

Analysis Report

Sustainable Civil Society Initiative
to Address Global Environmental Challenges

**Resource Vulnerability
of Semi-Arid Bundelkhand and
Recommendations for Policy Response
- a brief analysis**



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Publication Details:

Published by
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Abstract

There is compelling and irrefutable scientific evidence on the setting in 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, sea-level rise, declining biodiversity etc. The immediate need to address the adverse impacts of climate change is no longer in dispute. Interventions which blend mitigation activities with adaptation are therefore highly crucial. Developing countries like India and within them, agro-climatic regions such as semi-arid areas are considered particularly vulnerable due to their dependence on climate sensitive sectors such as agriculture, water, forestry and other natural resources. What makes matters worse is that these regions have limited capacities to anticipate and effectively respond to sudden variations in their environment. Limited options of alternative livelihoods and widespread poverty continue to threaten livelihood security of millions of small and marginal farmers in the arid and semi - arid regions of India (*State of the Environment Report 2009*). Comprehensive climate resilient adaptation and mitigation measures will be required, which specifically address the vulnerability of these communities living in semi – arid areas to current and future climate changes and their associated impacts.

The Bundelkhand region in Central India is a typical example of a semi-arid region affected by an overlay of geo-climatic conditions peculiar to the region and further accentuated by human mismanagement of resources, social disparities and institutional incapacities. This has resulted in a poor development base that reduces the capability of the communities and natural systems to cope with emerging climatic variability. Bundelkhand region is a chronic drought prone region of India. Unsustainable water management coupled with climate change and indiscriminate cattle grazing activities has made the problem of water scarcity more critical in this region.

Yet, with some assistance, the region has the potential to turn around from its present situation. It has great diversity of natural resources, a workforce trained in traditional agriculture and artisanship, and a rich traditional time-tested knowledge-base. With agriculture contributing significantly to the region's economy, it is critical that climate change policy addresses issues of loss of livelihood as a result of changing crop patterns, as well as the need to shift some areas to cultivation of new climate resilient crops and the associated skills and training required.

Given the peculiarities of these regions and their high vulnerability to climate change impacts, it is also relevant to develop a different set of policy measures for arid and semi-arid regions across India. There are new and emerging approaches to deal with climate change in both arid and semi-arid regions which generate multiple benefits of mitigation, adaptation and development such as ensuring food, livelihood, water, energy and social security of communities.

It is imperative that policy makers explore new dimensions to climate change efforts such as linking poverty alleviation and economic development with climate change. The National Action Plan for Climate Change (NAPCC, 2008) is probably the first official document that has made an attempt to indicate such linkages. NAPCC identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively. One such emerging approach is Low Carbon – Climate Resilient (LC-CR) development. The LC-CR framework basically integrates climate change and poverty alleviation efforts. Developed by Department for International Development (DFID) in collaboration with Development Alternatives, the framework attempts to conceptually map the relationship of mitigation and adaptation responses of climate change with poverty alleviation initiatives. The label of LC-CR development may be relatively new in India. However, the concept is very much reflected in the NAPCC (2008).

The present paper attempts to highlight key issues and challenges relating to climate change adaptation in arid and semi - arid regions. It discusses processes which can result in sustainable use of water resources especially in relation to food security in the semi-arid region of Bundelkhand. It looks at current situation and resource vulnerability and resultant livelihood insecurity. Perspectives of various stakeholders such as farmers, local governments, scientists, civil society institutions and state government catered through various consultations reflect the policy direction required. The paper concludes by providing recommendations for enhancing climate resilience in the Bundelkhand region.

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Chapter 1

A brief situation analysis – Bundelkhand and semi - arid regions of India

Introduction

Semi - arid regions are typically characterized by unreliable rainfall where the rate of evaporation of water is higher than the rate of moisture received through precipitation, resulting in unfertile, famine-prone land. As a result of scanty precipitation, the vegetation mostly comprises of grasses with a few scattered trees making sustainable agriculture in such regions a difficult proposition. Perhaps the most defining characteristic of a semi – arid region is persistent drought. A drought is said to occur when the rainfall is deficient in relation to the statistical multi-year average for a region, over an extended period of a season or a year. In India, around 68% of the country is prone to drought in varying degrees. The National Commission on Agriculture in India classified three types of drought: meteorological, agricultural and hydrological. Meteorological drought is defined as a situation when there is significant decrease from normal precipitation over an area (i.e. more than 10 %). Hydrological drought results from prolonged meteorological drought resulting in depletion of surface and sub-surface water resources. Agricultural drought is a situation when soil moisture and rainfall are inadequate to support healthy crop growth.¹

Bundelkhand is located between 23° 20' and 26o 20' N latitude and 78° 20' and 81° 40' E longitude. 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, Chhatarpur, Damoh, Sagar and Panna. Often called as the heartland of India, the Bundelkhand region of Central India has a population of approximately 18.3 million, 77.5 % of which are rural households. The region is characterized by below average human development indicators. Literacy rate remains as low as 59.8 % and female

literacy rate falls below the regional average (39.2%)².

The Bundelkhand region of Central India is a typical example of a semi arid region. Variability of monsoon as a consequence of the changing climate coupled with a breakdown in natural resource management practices are key factors leading to frequent occurrence of droughts in this region. With a collapse of traditional water management practices and inadequate scientific water-management systems, irrigation is insufficient and inefficient thus directly hurting agricultural productivity. Such stress on the agricultural sector has complex implications in the form of endangered food-security, persistent poverty, illiteracy and large scale migration. Policies and programmes being designed with both short and long term development goals face many challenges in effective implementation. Community groups and institutions face severe challenges with respect to feed-back, monitoring and mainstreaming new models for adaptation and development.

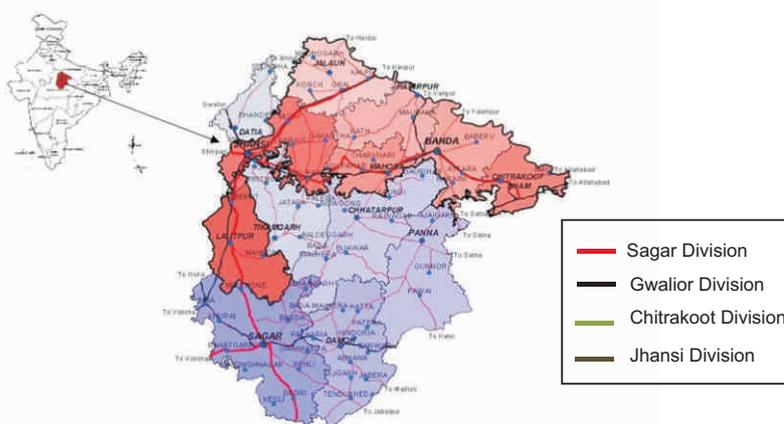


Figure 1: Geographical Location of Bundelkhand Region

¹ National Disaster Management Guidelines: Management of Drought. A publication of the National Disaster Management Authority, Government of India. ISBN 978-93-80440-08-8, September 2010, New Delhi. Available online at: http://ndma.gov.in/ndma/guidelines/NDMA_Droughtguidelines.pdf

² Census of India 2011

Dependence of population on agriculture

Bundelkhand has a predominantly agrarian economy. Over 80% of the population is dependent on agriculture, livestock rearing, collecting forest produce and outsourcing 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.

Bundelkhand region witnessed one drought in 16 years in 18th and 19th centuries which increased by three times during the period 1968 to 1992 (Rameshwar Singh et al., 2002) and the past years have witnessed continuous drought. Climatic changes have increased frequency of extreme weather events during past 15 years and raised the vulnerability and risk³.

During the period 2003-2009 Bundelkhand faced a period of continuous meteorological, hydrological and agricultural drought of 6 years. The Bundelkhand region is rocky and has high percentage of barren and uncultivable land. It is characterized by a mixture of black and red yellow soil which is not considered very fertile. Rainfall is sparse and the agricultural production is low. Therefore, the agriculture-based economy in Bundelkhand has always been on the verge of subsistence on account of infertility of land, lack of irrigation facilities, unscientific cultivation in terms of non-use of modern methods of agriculture, low productivity and distorted land distribution where a few medium and large farmers have a major share in land holdings. In last 25 years, due to promotion of cash crops, changing agricyycle, degradation of forest, over exploitation of ground water and damage to traditional water bodies led to drying up of natural land moisture, water was pumped out from ground using tube wells leading to drying up of natural water sources. Now the water level for tube-wells has gone down up to the 600 to 750 feet in the region. Lack of forest, grass and rootless terrains causes water to flow with high velocity on Bundelkhand land, slowly turning the land into ravine category. 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, but it has gone down to the level of 35 in a year⁴.

Water availability over the years and water management practices and infrastructure

The Bundelkhand region receives water from a number of perennial rivers. It is bounded by Vindhyan Plateau in the South, river Yamuna in the North, river Ken in the East and rivers Betwa, Sindh and Pahuj in the West. Erstwhile kings of the Bundela dynasty built and maintained innumerable rainwater harvesting structures, which ensured abundant supplies of water throughout the year to meet the region's domestic and irrigation water demands. The water bodies were mostly tanks (small, medium and large) which got filled up during the rainy season and which in turn charged the ground water. It was a fragile ecological equation where the forests helped recharge and regulate rainwater flow and the vast network of tanks and ponds acted as recharge pits capturing water for use during the leaner period. Local communities managed the water sources thus making the system equitable and sustainable⁵.

All this changed in the last 50 years when indiscriminate deforestation occurred. Deforestation clubbed with neglect of the traditional systems of water harvesting has distorted the equation. Now Bundelkhand conserves less rainwater than earlier. Traditional water harvesting structures and limited irrigation sources of tanks and dug wells were neglected and their revival for mitigating drought has been emphasised⁶. This has made the region more vulnerable to drought. Without the capacity to conserve water even a small deviation in rainfall causes drought. With ground water levels falling and lakes and ponds drying up, the overall water availability for irrigation has drastically reduced. On the other hand, government supports wheat based cropping system which is water-intensive that has accelerated the region's water

³ nraa.gov.in/drought%20mitigation%20strategy%20for%20bundelkhand.pdf

⁴ (source: DA-Swiss project on climate resilient development)

⁵ (Source: Prakash, Bharatendu et al. Problems and Potentials of Bundelkhand with Special Reference to Water Resource Base. Delhi: Center for Rural Development and Technology, 1998.)

⁶ Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

scarcity problem. The traditional drought coping system of storing of food grains and fodder for two to three years especially in the normal or excessive rainfall year has got diluted due to public distribution system (PDS) and attractive support price especially for wheat and paddy⁷.

There are three major problems that characterize the Bundelkhand region's water features: severe shortage of rainfall coupled with erratic monsoons and low water retention capacity of the soil. The scarcity of rainfall results in minimal recharge of ground water. Shortage of water severely impedes irrigation, directly hurting agricultural productivity. Erratic or un-timely rainfall causes delayed crop sowing, leading to crop failures. The water retention capacity of the Bundelkhand soil is extremely low, which compounds the problem of irregular and low rainfall. The average annual rainfall of Bundelkhand in Uttar Pradesh is 876.1 mm with a range of 786.6 to 945.5 mm. In Madhya Pradesh portion the average rainfall is 990.9 mm with a range of 767.8 to 1086.7 mm and is 13% more than the Uttar Pradesh part. About 90% of the rainfall is received in the monsoon season of July to September in about 30-35 events or spells. Rainfall variation within the season is important for crop production and rain in September is crucial for the maturity of Kharif crops and sowing of Rabi crops. Delayed onset of rains, early withdrawal or long dry spells in between also lead to drought like situation. The U.P. part of the region experienced rainfall deficit of 25% in 2004-05, 33% in the year 2005-06 which went up to 45% in 2006-07 and 56% in 2007-08. Five out of seven districts had more than 50% rainfall deficit. All the districts experienced meteorological drought⁸. Due to the region's natural characteristics of shallow soil depths, hard rocky substrata and light textured soils, water storage in aquifers and moisture conservation in soil becomes very low. Meteorological and hydrological droughts are very common in this area. As a result, the ground water level in Bundelkhand has

been reducing at an alarming rate and 70% of the water bodies have dried up⁹.

