adaptation, as well as advocacy among stakeholders, will be easier to achieve. The information gap in the region also increases due to absence of centres providing agromet services at the local level. 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[13].

Outreach of relevant information to the farmers is also 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 information needs of the entire area for which they are responsible. Each RAEO is in charge of providing extension to around 1-5 villages, but these agents often do not adequately serve these communities because of lack of dedication and adequate skills. 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 KVK, 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[14].

2.3 Mainstreaming Climate Change Adaptation in Policy and Planning

Climate adaptive planning involves 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 climatic losses in the present the distress could then make coping costlier in the future. This requires mainstreaming climate change adaptation in the current planning process in order to address the issues of growing vulnerabilities and threatened livelihood security of poor communities. Mainstreaming requires cross cutting policy approach which will not only address climate resilient development in future planning processes but will also make the already existing policies climate smart.

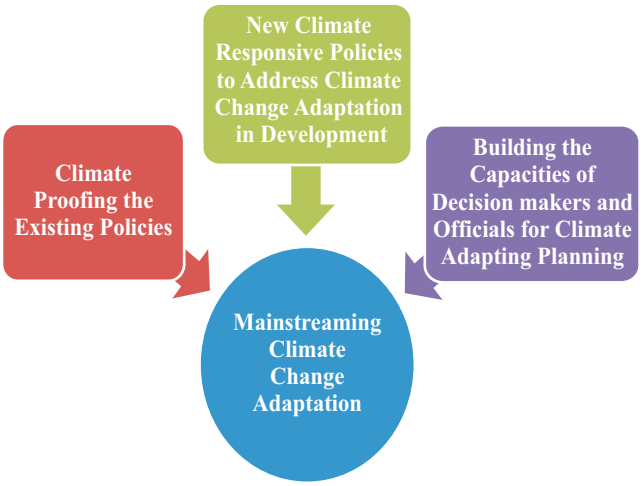


Figure 3: Mainstreaming climate change adaptations in the planning process

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 ministry of state planning or finance in the core of the association. Currently, decision makers need to understand the need of climate adaptive planning through cost benefit analysis of potential losses from climate change risks and perceived benefits of climate

13 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Information and Communication Needs for Climate Change Adaptation, 2013

14 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Mainstreaming Climate Change Adaptations in Policy and Planning, 2013

resilience development in the long run. Adequately addressing climate change issues requires planning for 20 years down the road along with 5- year and (more commonly) 1-year plans currently being developed. Therefore the climate adaptive planning should be reflected into the midterm plans, the five year perspective plans and ultimately in short term plans. Climate change concerns should be internalized by incorporation of climate smart vision in the planning and implementation process.

A structured approach for mainstreaming would require identification of entry points to necessitate a clear distinction between development processes in the content of climate change adaptation. Linked with this is the information of adaptive planning in the policy processes. finally, a critical step would be the implementation & monitoring of climate adaptive planning.

3. Way Forward

The research findings clearly indicate that semi-arid region of Bundelkhand is highly **vulnerable to climate change**. As a semi-arid agricultural region, one of the main challenges Bundelkhand faces (both historically and more-so under a changing environment) is maintaining and increasing agricultural productivity under varying degrees of water scarcity and climate change variability and uncertainty. For this reason, many of the adaptation practices currently being discussed, developed, or implemented in the Bundelkhand region relate to water resource management and/or agricultural improvements. There are several adaptation measures available in the short term and long term perspective which, if incorporated well for the present geography, can create significant change in the lives and livelihoods of the communities.

Currently, there are many existing schemes, policies, and practices that have been formulated, implemented, and deployed to enhance the livelihoods of rural communities. These actions can be further retrofitted and efficiently implemented as **short adaption measures**[15] to serve the purpose of **climate-resilient development**. Some of these options are detailed below:

- Promotion of efficient irrigation, soil conservation methods and agro-forestry involving demonstration plots and exposure visits of farmers. Although single interventions have limited impacts; putting together different available technical options coupled with institutional strengthening demonstrate significant impacts. Farmers are ready to adopt 'demonstrated beneficial practices' even if these are not formally validated by research / Government institutions.
- Extension of risk insurance (for example, crop insurance) to cover more farmers as current penetration of the insurance schemes is not adequate.
- Establishing of new "Farmers Adaptation Clubs/Clusters" and strengthening of existing to bring farmers together to respond to the threats of climate change by connecting them to local markets.
- Enhancing the access to information of farmers by use of innovative platforms such as radio based rural reality shows and mobile telephony to enable farmers for enhancing productivity, reducing input costs and bringing about a quick change in strategy when monsoon variability threatens the *Kharif* sowing.
- Low cost/no regret options such as change in sowing dates have been shown to minimize losses or to actually increase the yields of agricultural crops. Such measures need to be tested at a pilot level for research purposes and then if found feasible, be scaled up.

