

Shubh Kal

We change with climate change

Research Paper

*Is Climate change policy in India meeting
the adaptation, information and knowledge
needs of the vulnerable rural communities?*



Project name

From Information To Knowledge And Action

Submitted to

Climate and Development Knowledge Network (CDKN)

Submitted by

Development Alternatives

B-32, TARA Crescent, Qutub Institutional Area

New Delhi - 110 016, India

Tel: 91 (11) 2654 4100, 2656 4444

Email: nahluwalia@devalt.org

Research Paper - Is Climate change policy in India meeting the adaptation, information and knowledge needs of the vulnerable rural communities? Learnings from the climate sensitive Bundelkhand region in central India

Author – Aditi Jha, Environment Scientist, Development Alternatives

Peer reviewed by - Mustafa Ali Khan (Ph D), Policy Specialist, India Himalaya Climate Adaptation Programme (IHCAP), email: mustafa@ihcap.in

Climate change poses a direct and growing threat to the livelihood of millions of people in India. Since the impacts of climate change are dependent on agro-climatic zones, socio-economic factors and other facets of vulnerability, adaptation to climate change is a local process (Agrawal et. al 2008). The main role of federal and state agencies in addressing climate change adaptation is to enable the implementation at the local level through bottom-up planning and efficient allocation of resources. A large portion of the country's massive agriculture sector comprising of poor resource-dependent rural households will bear a disproportionate burden of adverse impacts of climate change (Satapathy et al. 2011, Mendelsohn et al. 2007, Kates 2000) and thus should be the focus of adaptation information and knowledge sharing and interventions in the country.

While many ongoing research initiatives are studying impacts of climate change on local communities and packaging adaptation models in India and other developing countries in South Asia, studies suggest that research being conducted has had limited success in being taken up at the local level. This is partly due to challenges of communicating scientific research in ways that are appropriate to local stakeholder needs (Gauthier 2005) and a failure to meaningfully engage existing local institutions (Agrawal and Perrin 2009) and local cultural practices (Ensor and Berger 2009) among other reasons such as financial and infrastructural constraints (IPCC, 2007). Alongside these challenges, numerous studies have called for an increased scientific engagement with local or indigenous ecological knowledge as a valuable source of adaptive practice and a pathway to integrate new approaches to adaptation (Berkes, Colding et al. 2000).

So far climate change policy initiatives in India, such as the process of formulating action plans for climate change, have taken a top-down approach with the national level plan setting the precedent for the state level plans. These plans are yet to be integrated into national, state level and district planning processes to direct funds appropriately and enable implementation. There is a pressing need to integrate more locally focused adaptation dimensions in climate change policy (Urwin and Jordan 2007).

India is in a unique position to implement locally relevant action to deal with climate variability and change. This is because of a system of decentralised district level planning exists in the country and has been accorded importance in the Eleventh Five Year Plan¹. This process should ideally enable panchayat representatives and line departments to document their adaptation priorities, share best practices relevant to the locality and leverage funds from the planning process to meet their needs. Additionally, there are a few institutions at the local level that have been established for local level research and extension activity such as the Krishi Vigyan Kendras (KVK) and Agriculture Technology and Management Agency (ATMA). The country also has a system of imparting agrometeorological data through the Indian Meteorological Department (IMD), which issues bulletins, five-day forecasts and other relevant information that could be useful for decisions that farmers need to make in the case of climate variability and change.

However, even though these institutions and processes are in place, there are some significant gaps that need to be addressed to enable the vulnerable agricultural community to adapt to climate variability and change. For instance, in the country – print media that is the major source of information for climate change (Billet 2010) is not accessible to the largely illiterate population in rural areas. Also, indigenous local knowledge and grassroots needs are not feeding into policy formulation adequately.

Climate Change Information and Knowledge Communication at the Local Level

Development Alternatives (DA) and Learning in Geography, Humanities, Technology & Science (LIGHTS) conducted a survey in the Bundelkhand Region to learn about climate change perceptions, modes of communication and sources of information among the agricultural rural community. A total of 104 agriculture-based households in the four districts of Lalitpur, Shivpuri, Ashok Nagar and Tikamgarh were covered in the survey. Bundelkhand is a region in central India comprising of districts from Madhya Pradesh and Uttar Pradesh. Here the impact of climate change is increasingly pronounced because of a predominantly agrarian economy, considerable poverty and regular incidences of drought (Hedger and Vaideeswaran 2010).

The geology and topography and pattern of rainfall in Bundelkhand show that it is prone to both drought and flood (Bhartendu et al. 1998). In most parts of the region, an impermeable rocky layer is found at fairly shallow depths. Hence runoff of both rainwater and soil is high. Erratic rainfall and thin forest cover in many districts aggravate the problem. Hence, drought or flood hits some parts of Bundelkhand every few years.