Availability of water is very critical in a semi – arid region like Bundelkhand. Agriculture being the mainstay of the rural economy, irrigation is one of the major energy consumers. However, since the grid-based energy is highly unreliable, most 89 % of the irrigation is based on pump sets using diesel as a fuel¹⁰. Energy use in irrigation is further increased by the practice of flood irrigation, which is highly inefficient in terms of both water and energy. The area's biggest challenge is that irrigation is dependent on irregular and unpredictable rains. Ground water resources are overburdened. Efficient water resource management is crucial for proper planning, distribution and management of water resources in a semi – arid, drought prone region like Bundelkhand. About 45.6% of UP and 44.7% of MP net sown area (NSA) is irrigated by canals, dug wells, shallow tube wells, lift irrigation and other flows. Major portion of this, i.e., 26.7% of NSA in UP and 31.7% of NSA in MP is irrigated by ground water. Surface water contribution on the other hand is 18.9% in UP and 12.9% in MP¹¹.

According to a study done by Central Ground Water Board, the total ground water resources of the Bundelkhand region are 8397 Million Cubic Meter (MCM) out of which 4632 MCM (55.1%) is in Uttar Pradesh and remaining 44.9% in Madhya Pradesh. Utilizable potential for irrigation in Bundelkhand region is around 6419 MCM (76%) out of which 3544 MCM (42%) is in Uttar Pradesh and 2875 MCM (34%) is in MP.

Present level of ground water utilization in Uttar Pradesh, is 1019 MCM (29%) and balance ground water available for future development is thus 2525 MCM (71%). On the other hand present level of ground water development in MP is 961 MCM (33%) and balance ground water available is reported at 1914 MCM (67%).



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

⁸ Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh, Inter Ministerial Central Team, Government of India, 2008

⁹ Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh by Inter - Ministerial Central Team (2008)

¹⁰ Baseline Survey Report of SCSI Project, 2009

¹¹ Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh by Inter - Ministerial Central Team (2008)

There are about 2,00,000 dug wells created by the private investments of farmers irrigating 28.6% of the net sown area in MP, on the other hand number of dugwells in Uttar Pradesh is 78,476 irrigating only 8.9% of net sown area. There are 4,604 deep tube wells and 44,870 shallow tube wells in UP compared to 3,124 tube wells and 16394 shallow wells in MP. A large number of ponds/tanks/diversion structures, water conservation structures etc. exist in Madhya Pradesh. MI Census (2000- 01) puts their number well above 12 thousand¹².

Bundelkhand has different levels of development with ground water more predominant over surface water in both the states.

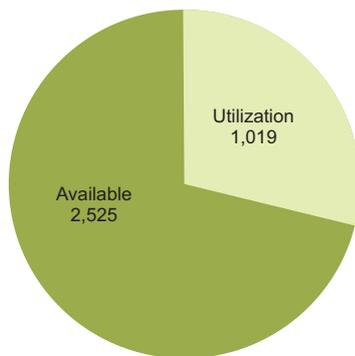
About 16% of the area is irrigated by major/medium schemes and 26% by the

ground water sources and 2 % by minor surface water in UP part of Bundelkhand.

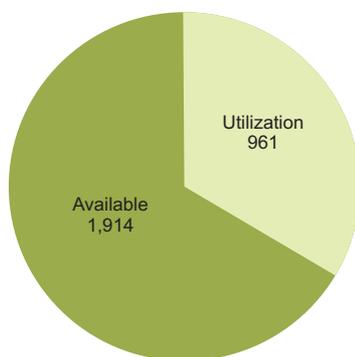
Considering that about 90% of the geological area of Bundelkhand is a hard rock with poor yield of aquifer, fast depletion of water table and inadequate rate of replenishment or recharging, development of ground water resources is not very dependable and aquifer water should be prioritized and preserved for drinking purpose. Watershed management, development of surface water resources, improving water use efficiency, enhancing biomass productivity of forest and livestock sector should be the most important options.

According to third – Minor Irrigation Census (2000-01), about 45.6% of UP and 44.7% of Madhya Pradesh net sown area (NSA) is irrigated by canals, dug wells, shallow tube wells, lift irrigation and other flows. Major portion of this, i.e., 26.7% of NSA in Uttar Pradesh and 31.7% of NSA in Madhya Pradesh is irrigated by ground water. Surface water contribution on the other hand is 18.9% in UP and 12.9% in MP with about 50% utilization. Surface water development from major and medium projects is comparatively under developed in Madhya Pradesh. While Uttar Pradesh has developed 16.7% from 28 major and medium projects and 2.2% from minor surface flow and lift irrigation schemes, Madhya Pradesh on the other hand has developed only 3.9% from 19 major and medium projects and 9.0% from minor surface water flow and lift schemes. There are about 2 lakh dug wells created by the private investments of farmers irrigating 28.6% of the net sown area in Madhya Pradesh, on the other hand 57 dug wells is irrigating only 8.9% of net sown area. In addition to making substantial contributions, dug wells are more equitably distributed in both the states. There are 4,604 deep tube wells and 44,870 shallow tube wells in UP compared to 3,124 tube wells and 16394 shallow wells in Madhya Pradesh. Tube well development is more pronounced in alluvium belt in Uttar Pradesh near Yamuna where its average yield is 37.5 ha per structure. The distinct variation in yield rates is primarily due to the hydro-geological characteristics dominant in the two states.

Utilization and availability of ground water in UP part of Bundelkhand (MCM)

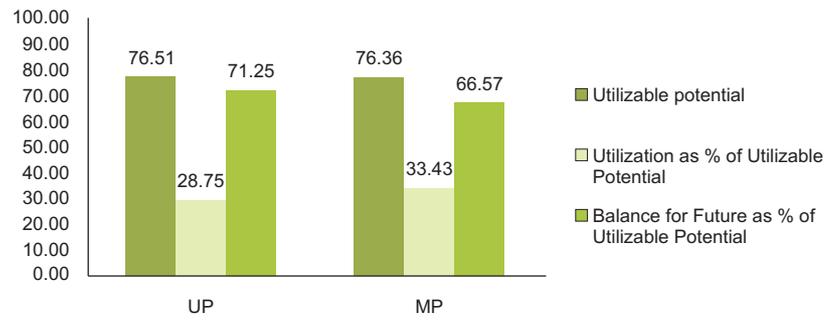


Utilization and availability of ground water in MP part of Bundelkhand (MCM)

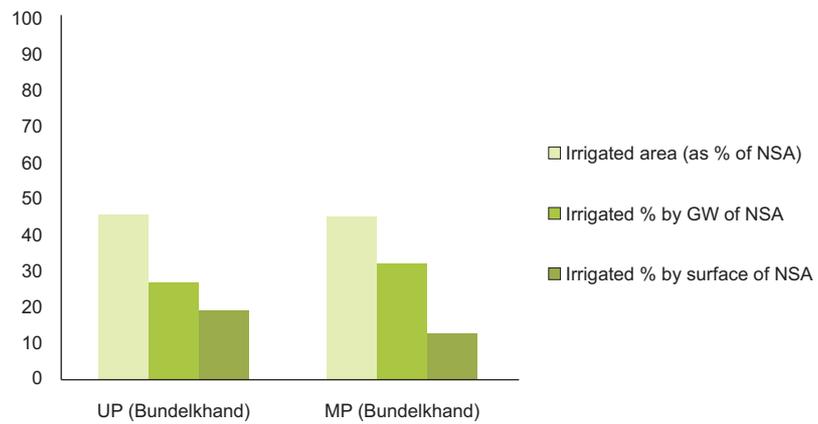


¹² Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh by Inter - Ministerial Central Team (2008)

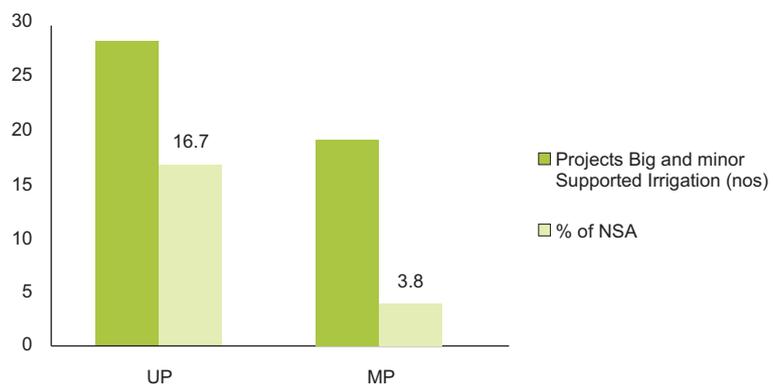
Groundwater Status (Bundelkhand Region)



Irrigated area as % of Net Sown Area



Surface Irrigation



A brief analysis of vulnerability of Bundelkhand

Development Context

The poverty situation in the dry, semi-arid and drought-prone Bundelkhand region has become extremely critical in recent years. Extended and frequent spells of drought and drastically reducing agricultural yields can be attributed to impacts of climate change while inadequate development interventions have resulted in high levels of vulnerability. Reduced resilience and current land water management practices as well as the development deficit have contributed to reduced ability of local communities to adapt to the changes. Reports of farmer suicides in these areas have become frequent and highly alarming. Insecurity of livelihoods and lack of supportive governance have led to forced migration to other parts of the country.

Rampant unemployment and resource degradation highlight the urgent need for innovative solutions and supporting mechanisms that enable village communities to adjust their natural resource management and production systems in such a way that they adapt to the changing climate and provide better livelihood security while also being low on carbon footprint.

Livelihood (in) Security

The primary occupations of people in Bundelkhand are agriculture and animal husbandry. Landless households and the large tribal population of *Sahariyas* depend on daily wage, unskilled labour work in agricultural fields and stone quarries for their livelihoods. The rate of development is depressingly slow on account of sluggish economic activity, low capital formation and inadequate investment in housing and infrastructure.

People in the region face high levels of livelihood insecurity due to the following reasons:

Low agricultural productivity, because of inappropriate agricultural practices that make farming an occupation limited to subsistence levels. Due to increase in population, land holding per person has become very low that renders low yield (200 kg/ha for wheat¹³) and therefore poor income from the land. Out of the total number of land holdings, 68% belong to small and marginal farmers who have less than two hectares of land. Most of the agriculture is based on single-cropping. Large numbers of farmers are highly dependent on the monsoon rains. Modern agricultural practices for efficient water use have not been adopted.

Lack of alternate livelihood options: Lack of investments and other infrastructural facilities makes Bundelkhand one of the most backward regions in India. Industrial activities in the form of mining of stones, sand, gravel and building materials are at a very low scale and do not offer any sort of large scale employment potential which can reduce the population's dependency on agriculture.

