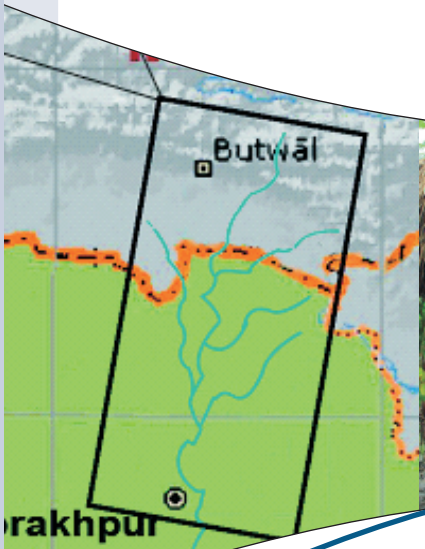
सत्यमेव जयते

Training Module

Mainstreaming Climate Change Adaptation and Disaster Risk Reduction

into District Level Development Plans



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Towards a disaster free India

ISET

Training Module

Mainstreaming Climate Change Adaptation and Disaster Risk Reduction

Into District Level Development Plans

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MESSAGE

Disaster risk and climate change are two threats to human well-being that adversely reinforce each other. Disaster risk is an intrinsic characteristic of human society, arising from the combination of natural and human factors and subject to exacerbation or reduction by human activities. All over the world, the number and the severity of natural disasters, caused by climate related functions and events have been increasing.

Climate change is a phrase that is essentially self explanatory, it is the change in the climate of a country, region, or the world over, and is believed to be caused either directly or indirectly by the activity of the human race. Climate change, the result of anthropogenic enrichment of green-house gases in the atmosphere, has attained a serious concern in disaster management as well. Climate change is known to increase the frequency and intensity of natural hazards, particularly the hydro-meteorological ones, besides affecting people's resources and ecosystems, and thereby, aggravating vulnerability to such disasters.

Inter-Governmental Panel on Climate Change (IPCC) in its 4th Assessment Report (2007) has warned about serious consequences on climatic patterns and events. The 2012 Intergovernmental Panel on Climate Change (IPCC) Special Report on Managing the Risks of Extreme Events (SREX) and Disasters to Advance Climate Change Adaptation provides clear evidence that climate change has already affected the magnitude and frequency of some climate extremes.

Keeping paradigm shift in 'disaster management' from 'response and relief' to 'prevention and mitigation' centric approach, climate focused Disaster Risk Reduction (DRR) is need of the time. The approach of adaptation which aims to address the current and future impacts of climate change on human life, livelihood and resources, offers 'no regret solutions' to the emerging challenges and tried to address underlying causes of vulnerability. Integration of Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) within planning and implementation framework at different levels is needed to ensure our journey for sustainable development.

The study undertaken by the National Institute of Disaster Management (NIDM), jointly with Institute for Social and Environmental Transition (ISET), Gorakhpur Environmental Action Group

(GEAG) and District Disaster Management Authority (DDMA) of Goraphpur in Uttar Pradesh, of integrating CCA and DRR into district level plans, and resulting in improved Disaster Management Plan, is an excellent contribution in the area of climate related disaster risk management.

This Training Module has been developed as a key outcome of this research study undertaken under the project to utilize the lessons drawn during the process of implementation. I am sure the training module shall be of significant use in training and capacity building related activities, and in promoting knowledge & skills improving our developmental planning process.

New Delhi
24 Jan. 2014

(M. Shashidhar Reddy)

Dr. Marcus Moench

President,
Institute for Social and Environmental Transition (ISET),
Colorado, Boulder, USA

Message

There are many books, articles, and papers on concepts related to Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) but very few talk about ways they can be operationalized. More difficult are the challenges of lucidly explaining these concepts and linking them to practical approaches for incorporating them in district level development plans for various departments. Many government departments appear to operate in silos leaving critical horizontal and vertical coordination gaps between them.

As a result, while policies at national level mandate integration of DRR and CCA concerns, they do not get effectively implemented on the ground. With my long experience on CCA and DRR issues globally, I see is the inadequate capacities at district and lower levels to understand, appreciate, plan and respond to them effectively as the key hurdle in operationalizing integration of climate and disaster concerns.