¹ Para 1.147 of the 1st chapter of the Eleventh Five Year Plan document

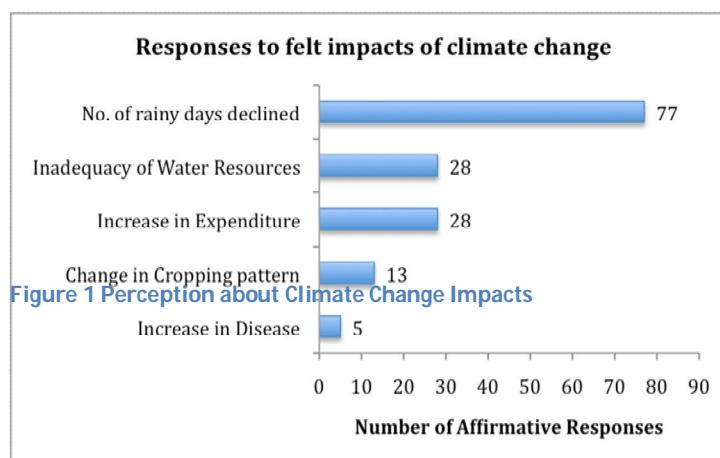
According to a report which was prepared by a Central Government team under the chairmanship of Dr J. S. Samra, head of the National Rain fed Area Authority, following visits to Bundelkhand districts in December 2007 and April 2008, moderate to severe agricultural drought occurred for two to four years in all the 13 districts of the region.

Some of relevant findings of the household survey are elucidated below:

Climate Change Perceptions

Perhaps one of the most significant findings of the survey was that respondents were unable to fully comprehend the concept of climate change. They were equating climate change with shifts in weather patterns². Thus, in the area communities continue to take decisions as and when climate varies – rather than come up with a long-term strategy for coping with impacts that include a shift in the onset of the monsoon and lesser number of rainy days.

At a stakeholder consultation on Climate Change Adaptation organized by Development Alternatives and The Environmental Planning and Coordination Organisation (EPCO) in September 2012, a representative from the agriculture department commented that at times farmers plant upto three different crops in a season because of climate variability. While this shows that farmers are adapting in the short-run (sometimes unsuccessfully), they need relevant information and resources to formulate a long-term strategy for adaptation.



When the potential impacts of climate change were posed to respondents separately however, nearly 70 per cent of the respondents alluded to the fact that the farmers' lands are not getting enough water. The respondents felt that in the recent decades there has been a decline in the number of rainy

days. Also, they felt that the pattern of rainfall has undergone a change. As eight respondents commented, there is very intense rainfall – all at one time with the water flowing away before it percolates down. The onset of the monsoon rains, the respondents feel are later than usual – as cited by the elders of the village.

² The difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere behaves over relatively long periods of time. When we talk about climate change, we talk about changes in long-term averages of daily weather - http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html

The inadequacy of water resources with rivers running dry most of the times, as opposed to earlier times when minimal flow was reported, is affecting the lives of the people here as water resources are increasingly becoming scarce. The various rivers and rivulets that criss-cross the terrain were once adequate sustenance throughout the year for the region, but now they run dry for most part of the year. Respondents have also said that with no check dams in the vicinity, the groundwater table is falling. Privately owned bore wells are being used in the region for irrigation as the traditional water points have dried up added the respondents.

Thirteen households reported a change in cropping pattern in the recent decades, as compared to earlier generations. Respondents claim that the household only grows one main crop, usually wheat, as compared to earlier times, when a second crop, such as gram, sorghum etc. was also grown. Cropping patterns have also undergone a change with the respondents claiming that the land has gone bad – meaning thereby a fall in productivity, rise in pest attacks and crop failures. 19 per cent respondents claimed that sowing season for the kharif crop began after *dussehra* festivities, but now it has changed and sowing time seems to be sometime later.

The respondents in the study area also reported an increase in expenditure. The reasons cited include increased use of fertilisers and investment in better seeds. The cycle of expenditure, the respondents claim, thus rotates in an upward spiral and in most cases are beyond their means, forcing them to leave the land fallow and migrate to urban areas for work. About 12 per cent respondents have claimed a doubling of expenditure in the recent years. 7 per cent respondents have claimed that traditional seed varieties were better and harder with stable productivity. However today the seeds they claim are not of good quality, escalating their efforts to search and purchase better seeds.

A small portion of the respondents cited a rise in diseases with the lack of fresh water and changing weather patterns. Although not part of the graph below, some respondents also cited the lack of quality education to be the source of all the agriculture related problems of the area.

Modes of Communication Accessed in the Study Area

The people of this region are well connected to a few means of information and communication. They are avid TV and radio fans and almost every individual has a mobile connection. Telecommunications has taken India by storm and this region too has highly benefitted (Tripathi, 2006).