New forms of employment are virtually non-existent. For example, the total number of industries in Tikamgarh district reported in the District Statistical Handbook of 2003 is 317 in number, having an investment of Rs. 99.30 lakhs and employing only 745 persons. A large number of people are forced to migrate to other regions of the country. The estimated seasonal migration rate for the region is 39.4%¹⁴.

Forests of Bundelkhand are dwindling. It is causing concern because it has been a major source of livelihood for poor people. People living in and around forests have been using it for shelter, fuel, food, medicinal plants, crafts and cottage industries. But the control of forests by the government through its forest department and the nexus between feudal and official forces has left the poor people, particularly ST/SC out of receiving the benefits from the



¹³ Source: "Study on Bundelkhand" available on http://planningcommission.gov.in/reports/sereport/ser/bndel/stdy_bndel.pdf

¹⁴ Source: India Today

forests. In Bundelkhand, Panna is the only district which has the percentage of forest area over 50% with respect to its geographical area. Satna and Chhatarpur have the forest cover between 20-30%, while Datia and Tikamgarh have it less than 20%. The population of Bundelkhand is 82.32 lakh at the present, and the total fuel requirement is 36.64 lakh MT. The forest of the Bundelkhand is very degraded in nature owing to heavy grazing and fuel wood collection. As per the report of fuel committee appointed by planning commission the sustainable fuel wood production from reserve forest will be to the tune of 0.5 tons per year. With wooded area of 195000 hectares, the production capacity of these forests is 97500 MT, which is only 1.28 % of the total requirement¹⁵.

Livestock-rearing, another major traditional economic activity has become unviable due to loss of green pastures. District Tikamgarh has the animal count of 8,19,557 in which the largest share is that of cow family with its number being 4,63,806. Buffalo family constitutes 1,29,848 while sheep/goats/pigs constitute 2,25,903. This shows the importance given to livestock by the people of Bundelkhand because, these animals serve the livelihood purposes of the people. The population of hens etc. is also considerable who are 78,486 in Tikamgarh district, counted in 1995-96. The similar pattern, like that of Tikamgarh, follows in other districts in terms of the population and importance given to animals and livestock. Satna has the count of 10,54,314 livestock, Panna has 7,58,874, Chhatarpur has 13,65,019 and Datia has 3,14,786. These animals serve mostly through milk, manure and cowdung, apart from being used in cultivation, carriage and transport¹⁶.

Lack of energy supply: Bundelkhand is one of the most energy starved regions of India. Commercial grid based power is available in villages, towns and even district headquarters for only 8 to 10 hours per day. Rural areas are the worst affected as supply is given mostly at night. This forces farmers and small business owners to rely on diesel based power generation. A primary survey conducted by Development

Alternatives on energy use patterns in nine villages of Jhansi district revealed that there were 329 diesel pump sets (varying from 5 to 10 HP) being used to irrigate 482 hectares of land. The average diesel consumption of each pump was 170.2 litres. Lack of affordable and reliable energy supply therefore, is a major constraint in value addition and income generation for the rural communities in Bundelkhand.

Poor access to information, technology, finance and markets: People in the region have very poor access to information on developmental plans, schemes and products. Service delivery systems are poorly developed resulting in high access costs which people in the region cannot afford to pay. Access to formal credit is very low in the region leading to high dependency on local moneylenders resulting in long term indebtedness. Inadequate infrastructure and facilities like roads, warehousing and unreliable communication continue to plague this region. A very small number of farmers were able to get access to crop insurance scheme of the Government (3%). As wheat was perceived to require larger quantity of water the farmers have switched to growing lentils and sesame as an autonomous adaptation/coping strategy. Farmers have also diversified their livelihood options and have started small scale enterprises such as selling vegetables in the adjoining urban centre. Households have an average debt of around of Rs. 9000 every year. Nearly half of the debt is coming from informal institutions such as money lenders and friends¹⁷.

On the agricultural credit, poor farmers have to pay one and half times interest. If not paid on time, it increases till it covers the cost of the land and land goes to the rich land-lords. Villagers take credit/loans for marriages and illness of their family members. For every 100 rupees 15-20% interest is to be paid monthly. If not paid, they have to become almost bonded labour for the landlords¹⁸.

There are two sources of loan/credit for the villages. One of them is from banks, but its lengthy processes discourage poor



¹⁵ http://forest.up.nic.in/BKD_Packag/01.pdf

¹⁶ http://planningcommission.nic.in/reports/sereport/ser/bndel/stdy_bndel.pdf

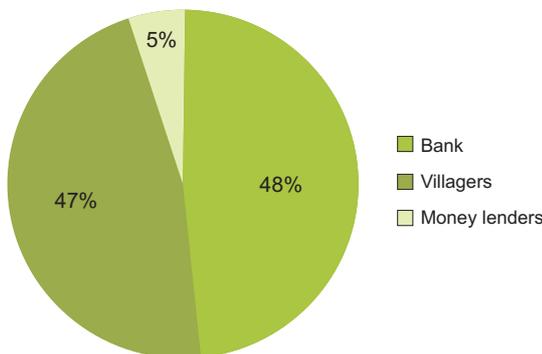
¹⁷ ERM Report on Vulnerability assessment and adaptation planning for Madhya Pradesh.

¹⁸ http://planningcommission.nic.in/reports/sereport/ser/bndel/stdy_bndel.pdf

villagers to take advantage of it, while rich farmers are well able to avail it. Poor people take loans from feudal rich to whom the interest upto 25% is to be paid for agricultural loans. On the loans for marriage, and sickness one has to pay the interest upto 5% monthly. Quality of life in Bundelkhand is reflected by the prevalence of diseases, high mortality rate, atrocities against women, poor linkages by roads and lack of sanitation at the household level. Though Datia, Tikamgarh and Chhatarpur have almost all of its villages connected with electricity but its actual benefits are for a rich few. Poor and marginalized households hardly have electricity connections. Availability of electricity for rural areas is also a big question. Panna and Satna districts have not been able to electrify all of its villages, where only 68.78 and 73.23 percent of villages, respectively have got connected. Roads to the rural areas are also in bad conditions. Rural areas are unapproachable for quite a considerable period of time during the year. Poor connection through roads to service centres like Primary Health Centres and lack of transport facilities cause a number of losses in terms of deaths, particularly that of pregnant women and children. The general usual living-patterns of villages of the districts of Bundelkhand are given in the form of a few cases¹⁹.

When Banks and financial institutions initiate loan recovery processes, farmers face threats of losing their possessions and social esteem. When they are not able to cope up, they commit suicides. In Bundelkhand, 70%100% farmers are in a debttrap owing to rising prices of agricultural inputs and lack of support prices for their produce. Many suicides could have been avoided had banks and lending institutions followed the directives of the Reserve Bank of India which exempt mortgaging farmers' land for Kisan Credit Cards up to Rs 1 lakh, and permit loan recovery in installments in 10 years. The total outstanding rural bank debt in UP Bundelkhand today is Rs 4,370 crore, up by 21% since 2010 (Rs 3,613 crore). In Banda, Hamirpur, Lalitpur and Jhansi alone, farmers owe banks about Rs 2,750 crore. Interest on agricultural loans is 3% in MP, but 7% in Uttar Pradesh. This imbalance needs to be corrected urgently. The Uttar Pradesh government provides exemption on loan interest only to those farmers who have more than five ha of cultivable land. In the 200809 Union Budget, the government announced the "Agricultural Debt Waiver and Debt Relief Scheme" to exempt the agricultural loans of marginal and small farmers holding land up to five acres. This was revised in May 2008 to cover 237 dry land districts where farmers with more than five acres were offered a onetime settlement rebate of 25%, subject to their paying the balance loan amount without interest in three installments up to 30 June 2009. Though all districts of Uttar Pradesh Bundelkhand figured in that list, farmers did not adequately benefit owing to administrative neglect. The Uttar Pradesh and Madhya Pradesh governments have taken no initiative in formulating a proactive, integrated and coordinated strategy for the holistic development of Bundelkhand. Even the central schemes (antyodaya, midday meals, pension, etc) have not been properly implemented and show little impact. There are no jobs under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), and corruption is so rampant that the Supreme Court had to order an enquiry. Thus, poverty is rampant in Bundelkhand region. Low productivity in agriculture and industrial backwardness, together with the dying traditional household/cottage industries that are

Graph: Showing sources of credit



(Source: ERM Report on Vulnerability assessment and adaptation planning for Madhya Pradesh)

¹⁹ http://planningcommission.nic.in/reports/sereport/ser/bndel/stdy_bndel.pdf

languishing for want of resources, energy and institutional support mechanisms to enable local value addition have kept the region as one of the most under-developed in the country²⁰.

Climate Change Vulnerability

The rural areas of Bundelkhand region in the past few years have witnessed high vulnerability to climate change. Development Alternatives recently conducted a field level assessment of 2 districts in the Bundelkhand region to identify the specific causes of vulnerability to climate change, the adverse impacts being felt and the people's perception about it.

Trends of changing climate: Assessment of Bundelkhand clearly indicates a downward trend in rainfall in the last 30 years (by almost 7-8% from mean 1980 levels) and an increase in mean summer temperatures by 0.5 ° C. The region has experienced droughts in 18 of the last 30 years, and these have been continuous spells of droughts spanning 3 to 4 years at a stretch. This has led to highly reduced water availability. Surface water availability has been minimal and groundwater water sources have been extensively tapped for agricultural purposes. The situation is likely to further worsen in the future with climate forecasts (obtained from Indian Institute of Tropical Meteorology, Pune) for the region indicating a decrease in monsoon precipitation by almost 15% and a rise in mean summer temperatures by about 1.5 ° C by the year 2030.

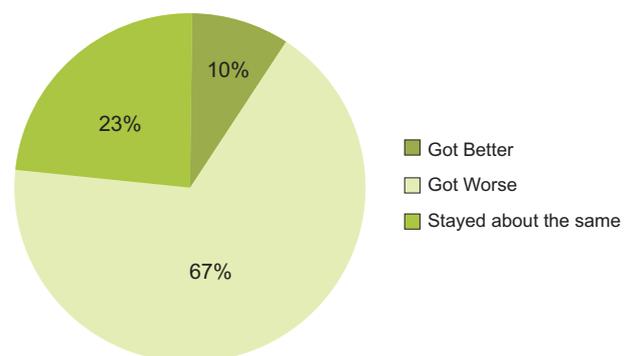
Agriculture is very sensitive to any type of climate change. Climate change will result in temperature rise and a changing precipitation pattern. The evaporation rate is also expected to rise because of the temperature increase. All these factors put together will increase the water requirement for agriculture resulting in a higher demand of energy for irrigation. Energy security poses to be a big problem area in semi – arid regions of India like Bundelkhand.

Low social capital affecting adaptive capacity: Studies in various parts of the world have suggested that a significant

determinant of the ability to withstand the climatic changes is the social capital base of a region. Development Alternatives undertook a vulnerability assessment study in Bundelkhand in the form of household surveys and participatory community exercises to assess the social capital of the region. The results²¹ of this study indicate that most of the population is highly vulnerable to climate change impacts owing to low social capital. This is evident from the fact that there are:

- **few groups and networks functional** which results in low level of information dissemination and collective decision making.
- **low degree of trust and solidarity** in turn inhibits the ability of the communities to undertake collective action in times of crisis.
- **low degree of collective action and co-operation** which inhibits the abilities of the communities to undertake collective action for climate change adaptation.
- **few sources of information and means of communication** result in the inability to effectively disseminate knowledge about adaptation measures and other relevant issues.