This training manual will guide you as a trainer through a step-by-step process to address these capacity gaps. It explains in a lucid way the core and emerging concepts in the field of DRR and CCA including the Climate Resilience Framework (CRF) drawn based on evidences and experiences from 10 cities under the Asian Cities Climate Change Resilience Network (ACCCRN) programme. Specifically, the manual presents how the CRF has been applied in practical context of Gorakhpur district through carefully facilitating an iterative process of Shared Learning with different departments to *first* enhance understandingof key elements of vulnerability (the various systems, institutions and agents, that each department deals with), and *second* to identify key actions that are needed to incorporate elements of resilience building in District Disaster Management Plans (DDMPs). In this, the manual provides a practical avenue to move away from relief and disaster centric approaches to a more holistic resilience building process.

For years I have known NIDM as a national policy think tank and capacity building organization on disaster management and I am glad to see NIDM bring out this training manual with inputs from ISET and GEAG. I hope this manual will be of immense value to practitioners and policy makers to shape and strengthen a nationwide process of mainstreaming climate and disaster risks in development planning.

(Marcus Moench)

Dr. Satendra, IFS

Executive Director,
National Institute of Disaster Management
(Ministry of Home Affairs, Govt. of India),
New Delhi

Foreword

Climate change is a key environmental driver of natural disasters. Impacts of climate change on rainfall patterns, glacial melt, sea level rise etc. lead to various disasters of hydro-meteorological nature like floods, droughts, cyclones etc. Loss of ecosystems and natural resource base, coupled with inappropriate changes in land-use, are known to aggravate livelihood challenges, resulting into poverty, inequality and socio-economic disparity. Integration of adaptation to climate change across all aspects of disaster risk management is, therefore, necessary for ensuring sustainable and safe development.

NIDM has been giving significant emphasis on climate change adaptation in its training, research and policy planning related activities. NIDM was engaged in the UNDP-MoEF project on Climate Resilient Development and Adaptation, in collaboration with Institute for Social and Environmental Transition (ISET), The Energy and Resources Institute (TERI) and Winrock International India during 2006-07, and organized an international dialogue 'Risk to Resilience" in 2009 at New Delhi. Specialized training programmes on 'Climate-change and Disaster Risk Management' have been part of NIDM's training calendar since 2007, starting its first course in Rajasthan.

Benefits of Ecosystem-based Adaptation have been referred in Ecosystem-based Disaster Risk Reduction (ecoDRR) in NIDM's collaborative programmes with United Nations Environment Programme (UNEP) and the international courses on this theme have been organized by NIDM in the past. NIDM also collaborated with several other Agencies like ICIMOD, GIZ, UNDP on issues of climate-change related DRR. The NIDM-GIZ collaborative programme- ekDRM with the theme on natural resource management also supported development of climate sensitive village disaster management plan (VDMP).

The NIDM's collaboration with ISET (US) and Gorakhpur Environmental Action Group (GEAG) (under the project supported by Climate and Development Knowledge Network (CDKN), was aimed at guiding the process of development of climate sensitive District Disaster Management Plan (DDMP) for Gorakhpur district of Uttar Pradesh and to draw lessons for feeding into policies, strategies and trainings. The present Training Module is an outcome of the lessons learned from the study. I am sure this training module will help trainers, professionals, researchers and policy planners in improving the process of mainstreaming CCA and DRR concerns into developmental planning at various levels.

(Satendra)