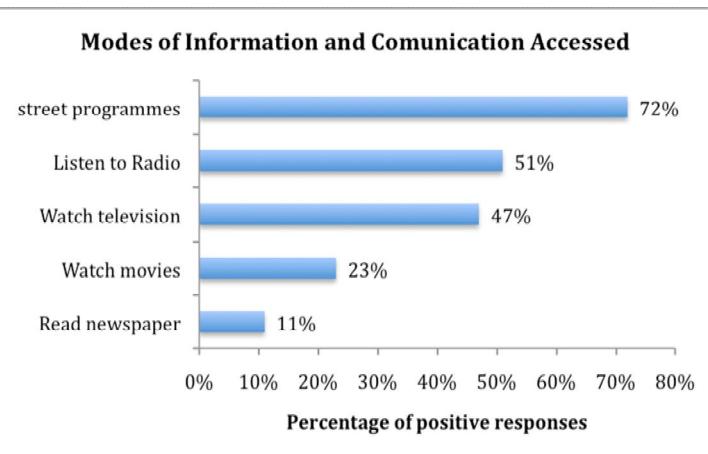


Figure 2 Modes of Information and Communication in the area

spaces, where discussions and forums among villagers enhance day-to-day information primarily about politics and parties and political leaders of the day.

Radio ranked second in preference. Although most mobiles are equipped with radios, the populations in an energy-starved region prefer to keep their mobiles switched off for most

part of the day to conserve charge in the mobiles. The battery operated radio sets are still used for listening to radio. The preferred programmes on radio are related to entertainment (mostly FM Radio) followed by news and then agriculture related. The respondents surveyed, listen to radio programmes of

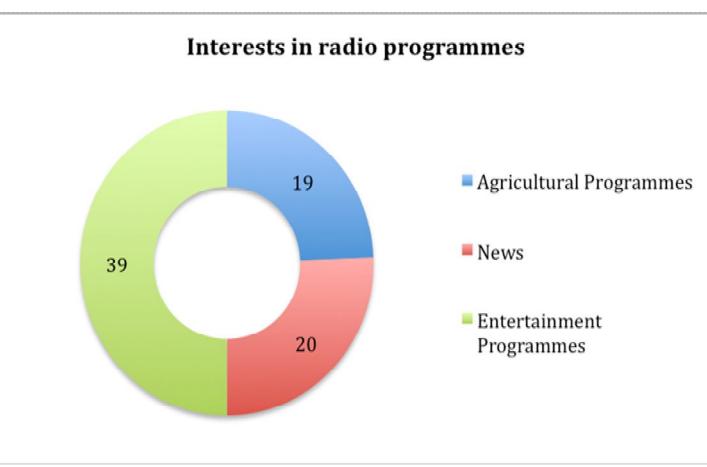


Figure 3 Radio programme preferences in the study area

community radio stations such as Radio Bundelkhand, Chatterpur Station, Radio Dharkan, Lalit Lok Wani and Big FM.

According to this study conducted in the region, of 78 people who access radio on a regular basis, 19 people are more interested in agricultural programmes, while 20 people like to listen to news. However most of the population is more interested in entertainment programmes. Thus from the sample survey it may be inferred that news listeners and agricultural programme listeners would partially be able to access information regarding adaption norms in agriculture in a climate change scenario, weather and other anomalies in the region. Thus about 50 per cent of the people of this area can access information and understand it provided it is adequately packaged.

Newspapers rank fourth directly correlated to the fact that literacy rates are depressed in these regions. Some of the papers in the region are Khabar Lahriya - a weekly newspaper in Bundeli, Akhand Bundelkhand in English and Hindi, Awaz ye Bundelkhand in Hindi, Bundelkhand Darsan in Hindi, Datia Prakash Newspaper in Hindi, Bundelkhand Samachar in Hindi, Zuban E Bundelkhand in Urdu.

The top ranking information and communication tool preferred in this region is street programmes locally known as '*nukkad nataks*' that have been traditionally practiced by local groups. *Nukkad natak* and *nautanki* are theme based presentations that are made by the local specialised roaming groups, the former being based on any contemporary theme, while the latter is based on traditional and mythological stories. The groups practicing these arts move from village to village making their presentations. The renditions are usually made during festival seasons, as communities are oriented towards interaction during those periods. The stories relayed are short and stand alone, an all out entertainment package. This is a really important communication tool whose identification and efficacy in the study region should play an important role to access climate change information so that people can learn about adaptation means.

Movies are least accessed among the communication tools as there are no movie halls in the immediate vicinity of the survey area. However, people do access the nearby areas to watch a movie. The people identified that those who access movies belong to a higher income category or are more mobile and visit adjoining urban areas frequently.

