Integrating climate change concerns in disaster management planning:

The case of Gorakhpur, Uttar Pradesh, India

By Shiraz Wajih, Gorakhpur Environment Action Group (GEAG) and Shashikant Chopde, Institute for Social and Environmental Transition (ISET)

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Flooding in Gorakhpur.

Contents

Key messages

- The District Disaster Management Plans created as a result of India's Disaster Management Act (2005) can be an effective mechanism for promoting climate-sensitive planning at district level.
- Integrating climate concerns in District Disaster Management Plans can be aided by using the 'Shared Learning Dialogue' process with various government departments at district level. This requires proper facilitation.
- The 'Shared Learning Dialogue' process is critical to developing the capacity of various departments to understand, appreciate, plan and respond to climate risks.
- Climate projections must be appropriately interpreted and presented in a way that fosters understanding of their implications for development programmes across government departments.

1. Introduction

Gorakhpur District is recognised as one of the most flood-prone districts in eastern Uttar Pradesh, India. Although its inhabitants are accustomed to twice-yearly flooding during the monsoon seasons, data from the past 100 years show a considerable increase in the intensity and frequency of floods, which are now recurring every 3–4 years and even annually in some blocks. Most of Gorakhpur's 4.4 million residents live in rural areas, with only 20% living in cities.[1] One fifth of the total population is affected by floods, which cause loss of life, health and livelihoods for the poor inhabitants, and extensive damage to public and private property.[2] For example, the flood of 1998 affected 1.4 million people and 16,000 houses, and agriculture losses amounted to roughly US$15 million (estimated at a rate of US$1 = INR60).[3]

2. Historic flood events and damages

Large-scale inundation has now become a common feature for the people of Gorakhpur. Historical records date back to 1823, when a sudden rise in the Ghaghara River blocked the outflow of the Rapti and Ami rivers – the resulting floodwaters turned the city of Gorakhpur into an island. Similarly destructive floods occurred in 1839, 1873, 1889 and 1892.[4] During the 20th century, the number of recorded significant flooding events increased (see Figures 1 and 2).

Figure 1. Increase in the frequency of significant flooding in Gorakhpur District