Acronyms and Abbreviations

ACA	Additional Central Assistance
ACCCRN	Asian Cities Climate Change Resilience Network
ARWSP	Accelerated Rural Water Supply Programme
BRGF	Backward Regions Grant Fund
CCA	Climate Change Adaptation
CRF	Climate Resilience Framework
DDMA	District Disaster Management Authority
DDMP	District Disaster Management Plan
DPAP	Drought Prone Areas Programme
DRR	Disaster Risk Reduction
EBA	Ecosystem Based Adaptation
EIA	Environment Impact Assessment
EMS	Environmental Management System
GLOF	Glacial Lake Outburst Flood
GRRT	Green Recovery and Reconstruction Toolkit
HFA	Hyogo Framework for Action
HPC	High Powered Committee
IAY	Indira Awas Yojana
ICDS	Integrated Child Development Services
IDA	Integrated District Approach
IPCC	Intergovernmental Panel on Climate Change
ISET	Institute for Social and Environmental Transition
IWDP	Integrated Wasteland Development Programme
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LCA	Life Cycle Assessment
LLOF	Landslide Lake Outburst Floods
LU	Learning Units
MoEF	Ministry of Environment and Forests
NAPCC	National Action Plan on Climate Change
NCRMP	National Cyclone Risk Mitigation Programme
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Force
NDWM	National Drinking Water Mission
NEP	National Environment Policy
NIDM	National Institute of Disaster Management
NRA	Natural Resource Accounting
NREGA	National Rural Employment Guarantee Act
NRHM	National Rural Health Mission
NRLP	National Rural Livelihood Project
OECD	Organisation for Economic Co-operation and Development
PDSI	Palmer Drought Severity Index

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INTRODUCTION TO THE TRAINING MODULE

1

1.1 Preamble

Change in weather patterns and climatic conditions have posed great threat to the development pace in the countries firstly due to increased frequency and intensity of hydro-meteorological hazards such as floods, droughts, heat waves, cyclones, storm surges etc. and secondly due to degradation or alteration of ecosystems (structure, extent and services), decreased food production, reduced availability of water and negative impacts on livelihoods, etc. This is posing serious challenge before maintaining the pace of development in developing countries like India, where agriculture and other natural resources serve as primary resource base for livelihood and economic development. This call for recognition of ecosystem services in development.

Over the decades, scientists have noticed that certain hazards occurred in the recent past at few regions, which were actually not present there in the past. Like, one of the striking features observed is that more areas that were not conventionally "flood prone" are now facing devastating floods. The consecutive flash floods in three major cities in the same year — Mumbai in July 2005, Chennai in October 2005 and again in December 2005, and Bangalore in October 2005 — caused heavy damages to the economy, loss of life and property, etc. besides causing likely permanent and complex consequences on environment and landscapes.

Astoundingly, 23 of the 35 states and union territories (UTs) in India are subject to floods, and 40-45 million hectares of land are prone to flood disasters. This, however, does not include urban floods areas and many flash floods in hill areas. It is a cause of serious concern that the flood related damages are showing an increasing trend in India. According to the National Disaster Management Guidelines on Management of Floods (NDMA, 2008), annual average flood damage during the period 1996-2005 was Rs. 4745 crores as compared to Rs. 1805 crores, the corresponding average for the past 53 years (i.e. 1953-2005). This can be attributed to many reasons including change in climate of the region, increased frequency of floods occurrences, population increase, inflation, ecological degradation and land use changes. Similarly, past events of India, such as the Thane Cyclone and Uttarakhand Cloud Burst have raised serious concerns related to preparedness and response at local levels besides complex results of climate change

on underlying causes of vulnerability. Some recent studies on extreme rainfall events over India show concentration of extreme rainfall events in central India. Such disastrous events now occurring almost regularly not only bring miseries to people more frequently, but also result in outbreak of serious epidemics, especially malaria and cholera, besides causing ecological and economic challenges.

While the community at large tries to adapt itself to these regular occurrences, the economic and social costs continue to mount year after year. There is a need to have an integrated approach with inclusion of policy makers, planners, scientific fraternity and communities to work together to develop appropriate strategies to mainstream Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) into development planning process.

CCA and DRR approaches are integrated to some extent at national level through India's commitment to Hyogo Framework for Action (HFA[1]), 2005-15, the National Action Plan on Climate Change (NAPCC, 2008[2]), and other ministerial level programmes. Furthermore, an array of sectoral departments such as Water Supply, Health, Agriculture, Rural Development and Urban Development undertake activities that influence climate and disaster resilience. However, when the overall implementation of such projects and schemes is observed at the state or district level, low horizontal & vertical coordination exists between departments, especially on integrating DRR and CCA concerns into their sectoral programmes. These gaps undermine the ability to translate concepts and DRR or CCA policies into action on the ground.