Sources of Agricultural Information

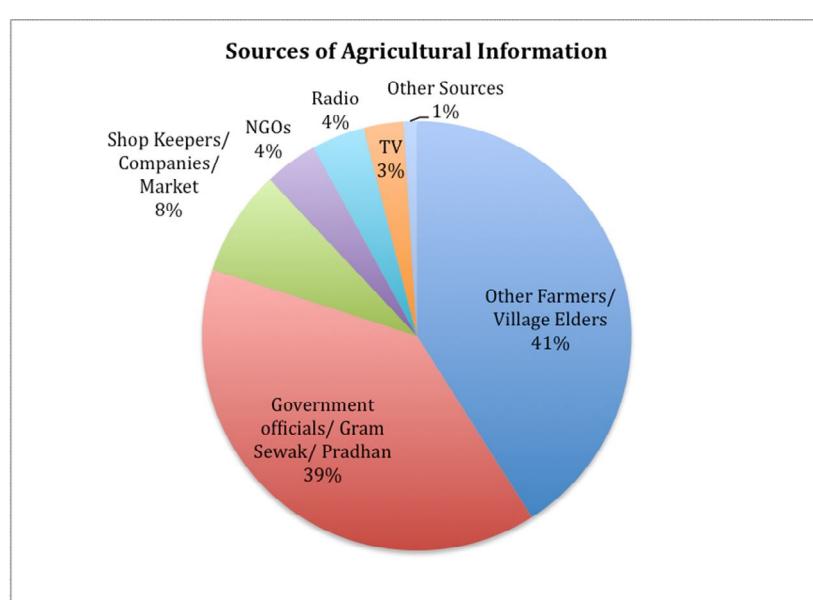


Figure 4 Sources of Information for Agricultural decision-making

The region seems to have discerning farmers that do not rely on a single source for information but use an intelligent mix. For crop, seed, fertiliser and animal care related information they seek the help of 'other farmers' and 'elders' primarily (41 per cent);

followed by government

officials in the panchayat or at the block level. Radio is at rank five, while TV is still lower at rank six as a source of agricultural information.

Information and communication technologies (ICTs) have been with us for many years and have played an important role in promoting agricultural and rural development during the last few decades. The role of TV and radio in rural education and extension services has been well documented. These technologies will continue to play a critical role in and along with the new information and communication technologies such as mobile phones and perhaps computers and internet – the latter however is a distant dream for the region. But there is now a qualitative difference in the way we can generate, disseminate and transfer knowledge and thus contribute to development. What seems pertinent however, that NGOs have made sizeable impacts in this area and are seen as important information provider ranking at number 4.

At the all-India level, of the 16 different sources sought for accessing information on modern technology for farming, the most popular was through ‘other farmers’ with 16.7 percentage of farmer households accessing information through this source, followed by input dealers (13.1 percent), radio (13.0 percent) and television (9.3 percent). Other farmers, who were usually large farmers, family members or neighbours and input dealers are contacted by farmers mainly either on a needs basis or seasonally (Mittal et al 2010).

Understanding of Seasonality, Climate Variability and Change

It is well understood that farmers use traditional knowledge to understand weather and climate patterns in order to make decisions about crop and irrigation cycles. This knowledge is adapted to local conditions and has been gained through many decades of experience passed on from generations. Farmers have been seeking out scientific weather forecasts in recent years however the survey reveals that their reliance continues to be on traditional rainfall predictions that were based on knowledge and evolved through observation and experience over a considerable period of time. The efficacy of these traditional means may not be as accurate in the face of increased climate variability and change.

Understandably farmers have also evolved several coping strategies and mechanisms in rain-fed systems across the country. Traditional knowledge is learned and identified by farmers within a cultural context, and the knowledge base reflects the specific language, beliefs, and cultural processes. The local weather and climate are assessed, predicted, and interpreted by locally observed variables and experiences using combinations of plant, animal, insect, and meteorological indicators (Raj 2010). The study in the Bundelkhand region thus attempts to highlight the traditional knowledge networks in the area and also attempts to understand the traditional markers of climate change.

A shift of season is primarily identified by the farmers by leafing, flowering and seeding

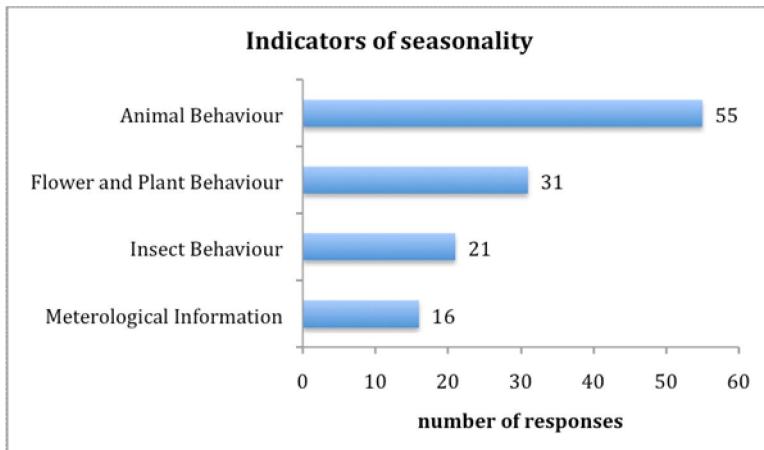


Figure 5 Indicators of seasonality

patterns in neem trees. An untimely fall of seeds, or flowering alerts them to a change in the atmospheric parameters. In recent years, the number of such shifts are claimed to have risen as compared to the earlier times.

A large number of households claimed that they know about weather patterns changing through conventional markers in the animal kingdom such as when they see that lizards change their colour, or they hear louder bird calls or observe frogs croaking, or see several eggs of insects on leaves etc.

The largest number of respondents said that they know about climate and weather change through other sources such as when the underground water from wells in the house starts getting warm (indicator for a particular time each day), particular cloud formations, or when northerly winds start to blow, etc.