Graph: Showing decrease in trust level among the villagers



(Source: ERM Report on Vulnerability assessment and adaptation planning for Madhya Pradesh)

²⁰ http://www.lokniti.org/pdfs_dataunit/publications2011/16279.pdf

²¹ Source : Project Report by DA titled "Communicating climate change to rural communities and policy makers in Bundelkhand region"

In addition, access of people to basic services from the government is poor. This is especially with regards to health care, infrastructure, public distribution system and general services such as electricity supply, administrative services etc. Gender inequalities in the region are high as women have very little control over common property resources and household decision making. A key learning is that communities in Bundelkhand need to be externally supported in building their social capital and individuals need to be provided with options and capacity building to use these options for undertaking adaptation and ensuring livelihood security. Lack of these tools and delivery mechanisms for capacity building is a big gap in the present situation. While technical, capacity building and extension institutions exist there is deficiency in communication between these institutions and the rural communities. Besides, these institutions need further strengthening in terms of knowledge infrastructure and human capacity viz. a viz. interdisciplinary climate adaptation science.

Food Security

From mid-nineties till now, India's food availability has deteriorated quite significantly adversely affecting food security. The Per capita net availability of

foodgrains increased by about 10 per cent between 1951 and 2007. However, net availability declined if we compare 1961 (469 grams per day) with 2007 (443 grams). Increase in foodgrains has not been able to keep pace with the increase in population. In the year 2007, per capita availability of foodgrains was only 443 grams - much lower than 501 grams in 1991. During the period 1951 to 2007, per capita availability of pulses has declined significantly²². Decline in access to food has arisen from lack of livelihood options, compression of real income of vast sections of the population coupled with lack of market institutions that can provide food items at a reasonable price and mobilize food supply to regions hit with food scarcity.

For the Bundelkhand region, the food security scenario is extremely vulnerable. Average productivity of the region is far behind the average of Uttar Pradesh and the country as a whole. Except pulses Bundelkhand is lagging behind in all other crops. Similar is the case for Madhya Pradesh. Yield gap of 30 to 40% in Sorghum, Jowar, pulses and oil seeds is quite common in the region²³. Between January and May 2011, there were as many as 519 officially reported cases of farmer suicides in this region. This is symptomatic of acute agrarian distress in the region.



Relative productivity (q/ha) of different crops in Bundelkhand

Productivity (q/ha)				
Name of crop	Bundelkhand	India	UP	Highest in UP
Rice	8.2	21.00	18.76	29.33
Wheat	19.11	26.20	27.66	40.27
Pulses	6.57	6.00	7.25	14.2
Oilseed	3.74	10.00	8.36	16.37

(Source: Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh by Inter - Ministerial Central Team, 2008)

²² http://www.oxfamindia.org/sites/www.oxfamindia.org/files/working_paper_7.pdf

²³ Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh by Inter - Ministerial Central Team, 2008

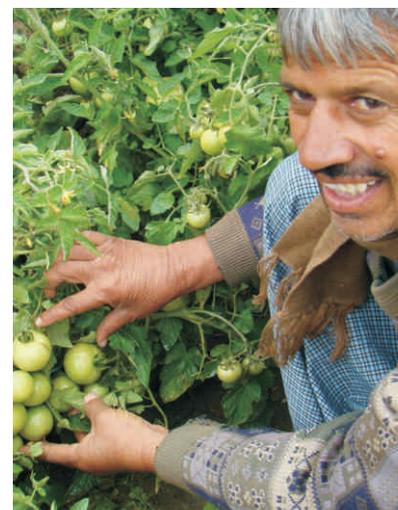
The Bundelkhand region faced its worst ever drought from 2004 to 2009 with a rain deficit of about 66 percent. According to the report of an inter-ministerial central team, headed by Dr. J. S. Samra of National Rainfed Areas Authority, the region could not cultivate 40 percent of the farms leading to about 30 percent reduction in food grain production. More than 20 lakh livestock were abandoned. Around 40 percent of the region's population had migrated out in search of work²⁴.

It has been predicted and observed that the frequency of extreme events such as droughts, cyclones, floods will increase in the event of climate change²⁵. The communities living in semi arid regions like Bundelkhand are very vulnerable to the impacts of climate change mainly because their economy is so closely linked to natural resources. Climate change and its impact on food productivity given current agricultural practices is an area of significant concern. Agriculture is highly sensitive to change in climatic conditions. A study revealed that a rise of 0.5 °C in winter temperatures could cause a 0.45 tonne per hectare fall in India's wheat production. The decline in wheat production in Bundelkhand²⁶ over the last decade has been a whopping 58 percent as compared to 16% decline in the rest of Madhya Pradesh.

A steady increase in temperatures by up to 2-3.5°C for Bundelkhand region is indicated

by the studies conducted by the United Nations Institute for Training and Research (UNITAR). A shift in precipitation is predicted from July towards August, thus reducing rainfall in July. Winter temperatures too are set to change. This will have an implication on crop productivity, especially wheat grown in the Rabi periods where a 25 % - 50% reduction in production levels is predicted under current practices.

In the long-run by the end of this century, Global Climate Models (GCMs) predict that the Bundelkhand region is most likely to experience climate extremes such as increase in consecutive dry days and fluctuations in rainfall in the form of precipitation extremes. Monsoon precipitation may decrease by almost 15 percent along with a rise in mean summer temperatures by about 1.5°C by the year 2030²⁷. Similarly, the Madhya Pradesh State Action Plan on Climate Change also indicates reduction in winter season precipitation of up to 50% by 2050. Winter season precipitation is important in the region as this supports the wheat crop in the region.



²⁴ Report on Drought Mitigation Strategy for Bundelkhand Region of Uttar Pradesh and Madhya Pradesh by Inter - Ministerial Central Team, 2008

²⁵ Mall, R.K., 2010. Integration of Disaster Risk Reduction and Climate Change. Personal Communication

²⁶ <http://www.wateraid.org/documents/perspectivebundelkhand.pdf>

²⁷ Source : Project Report by DA titled "Communicating climate change to rural communities and policy makers in Bundelkhand region"

Chapter 3

Policies and governance mechanisms

Policies and Governance Mechanisms

Government policies are directed by multiple drivers. The government has to balance the needs for development with those of environmental protection in a manner which is both internally as well as externally defensible. The Government of India has taken a lead in the international forums for representing the developing countries. The BASIC (Brazil, South Africa, India and China) group has taken up lead position on climate change issues in the 15th Conference of Parties at Copenhagen as well. Within India the climate policies have been driven primarily by issues of energy and food security. It was these issues which helped the climate adaptation policy agenda gain traction within the larger developmental agenda for the nation.

Here we outline some of the major policies, programmes, schemes of the Central Government and those of the states of Madhya Pradesh and Uttar Pradesh which have a direct impact on water, food and energy security of the Bundelkhand region.

Bundelkhand Package

The prevailing conditions of backwardness and acute poverty have led the central and state governments to take notice of Bundelkhand and special packages have been prepared to address the issues of this region. **The Bundelkhand Package²⁸** is primarily targeted for drought mitigation. The package is diversified and covers various sectors within agriculture such as watershed management, animal husbandry, fisheries, horticulture etc.

The Bundelkhand Package for Drought Mitigation is a flagship programme of the Government of India for the development of Bundelkhand. The programme focuses on

natural resource management for its implementation there being components of linkages with markets. The NRAA is the nodal agency for the implementation of the programme. The total money allocation is in the range of Rs. 7,000 crore. The money has been allocated to the State Governments of Uttar Pradesh and Madhya Pradesh.

The package is diversified and covers various sectors within agriculture. The details of the sectors and fund allocations are as follows:



²⁸ Drought Mitigation Strategy, Interministerial Report, 2008

Sl.No	Name of the Sector	Amount (Rs. Crores)	Grand total
1.	Institutional Credit i. Debt Relief ii. Crop Insurance Sub-total	930 100 1,030	1,030
2.	Watershed Management i. Watershed Management in Arable and Wasteland (11 lakh Rs.12,000/ha) ii. Farm ponds (50,000 ponds @ Rs.60,000 per pond) iii. Construction of new dug wells (20,000 dug-wells @ Rs.1 lakh per well) iv. Renovation and recharging of dug-wells, tanks Sub-total	1,180 480 400 740 2,800	2800
3.	Water Resource i. Development of Water Resources ii. Ken-Betwa River Linkage (centrally sponsored)	1,762	1,762
4.	Agriculture i. Contingency cropping, seed multiplication/banks, etc. (12 lakh ha) ii. Micro Irrigation (40,000 ha) iii. Warehousing, marketing infrastructure (@ Rs.100 crore per district) and one oil mill for sesame. iv. Capacity building v. Mechanization for zero tillage, broad bed & furrow system, multipurpose planter (custom hiring) (@ Rs.30,000 + tractor 4.5 HP @ Rs.4.8 lakh each – one set for each 100 ha (3750 units) vi. Upgrading Indian Grassland and Fodder Research Institute Jhansi to Deemed to be University Sub-total	200 100 1,300 150 100 120 1,970	1,970
5.	Animal Husbandry activities including a meat and milk processing plant	200	200
6.	Diversification into Horticulture (20,000 ha)	100	100
7.	Forest land (2,60,000 ha @Rs.12,000/ha)	314	314
	Grand-total		8,176

Allocation wise, the thrust area in the package is on Watershed Management which includes various interventions such as farm ponds, construction of new dug wells, renovation of existing wells and tanks. The second most important thrust area is that of agriculture advancement wherein modern technologies such as micro irrigation and zero tillage will be introduced. Modernization of the irrigation system and institutional debt are the other major areas. Within agricultural advancement the highest amount of finance has been allocated to warehousing and marketing. This strategy would have been appropriate in states which have high productivity and surplus is not reaching the markets. In conditions such as those prevailing in Bundelkhand and other semi-arid regions stress needs to be put at the production end of the system. Hence higher allocation of funds for promotion of technologies such as micro irrigation and zero tillage which reduce the need for water would have been appropriate. In the second stage stress could have been shifted to marketing.

A major criticism of micro irrigation systems has been that they have a high up front cost. The criticism could have been catered to if the allocation of funds in institutional credit had been loaded in favor of fresh credit and less on debt waivers and crop insurance. In the present scenario the message being conveyed to the farmers would make repayments even less likely the next time round. Also the need for crop insurance would have been reduced if more credit was available for adoption of efficient technologies which not only reduce the need for water but also increase the productivity of the land.

A major area which is noticeably missing in the package is that of "Institution Strengthening". The thrust areas are all hard and dependent on finance or technology. Social aspects of drought mitigation such as formation of common interest groups and co-operatives have been left asking for.

A large amount of funding has been set aside for major irrigation works in the Bundelkhand Package (Rs.1,762 crores). However, a major learning out of the existing canal systems in the Bundelkhand

region (e.g. the Rajghat Canal) is that only a few farmers within a short distance of the canal on either side are benefiting from it. For the vast majority the canal is an inaccessible resource. Keeping in mind the benefit of larger numbers of people it would have been more beneficial to promote the Command Area Development in a bigger way.

One major point which needs to be highlighted is that pertaining to improvement of cattle breeds. Recommendations pertaining to improving the breeds by way of introducing bulls of high quality and artificial insemination are more than welcome. However, one of the recommendations is to castrate bulls of low yield local breeds. Similar approaches to improve the local breeds of cattle have given disastrous results. A large project in Orissa for crop improvement took a similar approach. The calves that were born were not able to cope with the local environment and as a result perished. On the other hand the local bulls had been castrated. This resulted in a huge decline in milk production over a vast region in Orissa²⁹.