Improving the capacity of the District Disaster Management Authorities (DDMAs) towards integration of CCA & DRR concerns represents a potential point of entry for addressing the gaps. The DDMAs are district level organizations with a presence across India where all the departments converge. Hence, it offers a unique platform for integration of CCA & DRR approaches.

[1] http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf
[2] http://www.moef.nic.in/downloads/home/Pg01-52.pdf

1.2 Aim of the Training Module

The aim of the training module is *"to provide guide manual and course framework for designing and delivering training programmes for understanding, analyzing, designing and mainstreaming of DRR and CCA concerns into district level development planning."*.

1.3 Objectives

The module is designed to enable the trainers/officials to faculty to make the course participants understand CCA and DRR concerns at local level and to equip them with knowledge and skills for assessing, delineating strategies and delivering their roles in relation to the risk mitigation/ prevention and implementation of effective response to extreme events.

Key objectives are the following:

(i) To enable understanding on the linkages of CCA, DRR and sustainable development and their associated impacts and challenges.

(ii) To equip with knowledge and skills on understanding and analyzing pathways, approaches and process of mainstreaming CCA and DRR concerns into development planning.

(iii) To enable participants in designing strategies for mainstreaming of CCA & DRR concerns into development planning at district level through a case study of Gorakhpur district, Uttar Pradesh.

(iv) To enable improved understanding and promotion of process of "Practice to Policy Approach" in CCA-DRR integration.

1.4 Target Groups/Audience

The module is developed looking to the performance gaps and training needs of the following target participants.

(i) Senior to middle level officials from the state and district level officials from line departments or

Executives/professionals from other Government agencies/boards, programmes/schemes, including public sector undertakings,

(ii) Members/representatives of non-governmental and community organizations engaged in activities related to assessment, planning, implementation or monitoring of any aspect of disaster management, environment and development, and

(iii) Faculty members/professionals from training, education and research centres and other master trainers related to environment/ecology, disaster management, rural development, urban planning, health, forestry, land and water, agriculture, housing, etc.

(iv) Private Sector officials/professionals involved in water supply, environmental-health, waste management, power, industries, communication, risk management, etc.

1.5 Contents and Structure of the Module

The training module on mainstreaming CCA & DRR concerns into development planning is a training tool along with course guidelines and contents for promoting an integrated approach. This is to enable the participants develop a holistic view of addressing challenges posed by the climate change and extreme events through development process. The Module provides a good mix of theoretical and practical exercise developed from various literature available on the subject across a range of sources. The Training Module consists of three Learning Units (LU):

A. Concepts & Issues of DRR, Climate Change and Development

B. Pathways and Approaches of Integration

C. Mainstreaming CCA & DRR Concerns into Development Plans at District level

The details of learning units are following:

LU A: Concepts & Issues of DRR, Climate Change and Development

(i) Basic concepts of disaster risk reduction, climate change and development.

(ii) Increasing local vulnerabilities due to climate change.

(iii) Inter-relation of DRR, CC and Development

(iv) Climate Resilience Framework

LU B: Pathways and Approaches of Integration

(i) Methods and Approaches for including DRR into Development Planning

(ii) Legal Policy Framework for Disaster Management

(iii) Inclusion of DRR into Development Schemes and Projects

(iv) Schemes/Projects on Disaster Management & Climate Change

(v) National Action Plan for Climate Change

(vi) Reducing Risk through Local Adaptation Practices

LU C: Mainstreaming CCA & DRR Concerns into Development- Plan of District level

(i) Identification of objectives, data sources and methods adopted in the case study of Gorakhpur district.

(ii) Processes adopted for mainstreaming CCA & DRR into departmental level development planning.

(iii) Approach for mainstreaming CCA & DRR concerns at district level.

1.6 Tips to use the Module for Training

Each learning unit has been developed to enable learning through discussions, presentations and involvement of the trainee groups. Following are the important methods that can be applied to make the learning easy and interesting for the participants:

(i) Question-Answer/Quiz Sessions: these sessions have been kept to evaluate understanding of concepts of disasters, climate change and development.

(ii) Group discussions/work: Group activity is included in each learning unit to facilitate knowledge on developing skills related to analysis, planning and formulating strategies.