Although the traditional markers make for interesting reading, their scientific efficacy is yet to be ascertained and would need deeper probing in the said area of study. What emerges significantly is that traditional markers do exist and that farmers are still observant.

The survey results point towards an urgent need for reliable and reinforced communication at various levels. Communication plays a vital role in bringing change in the level of knowledge among farmers and helps them adapt new technologies to boost agricultural production in the backdrop of a changing climatic regime.

There is also a recognition of this need in the approach paper of the 12th five year plan that states:

The shift from mere technology generation to greater understanding of contexts is imperative; with enhanced research on seasonality, location-specific soil-crop-water interactions and linkages with other rural resource demands like drinking water. Successful varietal development for rain fed areas is possible only if decentralised research and information generation are tuned to agro-climatic features at the district and block levels, with participatory research and extensive infrastructure and facilitation of local

seed banks. The latter will be a necessity for responsive seed replacement and support in the event of climate variability and change. Increased allocation to research and extension must go hand-in-hand with institutional changes in public sector R&D and in the role mandated for Krishi Vigyan Kendras (KVKs).

The approach paper highlights the need for adaptation to climate change through adaptive agriculture practices and management of water resources. For this purpose it advocates the need for:

developing agro-climatic zone specific water harvesting and management technology to enable rural communities to withstand the effects of climate change” and “genetic improvement of agricultural crops to develop a flexible portfolio of plant varieties that can thrive in drier or wetter environments, survive flash floods, and resist pest attacks due to change in humidity, etc

The government has taken a few initiatives towards adaptation in agriculture. The most notable of them is the National Initiative on Climate Resilient Agriculture (NICRA). The project is aimed towards enhancing resilience of Indian agriculture (covering crops, livestock, fisheries) to climate change and climate variability through development and application of improved production and risk management technologies. The government has also expanded the network of Agricultural Technology Management Agencies (ATMA) to 600. These agencies are responsible for technology dissemination at the district level. The agency aims to identify location specific needs of the farming community, sustainable agricultural development and to execute and coordinate plans through line departments, training institutions, NGOs, farmer's organisations and allied institutions. Currently almost 600 ATMA's have been established. The ATMA has a provision to designate one 'farmer friend' or *Kisan Mitra* for every two villages.

However, despite these initiatives there continues to be lacunae at the grassroots. The provision of 'farmer friend' or *Kisan Mitra* from the ATMA is an excellent mechanism to ensure that information that is significant for farmers to adapt to climate change reaches them in a timely manner, since the survey results show that farmers make decisions based on inputs from other farmers and government representatives. Other aspects that need to be explored are the use of community radio that can considerably enhance the dissemination of information in close collaboration with KVK's and ATMAs. Information dissemination for preparedness to the impacts of climate change needs to engage with the local mediums of communication accessed by less privileged sections – these include community radio and '*nukkad natakas*' that are still extremely popular mediums in rural

areas where literacy hampers access to newspapers and no electricity restricts the amount of time they watch television.

Civil society organisations (CSOs) are also an important aspect of enabling adaptation. In the Bundelkhand area itself 'The Bundelkhand Knowledge Platform' which is a forum of CSO's, Community Based Organisations (CBOs), Research Institutes, KVK's and other relevant stakeholders for the exchange of ideas and experiences for sustainable practices in agriculture, livestock, energy and water security is a good example of a region specific facilitator of adaptation.

Information Needs for Adaptation: Policymakers and Practitioners

While States are in the process of formulating State Action Plans for Climate Change and working towards including it in planning processes, they are also in need of information to insure that they meet the adaptation needs of the most vulnerable. Madhya Pradesh is at an advance stage in the process of formulating their State Action Plan. The nodal agency for all climate change related matter in state is the Environment Planning and Coordination Organisation (EPCO). The Madhya Pradesh State Action Plan on Climate Change is unique, because it attempted a bottom-up approach, which involved cross-sectoral stakeholder consultations convened at two levels viz sectoral consultations with respective line departments and regional consultations at agro-climatic zone level.

The Climate Change Cell of EPCO intends to establish a mechanism that facilitates management of long term climate risks and uncertainties as an integral part of the state development planning. The basic purpose of establishing the cell is to build the capacity of the state government officials to coordinate and mainstream climate change issues in development activities and policies. The Climate Change Cell will manage information and knowledge and provide services to ensure environmental Sustainability through facilitation, identification and implementation of development projects. The state is currently looking at strengthening the MPSAPCC through enhancing information and accuracy on Regional Climate Models (RCMs) and undertaking vulnerability assessments at the spatial, temporal and sectoral levels for adaptation options.

A case study based on DA's implementation of climate change adaptation projects in Bundelkhand has documented the issues related to accessing; processing and applying climate information to help farming communities take robust and low-risk agricultural adaptation measures. While socio-economic data is easily available at the local level, the formulation of adaptation options also requires an array of climatic and hydrological data, satellite images and biophysical information for robust recommendations about adaptation

practices for farmers in the region (Khan et al. 2012). Currently this data has to be got, in some cases purchased, from Indian Institute of Tropical Meteorology (IITM), Indian Meteorological Department (IMD), the Indian Institute of Technology (IIT), the National Remote Sensing Centre (NRSC) and various Agricultural Research Institutes. The integration of this information requires experts and multidisciplinary teams to come together.