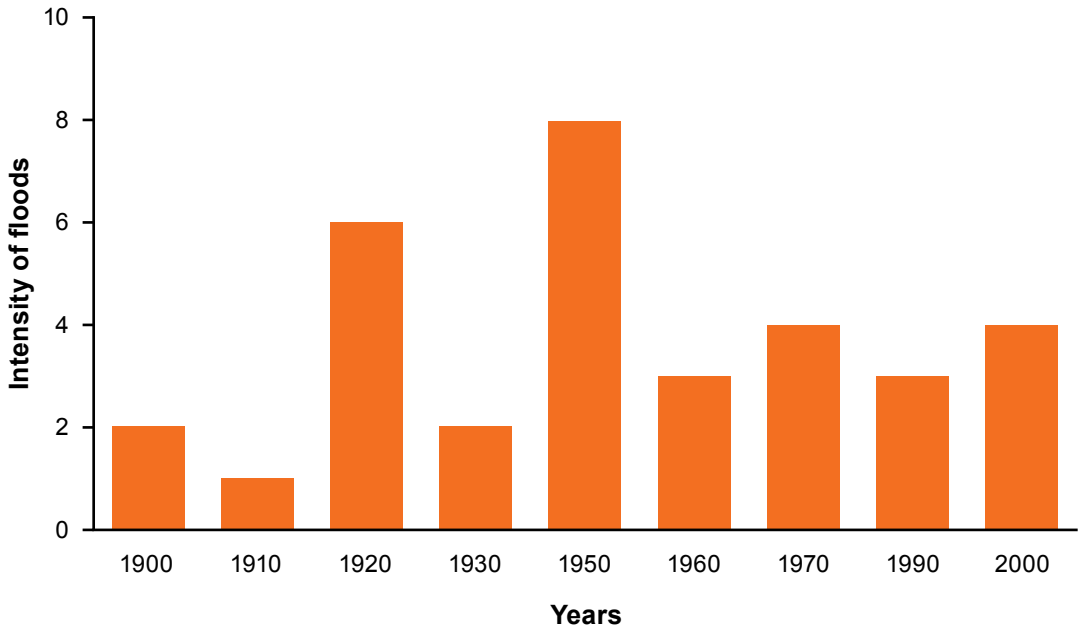
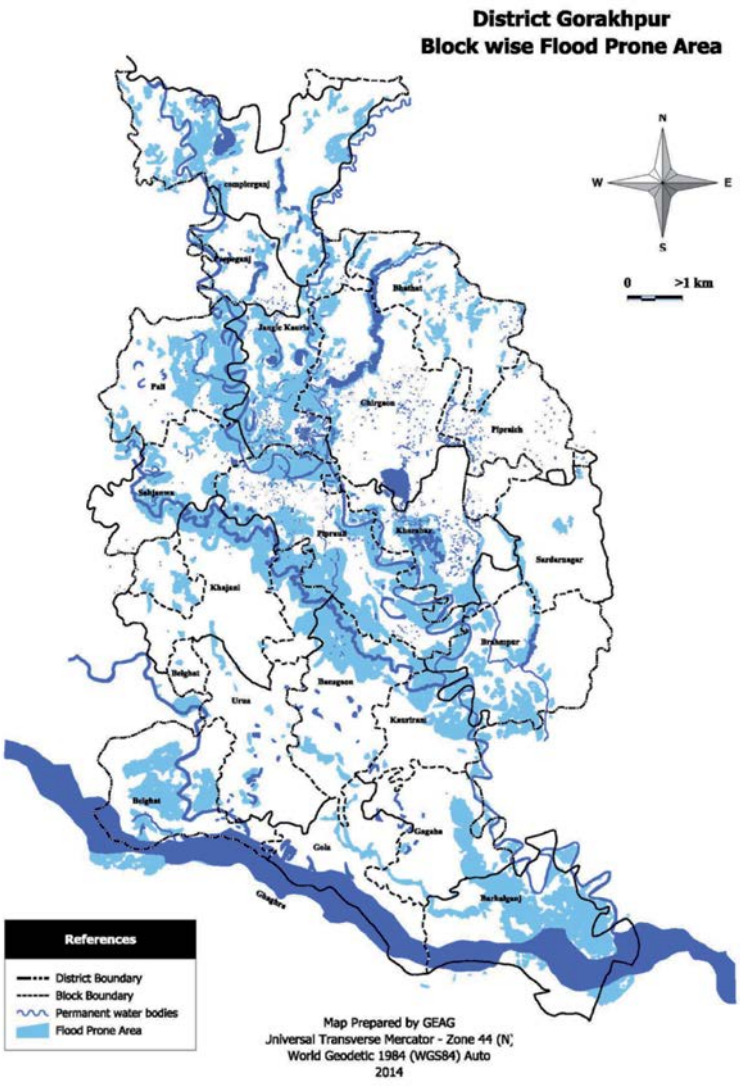


Figure 2. Flood-prone areas by block in Gorakhpur District



The 1974 flood was the most severe event since 1889 in terms of the extent of damage; however, the floods in 1903 were even more severe when flash floods of the Rapti and Rohini rivers exceeded 83 meters above sea level – that is, the average topography level of Gorakhpur.[5] The 1998 flood, in which the Ghaghara and Rapti rivers along with their many tributaries exceeded their danger levels, caused unprecedented damage. The subsequent embankment failures and drainage congestion disrupted normal life for more than 90 days. With large-scale changing of landscape from human encroachment, improper infrastructure, urban development and embankment construction, and ineffective flood moderation systems in large dams, medium-to high-intensity flooding has become more frequent – even with average rainfall levels. Table 1 outlines the damage due to major floods over the past two decades.

3. Purpose of the programme

An action research programme managed by START and supported by CDKN is currently addressing many of these issues in Gorakhpur. Jointly implemented by the Gorakhpur Environmental Action Group (GEAG), the Institute for Social and Environmental Transition (ISET) and the National Institute of Disaster Management (NIDM), the programme aims to effectively incorporate climate change considerations into disaster management planning within Gorakhpur District.

Table 1. Losses and damages due to major floods in Gorakhpur

	1993	1998	1999	2000	2001	2007	2008
Total affected villages	921	1598	373	679	928	610	721
Total population affected	831,695	1,414,790	218,876	465,179	715,010	453,100	506,505
Area inundated by flood (ha)	102,525	267,416	NA	500,032	98,861	25,248	292,009
Marooned villages	436	1,145	107	323	569	266	323
Houses damaged (fully)	317	16,275	NA	19	NA	NA	384
Houses damaged (partially)	1123	45,000	18	55	NA	NA	4,269
Loss of human Lives	26	127	2	23	40	38	23

Source: GEAG (2013) District Disaster Management Plan.