National Action Plan on Climate Change

The **National Action Plan on Climate Change** (NAPCC)³⁰ gives the overall approach and objective of the Government. Under it, the National Water Mission will take into account the provisions of the National Water Policy and develop a framework to optimize water use by increasing water use efficiency by 20% through regulatory mechanisms with differential entitlements and pricing. Incentive structures will be designed to promote water-neutral or water-positive technologies, recharging of underground water sources and adoption of large scale irrigation programmes which rely on sprinklers, drip irrigation and ridge and furrow irrigation.

National Mission for Sustainable Agriculture (NMSA) seeks to address issues regarding 'sustainable agriculture' in the context of risks associated with climate change by devising appropriate adaptation and mitigation strategies for ensuring food



²⁹ Everybody Loves a Good Drought, Sainath, P. 1996. Penguin, pp 3-9

³⁰ National Action Plan on Climate Change, Government of India, Prime Minister's Council on Climate Change, 2009

security, enhancing livelihood opportunities, and contributing to economic stability at national level. It aims to make Indian agriculture more resilient to climate change by identifying new varieties of crops (example: thermally resistant crops, capable of withstanding extremes of weather, long dry spells, flooding, and variable moisture availability), alternative cropping patterns and expanding its coverage to rainfed areas for integrating farming systems with livestock and fisheries so that agriculture continues to grow in a sustainable manner. This is to be supported by a comprehensive network of traditional knowledge, practical systems, information technology and biotechnology. It makes suggestions for safeguarding farmers from climate change like introducing new credit and insurance mechanisms and greater access to information.

National Mission on Strategic Knowledge for Climate Change (NMSKCC) has been launched with the broad objectives of mapping of the knowledge and data resources relevant to climate change and positioning of a data-sharing policy framework for building strategic knowledge among the various arms of the Government, identification of knowledge gaps, networking of knowledge institutions after investing critical mass of physical, intellectual, and policy infrastructure resources, creation of new dedicated centres within the existing institutional framework, building of international cooperation on science and technology for climate change agenda through strategic alliances and assistance for the formulation of policies for a sustained developmental agenda. It also has its own research agenda supported by climate change related institutions and a Climate Research Fund. It encourages initiatives from the private sector for developing innovative technologies for mitigation and adaptation.

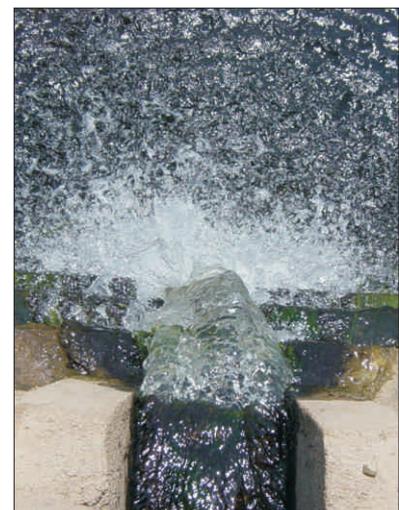
The Green India Mission aims at responding to climate change through a combination of adaptation and mitigation measures. These measures include enhancing carbon sinks in sustainably managed forests and other ecosystems, adaption of vulnerable species/ecosystems to the changing climate, and adaptation of

forest-dependent communities. The objectives of the Mission are increased forest/tree cover on 5 million ha of forest/non-forest lands and improved quality of forest cover on another 5 million ha (a total of 10 million ha), improved ecosystem services including biodiversity, hydrological services, carbon sequestration as a result of treatment of 10 million ha), increased forest-based livelihood income for about 3 million households living in and around the forest, and enhanced annual CO₂ sequestration by 55 million tonnes in the year 2020³¹.

National Water Policy (NWP)

NWP takes into account cost-effective irrigation options possible from all available sources of water and appropriate irrigation techniques for optimizing water use efficiency either in an individual project or in a basin as a whole, keeping in view the need to maximize production. Due regard to equity and social justice is also given. More specifically the water policy aims at achieving water use efficiency of 20 percent and provision of government support which holds promise in regions such as Bundelkhand which are chronically short of water. More recently Union Minister of Water Resources and Parliamentary Affairs Shri Pawan Kumar Bansal has underlined the need for a regulatory authority which could balance the competing demands of different sectors that use water. Shri Bansal observed that it is important that the pricing of water ensures its equitable distribution and the regulatory authority could serve this end³².

At the state level both Madhya Pradesh and Uttar Pradesh have their own state level water policies. However, their linkage with national water policy needs further strengthening. Madhya Pradesh state water policy stresses on assessment of availability of ground water after every ten years and exploitation of ground water on scientific basis. It also states that ground water should be utilised only to the extent, which can be recharged. For recharging the ground water methods of construction of minor irrigation tanks/percolation tanks are recommended³³.



³¹ <http://www.indiaclimateportal.org/the-napcc>

³² <http://pib.nic.in/newsite/erelease.aspx?relid=82236>

³³ http://www.mp.gov.in/wrd/ORG_RECORDS/Policy/SWP/SWP_REV.html

Uttar Pradesh State Water Policy promotes formulation of projects as far as and whenever possible on the concept of basin or sub-basin, treating both surface and the ground water as a unitary resource, ensuring multipurpose use of the water resource, provides for a Management Information System (M.I.S.) for effective monitoring of policy implementation and a mechanism for the resolution of conflicts between various users³⁴.

Drought-Prone Areas Programme and Desert Development Programme

The Drought Prone Areas Programme (DPAP) and Desert Development Programme (DDP) are area development programmes implemented by the Government of India since 1973–74 and 1977–78 respectively. DPAP and DDP are meant for drought proofing and combating desertification to tackle the special problems faced by fragile areas in the arid, semi arid and dry-sub humid regions. Until 1994, DPAP and DDP were being implemented on a sectoral basis in a fragmented manner by the different line departments.

In 1994, a High Level Technical Committee reviewed these programmes. Based on the recommendations of the Technical Committee, comprehensive Guidelines for Watershed Development were issued in October 1994. These Guidelines were applicable to Integrated Wastelands Development Programme (IWDP), Drought Prone Areas Programme (DPAP) and Desert Development Programme (DDP). The basic objective of these programmes is to:

- minimize the adverse effects of drought on the production of crops and livestock and productivity of land, water and human resources thereby ultimately leading to the drought proofing of the affected areas.
- Promote the overall economic development and improve the socio-economic condition of the resource poor and disadvantaged sections inhabiting the programme areas through creation, widening and equitable distribution of the resource base and increased employment opportunities.

- integrated wastelands development based on village/micro watershed plans. These plans are prepared after taking into consideration the land capability, site condition and local needs of the people.

The outcomes are prevention of soil erosion, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. This enables multi-cropping and the introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed area.

ROLE OF WATERSHED MANAGEMENT PROGRAMME IN THE MADHYA PRADESH

In Madhya Pradesh the agriculture sector accounts for nearly one-third of GSDP and forms the backbone of the State's economy. Sustainable and continued agricultural development is essential for the overall development of the State. In Madhya Pradesh, agriculture is characterized by several problems, prominent among which is that of wide year-to-year fluctuations in production and consequently, farm incomes. The absence of assured irrigation in large parts of the State and of appropriate technology for dry land and drought prone areas compounds the problem. The State has 5 crop zones, 11 agro climatic regions and 4 soil types, which add to biodiversity in the State and acts favorably for production of various agriculture and horticulture crops. There are a high proportion of low value crops with low productivity and agriculture holdings are highly fragmented. There are also large areas of cultivable wastes and fallow lands.

According to the 2000-01 Agriculture Census there were 73.60 lakh operational holdings in the State. 65% of agriculture in the State is still traditional and mostly rainfed. With its most cropped area belonging to the rainfed category, the incidence of drought has become more or less a perpetual feature. It is pertinent to note here that in the last ten years the State has faced drought in nine years, which has impacted the GSDP adversely. Added to this the relentless exploitation of the natural resources base in the form of soil cover, vegetative cover and ground water due to increased biotic pressure is mounting



³⁴ http://swaraup.gov.in/Downloads/up_wp.pdf

pressure on fragile eco-system. Rural poverty and extensive unemployment amongst the casual farm and non-farm workers indicates inadequate work opportunities. As consequences the livelihood of rural people's in rainfed agriculture areas has always been under constant threat. In the context of above background the watershed management programme is the most appropriate and scientific approach for conserving the soil and water resources and optimizing their utilization to have increased/sustainable agricultural productivity, regeneration of natural vegetation and better livelihood opportunities in rainfed areas of Madhya Pradesh³⁵.

The major activities taken up under the IWDP scheme influencing the food security management are:

- In situ soil and moisture conservation measures like terracing, bunding, trenching, vegetative barriers and drainage line treatment.
- Planting and sowing of multi-purpose trees, shrubs, grasses, legumes and pasture land development.
- Encouraging natural regeneration.
- Promotion of agro-forestry & horticulture.
- Wood substitution and fuel wood conservation measures.
- Awareness raising, training & extension.
- Encouraging people's participation through community organization and capacity building.
- Drainage Line treatment by vegetative and engineering structures
- Development of small water Harvesting Structures.
- Afforestation of degraded forest and non forest wasteland.
- Development and conservation of common Property Resources³⁶.

These guidelines have been revised periodically. The key features of this new unified approach are Delegation of Powers to States, Dedicated Institutions, Financial Assistance to Dedicated Institutions, Livelihood Orientation etc.

Participatory Irrigation Management (PIM)

The concept of involvement of farmers in management of the irrigation system has been accepted as a policy of the Government of India and has been included in the National Water Policy adopted in 1987. There has been increased consciousness in States regarding the need for actively involving farmers in management of the irrigation systems. States of Andhra Pradesh, Assam, Chhattisgarh, Goa, Gujarat, Karnataka, Kerala Madhya Pradesh, Maharashtra Orissa, Rajasthan and Tamil Nadu have enacted exclusive legislation for involvement of farmers in irrigation management. Under Restructured Command Area Development and Water Management Programme, more emphasis is being given to the participatory approach. Under this programme, payment of central assistance to States is linked with the formation of Water Users' Associations. There has been a greater participation of member-farmers in management decisions. In most of the project sites, there was an initial reluctance to pay the community contribution towards cost of repair of the canal because of the fear that the money will be misappropriated by the WUA Presidents as in the case of Chhapi WUA, or because the physical works was taking just too long to start although some amount of contribution had already been collected as in Gora and STP WUAs. However, at all these sites, the NGOs tried to assuage the fear by undertaking physical works on a piecemeal basis. Clearly, physical benefits accrued in a short time were distinctly visible to the community. Moreover, the formation of the Works subcommittee in some of these WUAs ensured that a larger number of members were involved in monitoring and supervising, that quality work was being done, as well as that the costs are contained. Following the first phase of work, large numbers of farmers came forward to pay their contributions. This is clearly visible



³⁵ http://swaraup.gov.in/Downloads/up_wp.pdf

³⁶ <http://dolr.nic.in/iwdp1.htm>

from the trend in community contribution as can be seen from the individual case studies. A feeling of ownership over the *nahar* arose since it was their money which was also ploughed into the projects, and they felt it was their responsibility now to take care of it³⁷.