Currently this role of integrating various sets of information to come up with robust adaptation options at a local level is being performed by organisations that play an ‘interface role’ in bridging information across the gap between scientists, planners and farmers. These organisations include Development Alternatives (DA), The Energy Resources Institute (TERI), Watershed Organisation Trust (WOTR) and others that have the bandwidth to put together the required inter-disciplinary team with funding support from national and international sources.

However to mainstream this process of coming out with robust adaptation options, considerable investment is required to strengthen and expand the ability of existing institutions to integrate a wide range of information for climate change adaptation and translate this information into more decision relevant forms. In places where such institutions are absent there is a need for government and donors to consider creating institutions/organizations to fill this niche.

The focus on district planning processes can also considerably strengthen the implementation of adaptation in vulnerable areas. Currently, district level planners at the Gram Panchayat level who have a critical role to play have poor knowledge about the impacts of climate change and prioritising adaptation. The manual for Integrated District Planning recognizes that the provision of spatial and graphical data and improved multi-stakeholder processes can improve district level planning processes. Capacity building at the district level on assessing vulnerability, climate change adaptation, and mainstreaming can go a long way in ensuring the agricultural community is able to adapt.

Conclusion

An analysis of the findings show that while there is a lot going on at the national and state levels in terms of climate change research and policy – the translation into action at the grassroots level is lacking. Currently – the role of implementing adaptation action on the ground is being undertaken through a few initiatives and interface organisations.

The primary survey under this assessment establishes that farmers are unable to comprehend the concept of long-term impacts of climate change and continue to equate climate change with shifts in weather patterns and thus continuously undertake contingency measures. These measures are not always successful in the event of climate variability and

extreme events. There is a pressing need to ensure that the concept of climate change and potential impacts are communicated along with aspects of uncertainty in innovative ways to the community to facilitate adaptation actions. There is also a need to increasingly engage with farmers to understand their needs and priorities for scientific research and policy decisions.

To ensure that the adaptation needs of the most vulnerable are addressed, policy needs to engage with modes of information communication that are locally relevant – these include community radios, *nukkad nataka*'s as well as civil society institutions. These modes can also be used to improve the dissemination of research undertaken by the KVK's and alternate technology promotion by ATMA's as well as ensure that grassroots priorities are feeding into research and policy formulation.

The approach paper to the Twelfth Five year plan has recognised the need for participatory, decentralised research and information generation tuned to agro-climatic features at local level and Investments by the government are required to facilitate and strengthen such a decentralised participatory process for research and action on climate change adaptation. Additionally, addressing climate change concerns requires increased collaboration between governmental departments in plan and scheme development as well as additional focus on more long term planning. The institutional capacities of local level departments (village and district) need to be increased to adequately translate climate adaptation policies into ground level implementation. Finally, the communication of climate change related information needs to be enhanced to enable both communities and local level governmental departments to adequately respond to the threat posed by climate change on the region.

References

- Adger N. Lorenzoni I. and O'Brien K. (Eds.), *Adapting to climate change: Thresholds, values, governance* (pp. 350–367). Cambridge, UK: Cambridge University Press.
- Agrawal, A., & Perrin, N. (2009) 'Climate adaptation, local institutions and rural livelihoods' IFRI Working Paper W081-6, University of Michigan
- Agrawal A. McSweeney, C., Perrin N. (2008) 'Local Institutions and Climate Change Adaptation' World Bank, Washington, DC. <https://openknowledge.worldbank.org/handle/10986/11145> accessed on 9th December, 2012
- Agrometeorological Services in India (no date) eds. Rathore L.S, Samui R.P. and Chattopadhyay N. Agricultural Meteorology Division, India Meteorological Department, Shivajinagar, Pune. <https://imdagrimet.gov.in/sites/default/files/English.pdf> accessed on 11th November, 2012
- Bandelli, D. (2011) 'Women in Community Radio in India: avenues of research on participation and empowerment' Working Paper circulated on Solution Exchange India, September, 2011