India's National Disaster Management Act (2005) provides for constitution of District Disaster Management Authorities (DDMAs), which are entrusted with developing and implementing a District Disaster Management Plan (DDMP) in consultation with all the line departments.[6] Accordingly, the Gorakhpur DDMA has been constituted and has prepared a DDMP. At present the Plan is focused mainly on disaster response coordination among agencies (i.e. after a flood), with some emphasis on pre-disaster preparedness activities of various line departments. However, it lacks a systematic approach to hazard risk and vulnerability analysis, and it needs to focus more on pre-disaster risk mitigation. As well, various studies note that flooding patterns in the area are changing and climate projections point to significant changes in patterns of extreme rainfall events in the future. For example, one analysis predicts an increase in intensities of rainfall events of up to 33%, especially for events lasting 12 and 24 hours, and for all return periods (2, 10 and 50 years). This is consistent across all six best-fit Global Circulation Models for Gorakhpur.[7] Tables 2 and 3 show projected change in rainfall intensity for various return periods and durations.

To be effective, disaster management planning must include both current and projected climate change impacts. Also, preliminary gap analysis using the Climate Resilience Framework (see Box 1) – which helps to assess climate exposure, systems, institutions and change agents[8] – shows an oversimplified understanding in the DDMP of vulnerability issues and their root causes.

In light of all of this, the objectives of the CDKN-START programme are to:

- understand the systemic factors within the flood-prone Gorakhpur District that contribute to resilience or exacerbate vulnerability
- understand specific policy innovations that could help to bridge the vertical gap between the integrated national policy framework and local contexts, and the horizontal gap between actions within sectoral development programmes to integrate disaster risk reduction and climate change adaptation practice
- develop the relevant capacities of line departments and researchers on climate change adaptation and disaster risk reduction.

4. Extent of achievement of programme objectives

ISET and GEAG have been core partners in the implementation of the Asian Cities Climate Change Resilience Network programme in Gorakhpur since the engagement and assessment phase was launched in 2008. Hence, the joint understanding developed in the Climate Resilience Framework, formulated and based on earlier applied research, guided the creation of the programme objectives. These objectives proved valuable in setting the course of implementation and guiding activities toward desired outcomes.

The CDKN-START programme was designed as a pure research initiative with the objective of making recommendations on how to incorporate climate change concerns in DDMPs. However,

Table 2. Percentage change in rainfall intensity for 24-hour events between multi-model projected (2006–2055) and historical observed (1961–2005) events for Gorakhpur

Model	2 years	5 years	10 years	20 years	50 years
HADGEM2	9.6	6.1	4.3	3.4	2.2
NCAR-CCSM4	10.2	16.1	19.1	20.1	22.5
BCC-CSM1.1M	20.4	22.7	23.4	24.1	24.8

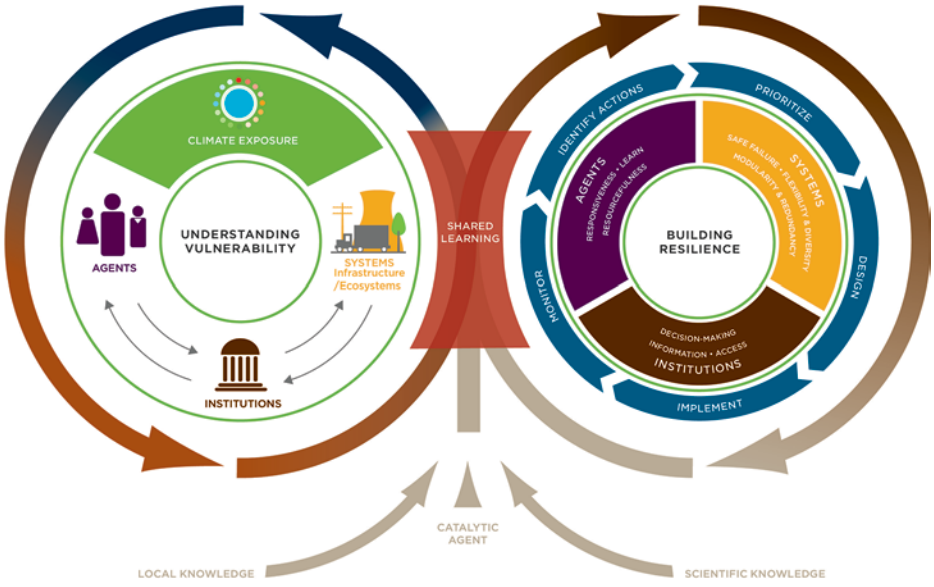
Table 3. Percentage change in rainfall intensity for events of select duration (1, 12 and 24 hours) for select return periods (2, 10 and 50 years)