There are 245 WUAs in Uttar Pradesh with 121,000 ha under management. Farmers have got the apprehension that in absence of surety of finance, it would be difficult for them to fulfill the requirement of funds for operation and maintenance. They feel that when Government is not able to handle the system with huge money available with them, how farmers would be able to do justice?³⁸

Integrated Watershed Management Programme (IWMP)

Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and Integrated Wastelands Development Programme (IWDP) of the Department of Land Resources have been integrated and consolidated into a single modified programme called Integrated Watershed Management Programme (IWMP). This consolidation is for optimum use of resources, sustainable outcomes and integrated planning. Watershed development programmes envisage a greater role for Gram Panchayats and self-help groups / user groups particularly during implementation. It is stipulated that project implementing agencies be preferably selected from amongst the community members. Major activities of the Watershed project are as follows: soil and moisture conservation measures like terracing, bunding, trenching, vegetative barriers etc.; rain water harvesting activities like farm ponds, percolation tanks, check dams etc.; planting and sowing of multi-purpose trees, shrubs, grasses, legumes and pasture land development; encouraging natural regeneration; promotion of agro-forestry and horticulture; measures needed to disseminate technology; training, extension and

creation of a greater degree of awareness among the participants; encouraging peoples' participation; livelihood activities for assetless people and production system and micro-enterprise³⁹. Madhya Pradesh has obtained noticeable changes in the land use pattern with most villages in the watershed areas in Guna, Narsinghpur, Seoni and Sehore undertaken for the study reported to have positive trend. From the state in Uttar Pradesh it is found that 41% watershed is reported to have positive change⁴⁰.

Madhya Pradesh State Government Water Programmes

Madhya Pradesh state water policy stresses on assessment of availability of ground water after every ten years and exploitation of ground water on scientific basis. It also states that ground water should be utilised only to the extent, which can be recharged. For recharging the ground water methods of construction of minor irrigation tanks/percolation tanks are recommended⁴¹.

Madhya Pradesh State Organic Agriculture Policy

MP State Organic Farming Policy is the statement of intent to create, facilitate, and strengthen the enabling environment for developing integrated value chains of the organic farm produce encompassing end-to-end solutions for both primary producers and consumers. The policy entails on "farm – to – fork" approach reassuring abundant supply of "healthy food for all". The policy statement provides concurrent thinking of the state with its futuristic, pragmatic pro-farmer initiatives. The "MP State Organic Farming Policy 2010" envisions three fold goals considering cross sectoral, temporal and spatial factors across the contours of productivity enhancement from the low production potential regions, threats of climate change, markets and above all holistic development paradigm especially encompassing agrarian communities in the hinterlands⁴².



³⁷ [:/www.asaindia.org/PDFs/5.pdf](http://www.asaindia.org/PDFs/5.pdf)

³⁸ <http://mowr.gov.in/writereaddata/mainlinkFile/File421.pdf>

³⁹ <http://rural.nic.in/sites/downloads/our-schemes-glance/SalientFeaturesIWMP.pdf>

⁴⁰ <http://dolr.nic.in/dolr/downloads/pdfs/Impact%20and%20Effectiveness%20of%20WDP%20by%20LB%20SNA.pdf>

⁴¹ http://www.mp.gov.in/wrd/ORG_RECORDS/Policy/SWP/SWP_REV.html

⁴² http://www.mpkrishi.org/krishinet/hindisite/pdfs/Javikneeti_Eng.pdf

Madhya Pradesh State Water Policy, 2003

The Madhya Pradesh state policy states that availability of ground water potential should be assessed after every ten years compulsorily and exploitation of ground water should be controlled on the scientific basis. The ground water should be utilized only to the extent, which can be recharged. For recharging the ground water methods of construction of minor irrigation tanks/percolation tanks should be adopted. It also states that In the planning and operation of system water allocation priorities shall be as under: drinking water supply, irrigation and afforestation, power generation/industrial and other uses and tourism⁴³.

Rajiv Gandhi Mission for Watershed Management

Rajiv Gandhi Mission for Watershed Management is an ambitious Programme of Government of Madhya Pradesh, for sustainable development of area on watershed basis. It not only aims at conservation of natural resources like land and water, but also attempts to improve economic conditions of villagers by enhancing their employment opportunities in their village. This Programme has innovated the approach of watershed management through community participation. At present this Programme is being implemented in all 313 blocks of Madhya Pradesh in an area of about 3.2 million hectares²⁶.

Water Supply Schemes

- Drinking Water Supply through hand pumps under Accelerated Rural Water supply Programme (ARWSP) sponsored by the Ministry of Rural Areas and Employment²⁷, Government of India. The coverage norms of ARWSP include: (a) 40 lpcd of drinking water for human beings (b) 30 lpcd of additional water for cattle in areas under the DDP (c) One hand pump or stand post for every 250 persons and availability of water source within 1.6 Kms.

- Piped water supply schemes are normally provided for villages having population of above 2000. The respective Panchayats have to pass a resolution for taking over these schemes for running and maintenance. Sometimes a smaller village may be considered for piped water supply scheme due to special circumstances such as existing topography or availability of distant drinking water source. Such schemes are executed under either (a) State programme or (b) Accelerated Rural Water supply Programme ARWSP²⁸.
- Spot Source Water Supply Schemes executed for smaller villages, where normally there is no dependable drinking water source. The water supply is provided to the villagers with the help of a power pump, pipeline and cistern under (a) State Programme, (b) ARWSP.
- Water Supply schemes in tribal areas (as notified by the govt. of Madhya Pradesh) sub-plan are executed by providing either hand pumps or piped water supply schemes under the programmes (a) State Programme, (b) With additive funds from Government of India.

Govt Expenditure on RD&D in Energy

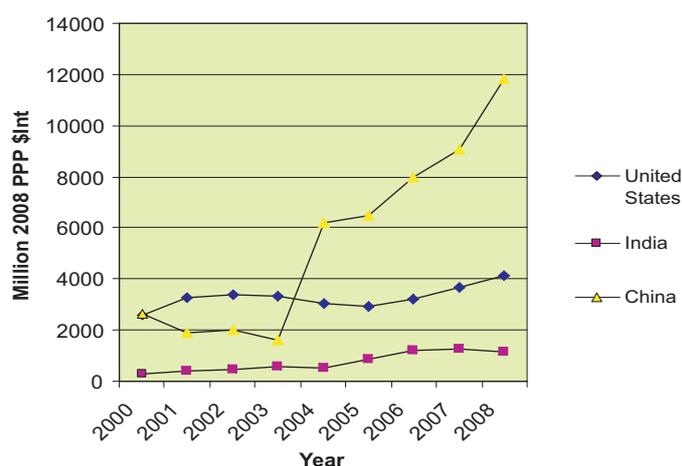


Figure 2 Source: Computed from Belfer Center Database, Harvard University

⁴³ http://www.mp.gov.in/wrd/ORG_RECORDS/Policy/SWP/SWP_REV.html#P2

- Government of Madhya Pradesh has notified villages, having more scheduled caste population, under Special Component Plan. Water supply for villages/habitations under this plan are covered under (a) State Programme (b)ARWSP.

Central Govt. Programmes for Energy

The Government undertook a number of initiatives over the years for rural electrification. Some are enumerated below.

Rajiv Gandhi GrameenVidyutikaran Yojana (RGGVY)⁴⁴

Rajiv Gandhi GrameenVidyutikaranYojana (RGGVY) was launched in April-05 by merging all schemes going under rural electrification. Under the programme 90% grant is provided by Govt. of India and 10% as loan by REC to the State Governments. REC is the nodal agency for the programme. The RGGVY aims at electrifying all villages and habitations with free connection to Below Poverty Line (BPL) families.

Remote Village Electrification Programme (RVE)

The objective of the Remote Village Electrification Programme (RVE) is to electrify all the remote census villages and remote hamlets of electrified census villages through non-conventional energy sources such as solar energy, small hydro power, biomass, wind energy, hybrid systems, etc. By focusing on unelectrified remote census villages and remote hamlets of electrified census villages, the Programme aims at bringing the benefits of electricity to people living in the most backward and deprived regions of the country.

Jawaharlal Nehru National Solar Mission

Under the NAPCC one of the eight missions is the Jawaharlal Nehru National Solar Mission⁴⁵. The objective of the National Solar Mission is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The Mission will adopt a 3-phase approach, spanning the remaining period of the 11th Plan and first year of the 12th Plan (up to 2012-13) as Phase 1, the remaining 4 years of the 12th Plan (2013-17) as Phase 2 and the 13th Plan (2017-22) as Phase 3.

Central Expenditure on Micro-irrigation Scheme (Revised Estimates)

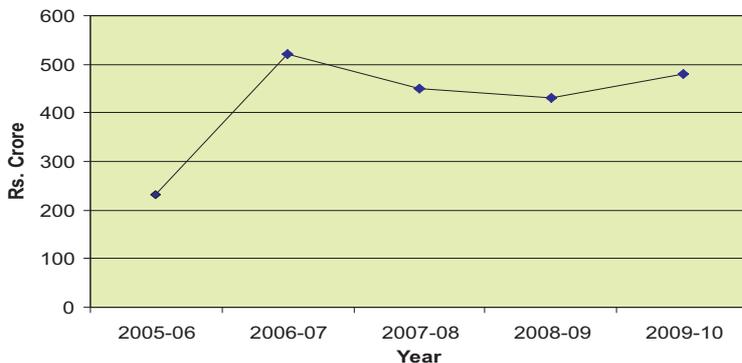


Figure 3 Source: Central Budget of India, various years

Government Expenditure

Research Development and Demonstration (RD&D), particularly in green-field technologies and subjects, is an important aspect for technological change. Since in such fields, there are considerable amount of risk (to the effect that such research may not succeed and hence can't bring any revenue return), it is important for the government to step in keeping in mind its positive implications on society and environment. Hence in the energy sector, responsibility of RD&D should be primarily owned up by government.

The above diagram shows a comparative analysis of government expenditures (2000 to 2008) of different countries on RD&D in the energy sector, in international dollar

⁴⁴ Details available at rggvy.gov.in

⁴⁵ Jawaharlal Nehru National Solar Mission Towards Building Solar India, Ministry of New and Renewable Energy, Government of India, 2009

(\$Int.) terms according to purchasing power parity or PPP as of in 2008. The complex conversion of currency was required for accurate inter-country comparison. The countries considered are the United States of America, China and India.

Over the period mentioned above, i.e. 2000 to 2008, India's government expenditure on RD&D in the energy sector has increased at a very slow pace. However from 2006 onwards, it has stagnated and even declined marginally. Expenditure of the U.S, though significantly higher than India's in absolute term, has also grown at a very slow pace. However, post 2005, it has shown some acceleration. The case of China is entirely different. Starting at a level similar to the U.S in 2000, China's government expenditure on RD&D in the energy sector has increased by leaps and bounds. In 2008, it stood at almost 3 times the U.S expenditure and more than 10 times the expenditure of India. China's extraordinary technological development in the field of non-conventional energy is certainly related to this phenomenon.

The above diagram shows that in the recent years, Central Government expenditure (revised estimates) on micro-irrigation scheme shows stagnation post 2006-07. As a percentage of GDP, it has been actually decreasing, apart from the fact that it is miniscule. This explains non-fulfilment of targets that have been set regarding micro irrigation programme (target of land to be brought under micro-irrigation was severely under-achieved).