- Berkes, F., Colding, J., & Folke, C. (2000) 'Rediscovery of traditional ecological knowledge as adaptive management' *Ecological Applications*, 10(5), 1251–1262
- Bhartendu P., Santosh S., Ghosh S. and Chourasia L.P. (1998) 'Problems and Potentials of Bundelkhand with Special Reference to Water Resource Base. Atara (Banda), Centre for Rural Development and Technology, Indian Institute of Technology, Vigyan Shiksha Kendra (Atarra) https://bundelkhandinfor.org/general/climate/drought_flood.html accessed on 10th December, 2012
- Boykoff M.T. (2007) Climate Change and journalistic norms: A case study of US mass media coverage. *Geoforum* Vol. 38 Issue 6 pp 1190-1204
- Census of India 2001, Age at marriage, New Delhi, accessed on 5th August 2012, <http://censusindia.gov.in>
- Census of India 2001, Demographic Profile of Schedule Caste and Schedule Tribes, accessed on 5th August 2012, http://planningcommission.nic.in/data/datatable/0904/tabc_119.pdf
- LIGHTS (2012) 'Communication Needs to Climate Change: Socio-Environment Study of Bundelkhand Region Survey and Report' Learning in Geography, Humanities, Technology and Science 14th September, 2012, New Delhi
- Community Radio for Disaster Management – <http://www.dhan.org> accessed on 11th November, 2012
- Dhar A. (2012) 'Whither Bundelkhand package' The Hindu, Jhansi, Feb 12,2012
- Ensor, J., & Berger, R. (2009) 'Community-based adaptation and culture in theory and practice' In W. N. Adger, I. Lorenzoni, & K. O'Brien (Eds.), *Adapting to climate change: Thresholds, values, governance* (pp. 227–239). Cambridge, UK: Cambridge University Press
- Fareed F. (2012) 'Rs 450 cr under Bundelkhand package lies idle' The Indian Express Mon June, 25, 2012
- Gauthier, J. (2005) 'Popularize, produce, disseminate! Reference sheets for field researchers' Sheet 12: Radio. Ottawa: IDRC
- GoMP Climate Change Cell (2012) 'Draft Madhya Pradesh State Action Plan on Climate Change' <http://moef.nic.in/downloads/public-information/MP-SAPCC.pdf>
- Goswami B. N. , Venugopal V. , Sengupta D. , Madhusoodanan M. S., Xavier K. (2006) 'Increasing Trend of Extreme Rain Events Over India in a Warming Environment', *Science* 1 December 2006: Vol. 314. no. 5804, pp. 1442 - 1445
- Gupta, S. (2001) 'Environmental Policy and Federalism in India' Department of Economics, University of Delhi
- Hedger, M. and Vaideeswaran, S. (2010) ' Scoping Study for Madhya Pradesh State Climate Change Action Plan' DFID, India (IDS)
- Indian Network for Climate Change Assessment (2010) 'Climate Change and India: A 4x4 Assessment – A Sectoral and Regional Analysis for 2030s' Ministry of Environment and Forest, Government of India
- India Second National Communication to the United Nations Framework Convention on Climate Change (2012) Ministry of Environment and Forest, Government of India, 2012
- IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

- Kandikar M. and Sagar A. (1997) 'Climate Change Science and Policy: Lessons from India" ENRP Discussion Paper E-97-08, Kennedy School of Government, Harvard University 1997
- Kates, R. (2000) 'Cautionary tales: Adaptation and the global poor' *Climatic Change* 45 (2000) (1), pp. 5–17.
- Khan M. A., Kumar A. and Vijayalakshmi K. (2012) 'Applying Information for Adapting the Agriculture Sector in Bundelkhand, India, World Resources Institute Case Study, Washington DC, USA
- Kumar H. (2002) 'Investment in Land and Water' FAO Corporate Document Repository, FAO – <http://www.fao.org/docrep/005/ac623/ac623e00.htm>
- Lebel L. (2011) Policy Research Brief No 2 Adaptation Knowledge – Regional Climate Change Adaptation Knowledge Platform for Asia – www.climateadapt.asia
- Madhya Pradesh Government, Bundelkhand Status Paper, accessed on 6th August 2012, <http://mp.gov.in>
- Madhya Pradesh Government, Annual Plan 2011- 2012, accessed on 6th August 2012, <http://mp.gov.in/spb/annualplan/ap-2011-12/Volume%20-1%202011-12.pdf>
- Madhya Pradesh Human Development Report 1995, Planning Commission, New Delhi, accessed on 5 August 2012, <http://planningcommission.nic.in>
- Mall R.K. et al. (2006) 'Impact of Climate Change on Indian Agriculture: A Review' Climatic Change No. 78 pp 445-478
- Ministry of Statistics and Programme Implementations, Annual Report 2010- 2011, http://mospi.nic.in/mospi_new/upload/mospi_annual_report_2010-11.pdf
- Mittal S., Gandhi S. and Tripathi G. (2010) 'Socio Economic Impact of Mobile Phones in Indian Agriculture' - <http://www.colombiadigital.net/newcd/dmdocuments/89.%20Socioimpact%20agriculture.pdf>
- Panda D. K. (2007), 'Power of Information in the Indian Rural Set Up – an Analysis' - <http://www.vrionline.org.uk/ijrs/April2007/Information%20dissemination%20in%20rural%20India.pdf>
- Prime Ministers Council on Climate Change (2008) 'National Action Plan on Climate Change' www.indiaclimateportal.org/the-napcc
- Patil, D. (2010) 'A Voice for the Voiceless: The Role of Community Radio in the Development of the Rural Poor' International Journal of Rural Studies Vol.17 no.1 Article 3
- Planning Commission, Data for use of Deputy Chairman, Planning commission, http://planningcommission.nic.in/data/datatable/0904/comp_data0904.pdf
- Planning Commission 'Eleventh Five Year Plan document' Para 1.147, Government of India http://planningcommission.nic.in/plans/planrel/fiveyr/11th/11_v1/11th_vol1.pdf
- Planning Commission ' Manual for Integrated District Planning', Planning Commission, Government of India - http://planningcommission.nic.in/reports/genrep/mlp_idpe.pdf
- Policy Guidelines for setting up Community Radio Stations in India – Ministry of Information and Broadcasting – <http://www.mib.nic.in/>
- Raj R. (2010) 'Harmonizing Traditional and Scientific Knowledge Systems in Rainfall Prediction and Utilisations', <http://www.maweb.org/documents/bridging/bridging.12.pdf>
- Satapathy, S. (2011) 'Adaptation to Climate Change with a Focus on Rural Areas and India' Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, India Project on Climate Change Adaptation in Rural Areas of India