Duration (hrs)	Return period (years)		
	2	10	50
1	11–18%	-12–52%	-22– 68%
12	10–17%	1–30%	-4–33%
24	10–20%	4–23%	2–25%

Note: Percent changes are derived from comparing intensity–duration–frequency (IDF) curves from multiple Global Circulation Models for the future (2006–2050) with historical IDF curves (1961–2005).

Box 1: Climate Resilience Framework

The Climate Resilience Framework is a conceptual framework for simplifying and analysing complex relationships among people, systems, institutions and climate change. The framework helps clarify factors that need to be included in the diagnosis of climate vulnerability, structures the systematic analysis of vulnerability in ways that clearly identify the entry points for responding, and supports strategic planning to build resilience to climate change.



Source: ISET International (2014), http://training.i-s-e-t.org

given the higher-than-expected level of buy-in and effective coordination by DDMA, the programme went beyond recommendations, publishing a climate-sensitive DDMP for Gorakhpur District. Several factors contributed to this achievement:

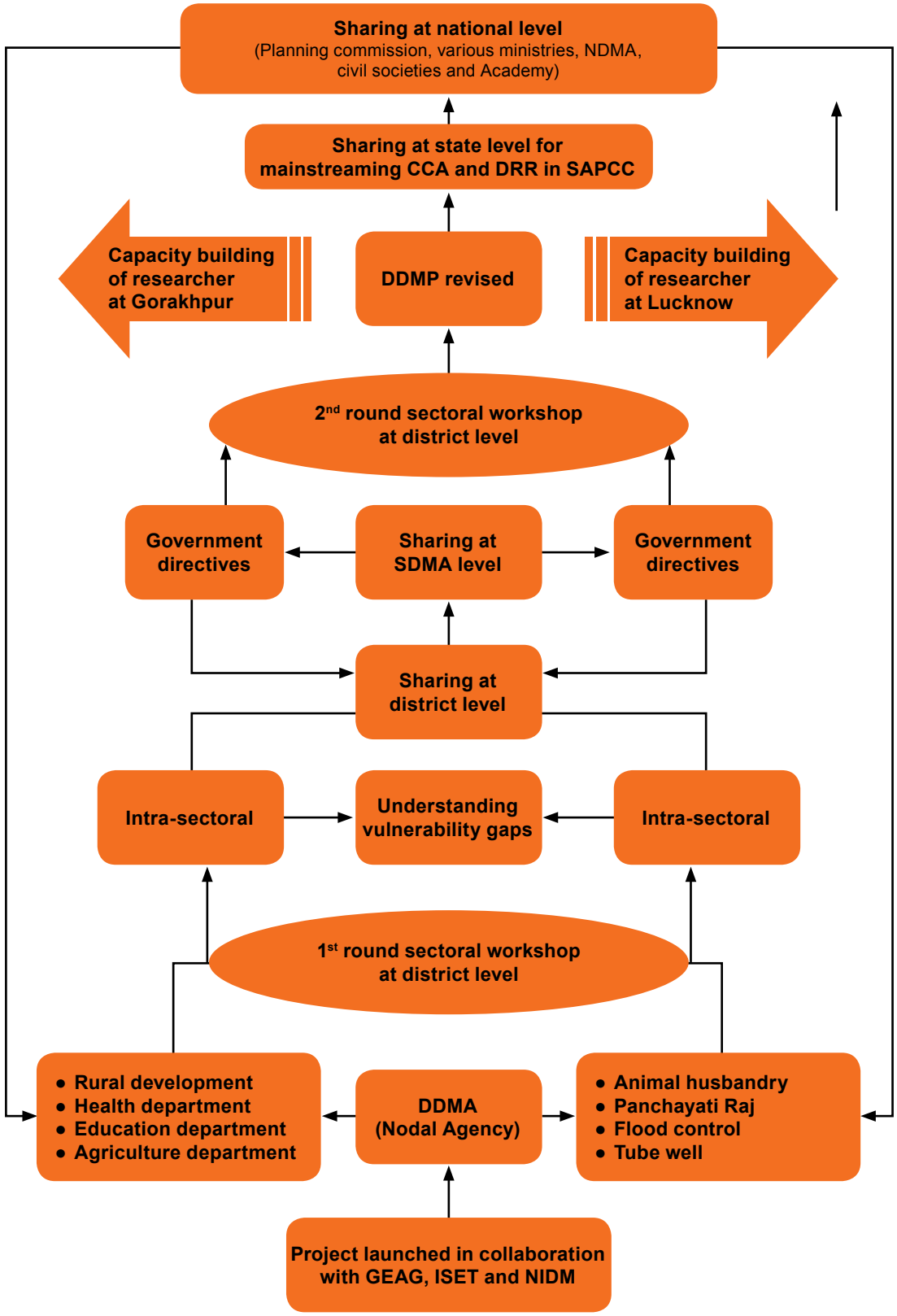
- The long-term work of GEAG in the region on relevant issues provided needed credibility among government departments.
- Government and other stakeholders recognised the recurring impacts of flooding – and hence the need to address it – as a high priority.
- The programme provided the necessary technical support on concepts and practical approaches to vulnerability assessment and resilience building.
- The programme helped raise awareness of the ways in which climate change may manifest, especially at the district level, by providing scientific analysis of climate projections in a form that conveys the urgency, relevance and implications of climate change to each department's plans and programmes. The programme team conducted a detailed analysis of