MP State Action Plan on Climate Change⁴⁶

Madhya Pradesh is considered to be one of the most vulnerable states of India. SAPCC identifies forests, water and agriculture as some of the climate sensitive sectors. Correspondingly the State Action Plan seeks a funding of INR 803 crore for forests, INR 667 crore for water and INR 1133 crore for the agriculture sector in the next five years. The MPSAPCC has been identified as one of the better state action plans because of the consultative approach which was followed for developing it. Some of the key strategies in the water sector

which have been identified to address climate change concerns include: develop comprehensive water data base in public domain; accelerate surface water development activities in the state; promote recharge of groundwater with special focus on overexploited areas; plan for efficient water supply systems and management; encourage water management practices like water auditing; regulated exploration of groundwater, water recycling, etc; enhance basin level integrated water shed management; review of existing water storing structures in view of excess precipitation; restoration of traditional water storing structures as groundwater recharging structures.

The key challenges now faced by the Madhya Pradesh State Action Plan On Climate Change (MPSACC) are:

- Integrating climate change in developmental programs and schemes
- Mainstreaming planning processes
- Communicating climate change adaptation concepts at community and department levels
- Developing indicators for climate change adaptation monitoring and tracking
- Development of tools to assist planning processes at state and district level



⁴⁶ <http://moef.nic.in/downloads/public-information/MP-SAPCC.pdf>

Chapter 4

Contradictions and synergies

Mainstreaming climate change adaptation and mitigation into development processes (planning) is complex and requires different tools at different levels. An integrated approach to policy making (top to bottom and bottom up approach) is required to strengthen the process. Policies and resultant programs and schemes at variance with each other can negate benefits they are expected to provide. On the other hand synergies in planning and action not only across policies and programs but institutions in different sectors can support and enhance the benefits.

This section looks at some of the obvious synergies and conflicts across policies and programs in selected sectors.

Water and food security

State policies for water management, agriculture and industrial development are often at variance with each other. Thus while, conservation and efficiencies of water use are being promoted through watershed development programmes (such as IWMP) on one hand, extractive practices through diesel pumps and high water requiring crops are also being supported simultaneously (subsidy on diesel and electricity) by parallel public programmes.

Industry and water security

Promotion of pollution intensive industries such as construction and mining is adversely impacting the source of rivers and catchments for water-sheds in the region. These decisions are governed by industrial development policies that are not connected with water management or agriculture resulting in a skewed development paradigm in the region.

Future challenges of increasing conflicts and pressures on the limited water resources from industry, recreation, service sector and urban sectors and for the eco-systems are imminent⁴⁷.

Forests and agriculture

Another major concern is plantation of invasive species (such as Eucalyptus) of trees through afforestation programmes under MGNREGS causing more harm than good. Eucalyptus is known to extract groundwater and also lead to deterioration of soil quality^{48, 49}. Instead of forests being promoted and given importance for their role in water augmentation and land management, they are unfortunately seen as a source of obtaining free wood. Incentive for conservation of forests by the communities is therefore compromised. **The villagers residing nearby forest blocks wholly depend upon the forest for their demand of small timber. The forests of Bundelkhand area meet their demand through Teak, Kardhai and Seja pole crop and from Bamboo. The demand in the last two decades is heavy leading to the decrease in wooded cover of the Bundelkhand to 58% of actual forest land cover⁵⁰.**

Employment and food security

Similarly, the MGNREGS pays to rural individuals who are employed in non agricultural activities. In Bundelkhand this has led to reduced availability of farm labor impacting the food security in the region. **If the labour takes NREGA and food subsidies and shrinks from other work, labour costs can go up steeply for rural employment on farm and in industries which are, as it is, not that competitive⁵¹.**



⁴⁷ Workshop on Sharing Experiences of Climate Change Action in Semi-Arid Regions of India, A Case Study of Bundelkhand

⁴⁸ <http://www.agu.org/pubs/crossref/2005/2004WR003761.shtml>

⁴⁹ <http://www.hindu.com/2011/04/28/stories/2011042865310400.htm>

⁵⁰ Source: forest.up.nic.in/BKD_Packag/01.pdf

⁵¹ <http://www.thehindubusinessline.com/opinion/article2831793.ece?homepage=true>

Energy and food security

It has been found that many taxes and subsidies are applied on the same services and products which nullify the advantages offered by the subsidies. Thus there is a need to streamline the financial incentives offered. Perhaps, the biggest example for this conflict of interest has been the subsidies provided on chemical fertilizers. While on one hand these cause serious pollution and are source of green house gases on the other they lead to an increase in the input cost for agricultural activities. The subsidy scheme on fertilizers is directly in contradiction to the overall policy goal of the Government of India to reduce dependency on imported fuels. Similarly electricity is provided to farmers at highly subsidized rates which leads to overexploitation of groundwater. Subsidy on power needs to be viewed only as a last measure for life saving irrigation in times of drought. Outlays for input subsidies for fertilizers, electrical power used for agriculture, and irrigation water distributed through surface irrigation systems increased about 11 percent annually in real terms (adjusted for inflation) between fiscal years 1993/94 (April-March) and 2008/09, when high world fertilizer prices pushed the total input subsidy bill to 1,609 billion rupees (US\$35.04 billion). On average, fertilizer subsidies, which include both subsidies to farmers and to the fertilizer industry, account for about 40 percent of all input subsidies. The cost of providing subsidized electricity for agriculture accounts, on average, for about 26 percent of total agricultural input subsidies, while subsidies to cover the operational costs of providing surface water irrigation typically account for about 21 percent of the total. The budgetary costs of operating India's PDS and storage for wheat and rice are accounted for in the "food grain subsidy." The real cost of the food grain subsidy increased sharply in the late 1990s, when India accumulated large surpluses of wheat and rice in government stocks. The subsidy declined as stocks were reduced in the early 2000s but is now rising again due to hikes in MSPs, unchanged subsidized issue prices through the TPDS, and rising government stocks. Overall, the real cost of the food grain subsidy has increased about 9 percent annually since the early 1990s, and is expected to reach a record of 513 billion rupees (\$11.2 billion) in 2010/11⁵².

The Bundelkhand Package – planning for sustainable development of the region

The state planning department is responsible for implementing the Bundelkhand Package with a mandate to transform the region. The Bundelkhand Package allocates Rs 8,176 Cr to this region, which is primarily targeted for drought mitigation. It distributes funds for different thrust areas like Watershed Management, Institutional Credit, Water Resource Agriculture and Animal Husbandry Development etc.

The following short term and long term plans have been drawn up to address the developmental deficits in Bundelkhand:

- The integrated watershed development programme for water management in the form of surface water enhancement and harvesting measures through check dams and stop dams is being taken up as a priority.
- The Bundelkhand package aims to get four lakh hectares of area under irrigation. To achieve this, renovation and repairs of canals is being done and projects like the Ken-Betwa Rivers link irrigation project are being supported.
- For livestock management, setting up of fodder banks and cattle improvements are being taken up.
- Soil conservation in addition to afforestation is being taken up to mitigate the ill effects of deforestation over the last few decades.
- The six districts of Bundelkhand in Madhya Pradesh have been brought under a special program of horticulture to give opportunities for creation of nurseries and promotion of agri-horti models for livelihood security and income generation.
- With the aim of strengthening research and development, an agriculture university is being started in Jhansi and the capacity of the Fodder Research Institute in Jhansi is being enhanced. The Government had planned for tabling The Rani Lakshmi Bai Central Agricultural University Bill, 2012 during the Budget session of the Parliament but did not do so due to opposition⁵³.

A key opportunity here, is to put the data required for social, economic and



⁵² <http://www.ers.usda.gov/Briefing/India/Policy.htm>

⁵³ <http://mpa.nic.in/preb12.pdf>

environmental development of the Bundelkhand region on an easily accessible data base and make available analytical frameworks to help monitor outcomes and support planning. A video based documentation and a GIS based mechanism for monitoring the development activities in the villages (of the MP-part of Bundelkhand districts) has been planned. The budgetary allocations for the districts for their development activities are linked with the preparation of plans by the village *gram sabhas* and approval of the same district plans by the District Planning -. Efforts are now on to integrate programmes of the line departments into the process for enhancing the development processes. A second opportunity lies in the capacity building of district and village level governance bodies to use such information systems to plan and monitor and track their work in real time.

Though, it is a comprehensive package, certain gaps and deficiencies need to be addressed to ensure that the implementation is appropriate to meet the local needs. The challenge that the government faces is that of time required for procedural aspects – and it is hoped that the package would spread into the 12th Plan period for enabling the effective utilization of funds so that desired impacts are achieved. A critical has been the importance given to large scale irrigation dams and canals at the cost of command area development. This means that while large farmers will be able to access the canal water for irrigation purposes using pumps small farmers will find it more difficult to do the same due to high capital costs and increasing fuel costs.

Government responses to the region

National Action Plan on Climate Change (NAPCC, 2008)

In the Indian context, climate change is inducing an additional stress on livelihoods dependent on ecological and socio-economic systems. These are already under tremendous pressures for various reasons including increasing population, rapid unplanned urbanization, industrialization and associated activities.

Since the Indian economy is primarily natural resources based, it makes the situation more vulnerable.

The climate change concerns of India led to the formulation of **National Action Plan on Climate Change (NAPCC, 2008)**, which outlines eight missions that are directed towards adaptive as well as mitigative planning and development. It is imperative that India's diverse topographic, socio-economic and climatic parameters need to be considered carefully while adopting strategies to tackle climate change concerns. Hence, states of the Indian Union have been advised to devise and implement strategies in view of their respective climate related sensitivity and vulnerability. Common framework for the preparation of SAPCC was developed by UNDP in consultation with other development agencies like GTZ, DFID and World Bank. The common framework that draws largely on the principles of territorial approach to climate change, focuses on sub national planning, building capacities for vulnerability assessment and identifying investment opportunities based on the state priorities. The framework provided broad, systematic and step-wise process for the preparation of SAPCC and advocated a participatory approach so that states have enough ownership for the process and the final Plan. The common framework specifically mentions integration of climate change into development planning of the state. In order to this the common framework follows an approach of understand climate data & its limitations; assessing climate change interaction with existing vulnerabilities; going beyond risk management; considering both top-down & bottom-up approaches; reaching out to a large number of sectors and actors; building broader stakeholder engagement ensuring inclusion & gender considerations; addressing state priorities while creating enabling environment for implementation of NAPCC and setting effective institutional mechanism for implementation (monitoring, review & refinement)⁵⁵.

Bundelkhand region comprises of 13 districts in both U.P and M.P. Both the states are marked with complex social structures, a predominantly agrarian economy, difficult and inaccessible terrain,

⁵² <http://www.ers.usda.gov/Briefing/India/Policy.htm>

⁵³ <http://mpa.nic.in/preb12.pdf>

⁵⁴ <http://moef.nic.in/downloads/others/SAPCC-workshop-summary-2010.pdf>

⁵⁵ <http://moef.nic.in/downloads/others/Experts-SAPCC-Preeti.pdf>

and scattered settlements over vast areas that together pose several formidable problems to service delivery systems. Climate change has the potential to undermine existing efforts to tackle the complex social development problems faced in the region.

The State Action Plan for Climate Change – integrating development planning and climate change concerns

The State Action Plan for Climate Change (SAPCC) formulated by the Madhya Pradesh Government has been prepared with a view to integrate climate change concerns into mainstream development planning agenda. Vulnerability assessments have been made. The government has based its planning process on extensive consultations. The SAPCC is to be viewed as a development plan keeping the climate, resource, economic growth parameters in mind in the long term, which is robust and can survive any climate shocks and be able to respond to extreme and unpredictable events. Keeping in view the vulnerabilities of the state, it is mainly an adaptation oriented plan. The challenge lies in the ownership to the vision and mission of this plan by various government departments, their capacities to implement the plan and the regular monitoring and feed-back into making this robust and result-oriented.