In the long run, there needs to be a systematic approach to the problem that may consist of:

- Conducting research to identify the best approach to adapt agriculture to climate change by determining the crop mix which would be most resilient to the impacts of climate change in different regions of the state.
- Establishment of a meteorological network in the state to provide customized local information and forecasting services to the farmers that will help in reducing the impacts of climate variability.
- Institutional capacity building will play a crucial in adapting to climate change by providing appropriate direction and channelization of funds and efforts. Therefore, there is a need of a long term programme for capacity building on key aspects of climate change adaptation.
- The Government of Madhya Pradesh needs to review its procurement policy to include/enhance quota for alternate crops such as sesame for preferential purchase in drought prone areas.

In order for these short term and long term measures to be effective there is a need for a better system that can disseminate agro-meteorological information in a timely and cost effective manner and community radios are one way to ensure this. At the same time following **information needs and communication channels**[16] require suitable attention for climate resilient development.

15 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Vulnerability and Adaptation Assessment of Bundelkhand Region , 2013

16 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Information and Communication Needs for Climate Change Adaptation, 2013

- Systems for provision of simplified and relevant data/information 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 existing 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.
- There is also a need to disseminate findings from local research being conducted by Krishi Vigyaan Kendras (KVKs) to farmers who are not beneficiaries of extension programmes, and improve the profile of Agricultural Technology Management Agencies (ATMAs), so that farmers find it more accessible.
- 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.
- Database should be generated for the different users for the data accessibility and knowledge flow. This will contribute in the building up of strong scientific evidences through vulnerability assessments, risk assessments, climate change projections, impacts of climate change and allied sectors etc.
- 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. The community radio can contribute effectively to all these processes.
- Institutional mechanism should give importance to the primary evidences collected through various developmental studies or pilot projects and integrate the findings into the planning strategies.
- There is a need to strengthen the existing knowledge sharing platforms. Bundelkhand Knowledge Platform (a regional knowledge platform established under DA-SDC SCSI project) needs to be further expanded and strengthened for sharing and disseminating the climate change adaptation knowledge across all the stakeholders.

Although several adaptation measures have been implicitly included in the planning process, inefficient delivery mechanisms at the ground level and communication gaps has led to weak implementation. Therefore efficient delivery mechanisms need to be strengthened through exposure visits, trainings etc.). Increasing the institutional capacities of local government on long term climate adaptive planning is also required. Communication of climate change related information needs to be enhanced to enable both communities and local government to adequately respond to threats posed by climate change in the region, this therefore requires **mainstreaming climate change adaptation into policy and planning**[17]**.**

There is an 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 the implementation authority at the local level is required. This can be ensured by building the capacities of the 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.

17 DA-SDC Climate Resilient Development in Bundelkhand Region of Madhya Pradesh: Mainstreaming Climate Change Adaptations in Policy and Planning, 2013

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 for 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 top-down and bottom- up approach in the planning process should be maintained. The challenge is not only to deal with the existing vulnerabilities but also to cope up with the additional threats posed by climate change in the 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 for Bundelkhand region. The central state of India is one of the leading states of the country with respect to preparedness for responding to climate change impact. 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 the 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.**

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Embassy of Switzerland in India

Climate Change and Development
Chandragupta Marg, Chankayapuri,
New Delhi - 110021
Phone: +91 11 4995 9570
Email delhi@sdc.net
Website: www.swiss-cooperation.admin.ch/india

Development Alternatives

B-32, Tara Crescent,
Qutub Institutional Area,
New Delhi -110016 (India)
Tel.: +91-11-26134103
E-mail: akumar3@devalt.org
Website: www.devalt.org