Sharma A. (2011) 'Community Radio As An Effective Tool For Agricultural Development' *Youth ki Awaaz* <http://www.youthkiawaaz.com/2011/07/community-radio-as-an-effective-tool-for-agricultural-development-research/> accessed on 10th October, 2012

Singh S. (2008) 'Agriculture', <https://exploringgeography.wikispaces.com/file/view/Chapter+4+Agriculture+new+2008.pdf> accessed on 10th October 2012

Smit B., Pilifsova O., Huq S., Challenger, B. and Burton I. (2001) 'Adaptation to Climate Change in the Context of Sustainable Development and Equity'

Tekade S. & Jambhulkar B. (2011) 'The Study of Marginal Farmers in India' <http://www.aygrt.net/publishArticles/22.pdf>

Tripathi, M., 2006. Transforming India into a knowledge economy through information communication technologies—Current developments. *The International Information & Library Review*, 38(3), pp.139–146. <http://linkinghub.elsevier.com/retrieve/pii/S1057231706000348>

Mendelsohn, R., A. Basist, P. Kurukulasuriya, and A. Dinar. (2007) 'Climate and rural income' *Climatic Change* 81(1): 101-18.

Mittal S., Gandhi S. and Tripathi G. (2010) 'Socio Economic Impact of Mobile Phones in Indian Agriculture' <http://www.colombiadigital.net/newcd/dmdocuments/89.%20Socioimpact%20agriculture.pdf>

Nagaraja M S. & Mariswamy H.K. (2008) 'Influence of interpersonal communication sources on knowledge level among farmers', <http://pub.uasd.edu/ojs/index.php/kjas/article/viewFile/1752/1653>

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

Raj R. (2010) 'Harmonizing Traditional and Scientific Knowledge Systems in Rainfall Prediction and Utilisations', <http://www.maweb.org/documents/bridging/bridging.12.pdf>

Thomas, David S. G. and Twyman C. (2006) 'Adaptation and equity in resource dependent societies' In *Fairness in Adaptation to Climate Change*. W. Neil Adger, Jouni Paavola, Saleemul Huq, and M. J. Mace (eds). Pp. 223- 37. Cambridge: The MIT Press.

UNFCCC (2007) 'Impacts, Vulnerabilities and Adaptation in Developing Countries' United Nations Framework Convention on Climate Change - <http://unfccc.int/resource/docs/publications/impacts.pdf>

Urwin K. and Jordan R. (2008) 'Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance' *Global Environmental Change* No.18 pp 180-191

Weingart P, Engels A and Pansegrouw P (2000) Risks of communication: Discourses on climate change in science, politics, and the mass media. *Public Underst Sci* 9: 261–283

About the participant groups



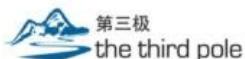
Environment Planning and Coordination Organization (EPCO), Government of Madhya Pradesh is registered under the Housing and Environment Department of the Government of Madhya Pradesh. It connects government as well as non-government agencies in solving environmental problems. <http://www.epco.in/>



The Institute of Development Studies (IDS) at the University of Sussex, UK is a leading global organisation for research, teaching and communication on international development. It acts as a development research and knowledge hub, connecting and convening networks throughout the world. <http://www.ids.ac.uk/>



Kings College London, Humanitarian Futures Group - The Humanitarian Futures Programme (HFP), works to support organisations with humanitarian roles and responsibilities to effectively anticipate and prepare for long term future crises. www.humanitarianfutures.org/



Third Pole Project is a joint project of the Internews Earth Journalism Network and the bilingual environment news website chinadialogue.net that seeks to improve coverage of climate change issues in the Himalayan region and downstream. The Third Pole – based in New Delhi, Beijing, London and San Diego – designs curriculum and carries out media capacity building and training workshops for local and regional groups across Asia. www.thethirdpole.net/



Development Alternatives (DA) is India's leading civil society organization engaged in research and development. DA set up the first Community Radio in the Central Indian region of Bundelkhand. <http://www.devalt.org/>



Supported by:

Climate and Development Knowledge Network (CDKN) supports decision-makers in designing and delivering climate compatible developments by combining research, advisory services and knowledge management in support of locally owned and managed policy processes. www.cdkn.org

Disclaimer:

"This document is an output from a project funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. However, the views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of the Climate and Development Knowledge Network, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them."