Setting up sustainable support systems – NABARD and other regional technical institutions

Lessons and successes from semi-arid regions of Maharashtra can be replicated and scaled up in Bundelkhand through NABARD's and ICRISAT's integrated watershed development programmes. Maintenance of watersheds or promotion of NRM based livelihood enterprises through community based enterprises is the preferred mode of support. NABARD programmes are designed to support community groups to move up the value chain through institutional development of federations and producer groups. The individual is as important as the community

and so the individual plans for water management by farmers are encouraged through funding to ensure democratic participation in the process of water conservation.

Integrated farming systems with diversified components that have the potential to reduce risks of single crop based system are promoted and NABARD provides support for such initiatives.

Another space that exists is trials of innovative technologies and practices that may be funded through NABARD for testing with farmer groups and taking forward the successful ones through a line of credit available to farmers. The agricultural extension services have been criticized by the Prime Minister himself who has stated that these are not robust enough. Relying upon them to take on the additional burden of providing and demonstrating means to adapting to climate change will not be a safe bet. However, capacity building of this extensive network in the long run will pay dividends.

Role of other CSOs, private, multi-bilateral organizations

There are a number of Civil Society Organizations (CSOs) which are active in Bundelkhand. These CSOs are carrying out grassroots level actions in diverse fields related to water, sanitation, agriculture, energy and employment and enterprise establishment. They have experiences from their direct involvement on ground based activities in which they have participated over the years. However, the CSOs lack resources to reach out and impact multitudes of people in the region. Such resources are present with the government which could gain by enhanced engagement with CSOs. Many of the CSOs are already part of larger platforms such as the Bundelkhand Knowledge Platform for sharing lessons from across Bundelkhand. The table given below⁵⁷ highlights the strengths, weaknesses and potentials of the NGO/CSOs in the Bundelkhand region.

A number of private sector players are active within the Bundelkhand region who have directly or indirectly supported



⁵⁶ Source: "Study on Bundelkhand" available on http://planningcommission.gov.in/reports/sereport/ser/bndel/stdy_bndel.pdf

livelihoods and developed models for linking farming communities to markets. Experiences of the private sector have the potential to provide models for market based approaches for adaptation to climate change. These models will have the long term viability embedded within them as it is a pre requisite to any entrepreneurial work. In order to cater to the needs of the agricultural and livestock sectors a number of private agencies are in place. These agencies include suppliers for inputs to agriculture (ex. fertilizer, pesticides, veterinary medicines etc.), small food processing units and marketing agencies. In the recent past suppliers of new technologies such as Jain Irrigation (for efficient irrigation) have come up seeing the opportunity in a drought prone region. However, because of lack of knowledge the farmers are often underpaid by middlemen. Also the rate of uptake of modern technology is slow as the risk taking capacity of the community is low. Thus

whereas on hand there is a need to provide market information to the farming community in an innovative manner (since most of them are illiterate) and also to demonstrate the appropriate technologies available in the local markets in farmers' fields.

Recognizing the precarious nature of Bundelkhand a number of bilateral and multilateral agencies have been undertaking developmental and climate change adaptation related projects within the region. These agencies have experienced the climatic reality of the region first hand and have harvested lessons from the projects which they have piloted over the years. Thus, CSOs, the private sector and bi/multilateral agencies have experiences which can provide inputs to synergize the formulation and implementation of policies and schemes within Bundelkhand.



Type of Actors/CBOs	Strengths	Weaknesses	Potentials
Small NGOs/ Associations/Group with committed leadership	High degree of enthusiasm, an ability to implement a programme, clarity on issues	Weak programme management/skill/ networking and linkages, Weak resources	Can demonstrate examples of grassroots development
Govt. promoted NGOs and cooperatives	Large coverage and network/young leadership Sufficient financial resources Good linkages/contacts and knowledge of local issues. Experience of working with people groups	Weak capacities of development No institutional mechanism to provide back-up support Too centralized. Decision control of the coordinator only	Useful Structure for advocacy on politically neutral issues. Useful for contacts and strengthening linkages. Can provide a base to initiate activities
Committed and credible individual/ old Satyagrahi or Bhoodan leaders	Good experience on selected local issues High levels of interest and commitment Willing to work on various issues	Lack of clarity on development issues No clear plan or strategy to work Weak financial base.	Can be good resource persons/ provide voluntary services

Chapter 5

Impacts of practices and policies on water and food security, way forward

The below section describes the likely scenario given the present state of policies and the manner in which programs are being implemented in the Bundelkhand region. The section goes on to propose to way forward in order to avoid the scenario and in order to bring about climate resilient development in the Bundelkhand region.

Reduced availability of ground water

The current policies do not incentivize water conservation. In fact they provide incentive for overspending it (Please see Chapter 4 section on water and food security/energy and food security for further elaboration). Such a scenario will result in depleting water table. Bundelkhand regions bedrock is granitic and recharge rates of aquifers is very low. In such cases recharge of aquifers is difficult and depleting ground water is increasingly being reported from across Bundelkhand. Water being the mainstay of agriculture based livelihoods in the region, depletion of this resource as a result of mismanagement of the system as a whole is of grave concern. Reduced rainfall and changes in the hydrological cycles leading to reduced water availability during the recurrent drought periods in Bundelkhand has been one of the main causes for water resource scarcity. Additionally, the mis-management of water systems such as decay and disrepair of traditional ponds and tanks, over exploitation of the ground water as compared to management of surface water systems, pollution of ground water resources have all contributed to water scarcity in the region. With reduced recharge of ground water and its over draw there is a continuous negative balance that leads to precarious situations in the drought years.

Increasing input costs and decreasing returns for agriculture

Prices of diesel and fertilizers are bound to go up with the central government having decided to deregulate the fossil fuel prices

to reflect the market rates. This will result in farmers to having pay more for the same amount of diesel or fertilizers. With the water tables going down the amount of diesel required with the current irrigation practices is going to increase. Agriculture in many parts of Bundelkhand is as of now a loss making proposition even without considering the labor changes involved. (Source: Development Alternatives, Baseline Report of the Sustainable Civil Society Initiatives, 2009) With higher costs agriculture will be an even more avoidable activity in a larger area of Bundelkhand.

Increasing out migration

Agriculture is the mainstay of the Bundelkhand economy and with the sector becoming increasingly loss making the pace of outmigration will increase. The average landholding of the Bundelkhand region is about 2 hectare per household. Assuming each household to be of 5 members the land is manageable even if 2 members of the family out migrate. However, any further outmigration will have serious consequences in terms of the land's fertility and soil quality.

Reduced food security

Bundelkhand region has very low agricultural productivity even when compared to Central India. With farmers giving up agriculture the farm production will fall further. Many of the subsistence farmers will then be dependent on the markets for procuring food commodities. In a fragile economy such as Bundelkhand's where alternate livelihood sources are scarce this will have devastating socio-political consequences. (Please refer Table 1 in Chapter 2, section on food security).

Investment lock-in

Current investment decisions which are not taking into account future climatic scenarios run the risk of locking in investments which will not perform their function in the future. A case in point will be centralized dam and canal systems which in case of flash floods



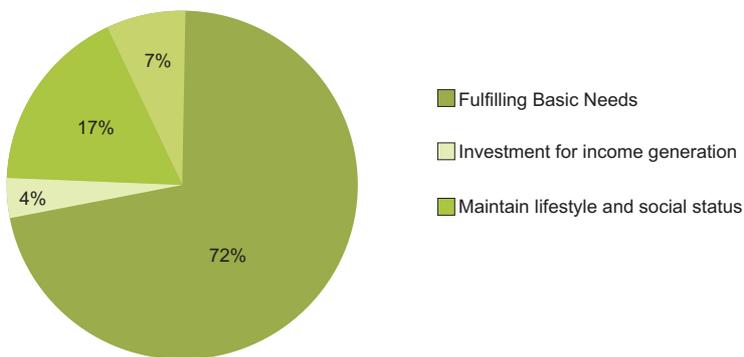
might worsen the situation in adjoining the very villages for whose development they were put in place. The chances of this happening are real as projections made by various agencies have predicted more intense rainfall in Bundelkhand region in the coming years⁵⁷.

Reduced adaptive capacity

Reduced food security combined with changing climatic conditions resulting from the above mentioned reasons will lead to reduced adaptive capacity of the communities. This means, that it will become harder for the communities to adapt to climate change. Thus the current policies and programs are leading to exactly the opposite direction in which one would like it to move in.

The next section provides tried and tested recommendations for reversing this trend while the time is still at hand. These recommendations have been arrived at following extensive research, and a consultation process spanning for over a year and involving communities in Bundelkhand, CSOs, private sector, practitioners, bilateral and multilateral agencies and governmental institutions.

Graph: Reasons for migration



(Source: ERM report on Vulnerability assessment and adaptation planning for Madhya Pradesh)

Way forward

The following are the recommendations which in our understanding will help in bringing about climate resilient development in the Bundelkhand region.

- **Interdisciplinary approach**
 Since each policy, scheme and program has unintended consequences there is an urgent need to take an interdisciplinary approach while policy formulation. There is a special need to keep in perspective the predicted climatic conditions so that investments and infrastructures created are resilient to climate change.
- **Model for program implementation**
 A number of models have been tried and tested for program implementation in the Bundelkhand region. Implementation models which involve the ultimate beneficiary, i.e. the community, as a part of the managing structure have tended to do better. This has been borne out by various action and action research projects carried out in Bundelkhand (and elsewhere in the semi arid regions) for climate change adaptation.
- **Evidence based policy formulation**
 Policy formulation needs to keep in perspective the evidence base which is guiding it. Policies and programs which are based on evidence tend to solve the purpose in a more straightforward and timely manner leading to higher satisfaction and relief among the vulnerable communities. Climate change adaptation projects targeted at resource efficient agriculture which are based on baselines have been found to be more successful.
- **Streamlining policies**
 Policies as they are now fail to provide clear signals to the communities. Therefore policies need to be streamlined to lead towards practices and technologies which are sustainable, climate resilient and also leading to enhanced livelihood security. A case in point could be promotion of activities which lead to over extraction of ground water while funding construction of water storage structures such as check dams for enhancing water availability.

⁵⁷ ERM report on Vulnerability assessment and adaptation planning for Madhya Pradesh

- Participatory planning across levels**
 For effective program implementation the perspective of the local communities need to be included. This can be done through CSOs or through platforms representing them. Participation of the community helps in designing programs which cater to the need of communities resulting in reduction of climate vulnerabilities and ensuring wider participation.
- Appropriate technology development and propagation**
 A number of technologies and practices

have been demonstrated in the Bundelkhand region by CSOs to reduce water consumption in agriculture while not the harming the production (in fact increasing it in many cases). Such technologies need to be scaled up and propagated across the region. A few examples of such technologies and practices include sprinkler based irrigation, drought resistant varieties of crops, crops which need lesser amount of water, agroforestry, horti-agriculture model.



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Analysis Report



**Sustainable Civil Society Initiative
to Address Global Environmental Challenges**

**A Brief Resource Vulnerability in
Analysis of Semi-Arid Bundelkhand and
Recommendations for Policy Response**



Schweizerische Eidgenossenschaft
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A brief analysis of vulnerability of Bundelkhand

Criteria for intervention selection

**Participatory demonstration
trial of garlic**