extreme events, showing changes in the magnitude and frequency of storm durations (e.g. 1 hour, 2 hours and 24 hours) across various best-fit Global Circulation Models. Many departments found this to be more useful than standard regional downscaled results, such as the Government of India 50 km x 50 km resolution climate change scenarios for the 2030s.[9]
- By supporting one staff member in the DDMA for the entire project duration, the programme established an effective mechanism for day-to-day coordination of its activities. This helped integrate climate change concerns with existing disaster management activities, including flood risk reduction.
- A better understanding of vulnerability issues at the district level, both intra- and inter-departmental, was achieved through Shared Learning Dialogues (SLDs) (see Box 2). This is a structured and iterative process of workshops and round table discussions, with each iteration involving various departments, individually and collectively, and conducted in such a way as to develop an appreciation of issues surrounding vulnerability and resilience building. SLDs foster this understanding both within and across departments (horizontally), as well as from departmental to district to state and higher levels (vertically).
- The rich experience of GEAG and ISET in designing and conducting the SLDs with the DDMA and its member departments catalysed the joint understanding of key gaps, issues and challenges.
- The key findings of the process at district level were used in the promotion of SLDs at state level, and this further strengthened the district-level process. The encouraging support of the Relief Commissioner / State Disaster Management Authority (SDMA), leveraged by the SLD process and presence of dynamic leadership, helped create a favourable environment for replicating the programme processes in other flood-affected districts in the state.

Generally speaking, real policy impact is possible when an effective network of programme initiatives led by several respected organisations is combined with a high level of government acceptance. In Uttar Pradesh, a similar alchemy occurred during the programme's rollout. The United Nations Development Programme, in close coordination with the state government and SDMA, was supporting a capacity-building project for 9,000 *Gram Panchayats* (rural village councils) in the state to develop Village Disaster Management Plans. The networking fostered by the SLD process in CDKN-START helped sensitise the SDMA on aspects of integrating disaster risk reduction and climate change adaptation. This in turn led the Gorakhpur DDMA to issue an order for integrating disaster risk reduction into the departmental annual development plans. This led to the release of several state government orders[11] to further the disaster risk reduction and the climate agenda, including:

- No-199/1-11-2013-state/11 dated March 13, 2013 – Regarding the integration of disaster risk reduction component into the departmental (annual) development plans
- Meeting minutes of the assessment meeting under the Chairmanship of the Uttar Pradesh Revenue Minister, dated June 19, 2013 – Action/preparation guidelines for flood protection.

The Climate Resilience Framework offers guidance on resilient design norms, technical codes, necessary decision-making processes and other institutional dimensions to allow agents to promote climate resilience. Some of the features that were possible given the resource and time constraints at the DDMA level have already become part of the DDMP. However, the remaining features, as below,

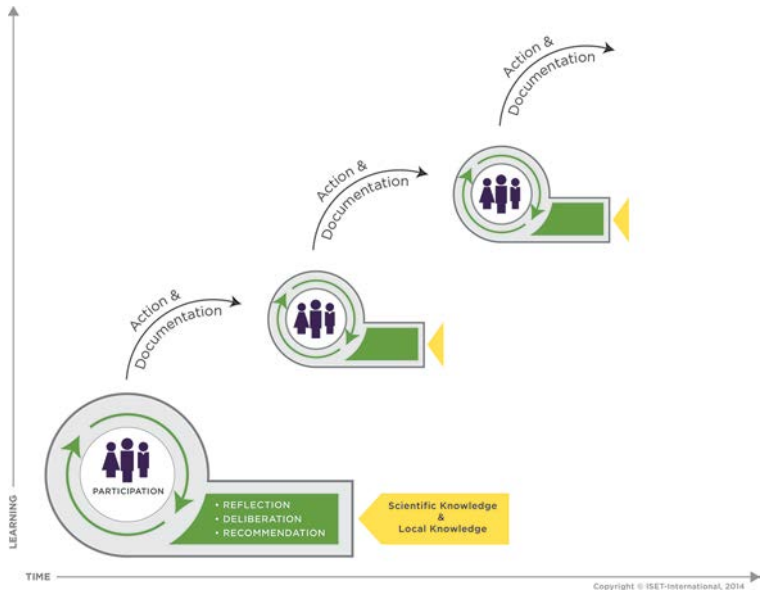
Figure 3. Process for integrating disaster risk reduction and climate change adaptation into district-level departmental plans



Source: Mani et al. (2014)[10]

BOX 2: Shared Learning Dialogues

Shared Learning Dialogues (SLDs) were a central component in the research approach. Different techniques of shared learning bring together knowledge from different disciplines with that held by individuals and organisations in communities, the government and other sectors. Shared learning involves structured one-to-one and small group interactions that elicit insights from participants and build their understanding of the views of others and their implications. Many of the techniques are similar to those used in participatory research, but they stand out for their ability to build new knowledge and common understanding. Shared learning processes move research away from outsider-driven, top-down, extractive information gathering toward participatory, bottom-up and inclusive knowledge generation.



Source: ISET International (2014), http://training.i-s-e-t.org

have been flagged in DDMP as areas to be followed-up by higher-level agencies (such as the SDMA, state-level departments or relevant national-level bodies). Two key recommendations are:

- to initiate a process of regular monitoring and learning mechanisms (periodic meetings) conducted by the DDMA to regularly update the vulnerability database and enhance understanding of core and variable factors of exposure and fragility
- to develop technical design norms for various flood-resilient private and public infrastructure.

In an effort to garner support from higher-level organisations (e.g., the National Disaster Management Authority and various ministries), the programme plans to share its findings at the national high-level policy round table with the leadership of the National Institute of Disaster Management (NIDM). In addition, plans are afoot to foster replication and scaling up by capturing the programme experiences in a training manual to be published by NIDM in collaboration with GEAG and ISET.

5. Challenges to programme implementation

Because of the key enabling factors highlighted above, the programme was able to exceed its initial goals. But it also faced some challenges at the district level:

Challenge 1: Lack of comprehensive understanding of vulnerability and its contributing factors, as well as a lack of a clear and systematic plan in departments to collect and synthesise data on vulnerability.

Strategy: The programme worked with various departments (including the lowest-ranked officers at the village level) directly through the iterative SLD consultations, facilitating joint understanding of vulnerability issues from the Climate Resilience Framework lens, and analysing departmental and inter-departmental issues related to vulnerability. Further, the DDMP and various department plans have been revised to incorporate data collection on impacts, damages and losses to departments in all future flooding and waterlogging in the district.

Challenge 2: Climate change is perceived as a distant phenomenon by sub-national entities. There is lack of understanding by departmental staff, especially on the context-specific implications of climate change for their departmental plans, infrastructure and programmes.

Strategy: The programme developed this understanding through the structured, iterative SLD process. In contrast to stakeholder consultations conducted in piecemeal fashion, the SLD process takes participants through a step-by-step process to develop understanding of comprehensive vulnerability issues and identify specific resilience-building actions.

Challenge 3: Lack of effective horizontal coordination among departments.

Strategy: As part of the SLD process, the programme worked with the DDMA and subsequently its members in various departments one-by-one to develop joint understanding of inter-departmental issues that influence vulnerability.

Challenge 4: Lack of availability of climate projections, downscaled and interpreted in a meaningful way.

Strategy: The programme overcame this by using simple-to-decipher results on extreme (precipitation) event analysis from other projects of ISET-GEAG.

Challenge 5: Damages due to floods are assessed only from the viewpoint of compensation. No detailed analysis is undertaken to understand the root causes of vulnerability.

Strategy: The programme used the Climate Resilience Framework, which unpacks complex vulnerability issues into four components: systems, institutions, agents and exposure.

6. Implications of experience for decision-makers and practitioners elsewhere

Climate change is no longer a distant concern, especially for district-level government departments and DDMAs. There are four key needs to be addressed specifically in the subnational/district-level context:

- A single department/authority must have a clear mandate to work on climate change manifestations at the local level (e.g. the DDMA for Gorakhpur).
- There is a need to bring the scientific and complex knowledge of climate change to district level in a simple, clear way that highlights the implications of climate change for departmental plans and programmes. This can be achieved by conducting relevant additional analysis (such as extreme event analysis for floods) on the data from available Global Circulation Models and Regional Circulation Models.
- There has been a lack of framework to analyse vulnerability in a comprehensive way and the Climate Resilience Framework is an effective tool to fill this gap.
- There is lack of understanding on how to respond to climate change at district level and hence, there is need to build capacity through training.

Endnotes

1 Census of India (2011). Government of India.
2 Wajih, S. (2008) Adaptive capacity of community to cope up with flood situation. Published by GEAG with support from Oxfam India. Gorakhpur, India: Gorakhpur Environmental Action Group.
3 GEAG (2013) District Disaster Management Plan. Published by Gorakhpur Environmental Action Group in collaboration with District Disaster Management Authority.
4 Nevill, H.R. (1909) *Gorakhpur – A Gazetteer, Being Volume XXXI of the District Gazetteers of the United Provinces of Agra and Oudh*. Gorakhpur, India: Luker.
5 Rana, N.K. (2005) Role of stream dynamics and hydrological modeling in flood mitigation: A case study of Rapti river basin, U.P. Unpublished PhD thesis, Department of Geography, DDU Gorakhpur University, Gorakhpur.
6 Government of India (2005) District Disaster Management Act, 2005. Gazetteer of India, Part II Section I, 26 December 2005.
7 Opitz-Stapleton, S. (2013) Mehewa Ward, Gorakhpur, India: Extreme Rainfall, Climate Change and Flooding. Policy Brief for the ACCCRN Initiative. Boulder, CO, USA: Institute for Social and Environmental Transition.
8 Tyler, S. and Moench, M. (2012) A framework for urban climate resilience. *Climate and Development* 4(4): 311–326.
9 Ministry of Environment and Forests (2010) Climate change and India: A 4X4 sectoral and regional analysis for 2030s. INCCA Report No. 2. New Delhi: Government of India.
10 Mani, N., Gupta, G. and Kumar, A. (2014) Mainstreaming climate change adaptation and disaster risk reduction in development planning , Gorakhpur: A process document, Gorakhpur, India: Gorakhpur Environmental Action Group.
11 GEAG (2013) Op cit.

About this Background Paper

The authors have produced this paper as part of a learning programme managed by the Climate and Development Knowledge Network (CDKN) and ICLEI-Local Governments for Sustainability. The programme captures lessons learned, and seeks to enrich understanding of what makes low-carbon and climate-resilient development efforts work well at the subnational level. For more papers in the series, visit www.cdkn.org/resources

About GEAG

The Gorakhpur Environment Action Group (GEAG) is a non-profit volunteer-based organisation based in northern India. A leading resource institute focused on sustainable agriculture through a participatory approach, it has completed various research projects on livelihoods, climate-resilient agriculture, mainstreaming urban climate change resilience and disaster risk reduction in flood and drought prone areas in northern India.

About ISET

The Institute for Social and Environmental Transition (ISET) is a not-for-profit organisation based in the United States that fosters partnerships to further the global climate change adaptation and resilience agenda. It has contributed to pioneering research for the Climate Resilience Framework and has offices in South Asia and South-East Asia.

About NIDM

The National Institute of Disaster Management (NIDM) was constituted under an Act of Parliament with a vision to be the premier institute for capacity development in India and the region. NIDM is responsible for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management. NIDM has performed a crucial role in bringing disaster risk reduction to the forefront of the national agenda. It works through strategic partnerships with various ministries and departments of the central, state and local government; academic, research and technical organisations in India and abroad; and other bilateral and multilateral international agencies.

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