(iii) After each group work, a presentation session has to be included, to motivate the participants in knowledge grasping, participation and sharing.

(iv) Table-top/classroom exercises to enhance ability of focused discussion in the group.

(v) Field visit to be organized, to facilitate understanding of data collection, group reality and situation analysis.

(vi) Case studies to provide live examples from the field so that knowledge could be connected with the ground reality.

1.7 Selection of Trainees

The criteria for selecting the trainees may be as given below:

Target level of Trainees	Senior to Middle level officials/professionals/agency representative
Nature of the Group	Heterogeneous (from various departments, agencies and academic institutions), with representation of women colleagues.
Qualification	At least graduation and preferably post-graduation, having written and spoken ability in English/Hindi. Computer knowledge is desirable.
Medium of Instructions	Mainly English with blend of Hindi

1.8 Pre-requisite for the Trainer/Course Faculty

A minimum team of consisting three faculties may be required to organize the training programme. One of the team members shall be from the region where training is being planned. Other criteria for course faculty/trainer may be as follows:

Eligibility	Expert of Disaster Management with a good knowledge on Environment & Climate change/Natural Resource Management and Developmental Planning Issues
Teaching Approach	Friendly and informal approach and have ability to involve heterogeneous group at a single platform
Challenges to be Addressed by the Trainer	Motivating the participants to bring them at similar level of knowledge and experience sharing.
Strategies to Overcome the Challenges	• Provide reading materials during registration (or preferably can be mailed in advance). • Involve the participants through group exercise, video clippings and quiz sessions, etc.

1.9 Expected Benefits

(i) Capacity of the Government officials/ DM Professionals/Environmental Scientists and Managers/Planners and other stakeholders developed in understanding local issues of CCA & DRR mainstreaming into planning.

(ii) The overall capacity of administration, academic institutions and non-governmental organizations improved in planning, coordination and strategy making.

(iii) Overall sensitization of departments to understand their role in CCA & DRR issues and knowledge on addressing these issues with more abilities.

(iv) Improved ability to collaborate with the each other both horizontally and vertically for achieving sustainable development at district level.

1.10 Instructions for Module Use

(i) The module can be implemented at district level or departmental level (National or state/ UT level with suitable modification utilizing its flexibility). For example, DDMAs can take lead in organizing training programmes for such heterogeneous group through coordinating with the line departments, academic institutes and other agencies. At national level, courses may be organized by Ministries, Institutes/Universities and leading NGOs, whereas at state level the course may be organized by State Administrative Institute, SIRD, WALMI, Forest

Institute, Ecology Commission, Environment Directorate, Council for Science & Technology or Disaster Management Institute/Centre.

(ii) Learning shall be facilitated by a trained trainer in relevant subject and preferably in a Training of Trainers (ToT) course on this module. Appropriate resource persons shall be selected and invited as speakers/moderators for taking up the case studies and field surveys based technical sessions. It is advisable to conduct a Training of Trainers (ToT) courses in every State in order to build their capacities in conducting training programmes at district level.

(iii) Each learning unit include case studies, group work etc. The course facilitator shall ensure that the Module has been taught in light befitting the target group's background, time and resources available.

(iv) Entire module is designed in a way to complete it within the given duration of about 4 to 5 days, depending upon the field visit exercise.

(v) At the end of the training, a feedback session shall be conducted by the facilitators in order to understand the opportunities and shortcomings of the Module. These feedbacks shall be complied and appropriately included in the future training programmes.

1.11 Action Plan/Post-Training Assignment

It is well understood that training has more impact on the ground if a mechanism for follow-up is in place. During the first activity in this module, participants review the gaps identified throughout the training in order to identify the changes they might be able to make in their own departmental/ organizations' work. Working as a group, they will:

- Identify areas for future action;
- Develop criteria for prioritizing future actions;
- Prioritize these actions according to the criteria;
- Create an action plan (and framework for writing an assignment)
- Assignment submission guidelines.

This Module presents an opportunity for capturing the motivation that participants have at the end of training and for them to return home with a tool – the action plan – to help them to focus on changes they want to make when faced with the day-to-day challenges of work. The action plan should help them build these changes into their routines, creating demands and eventually those of the department/organization.

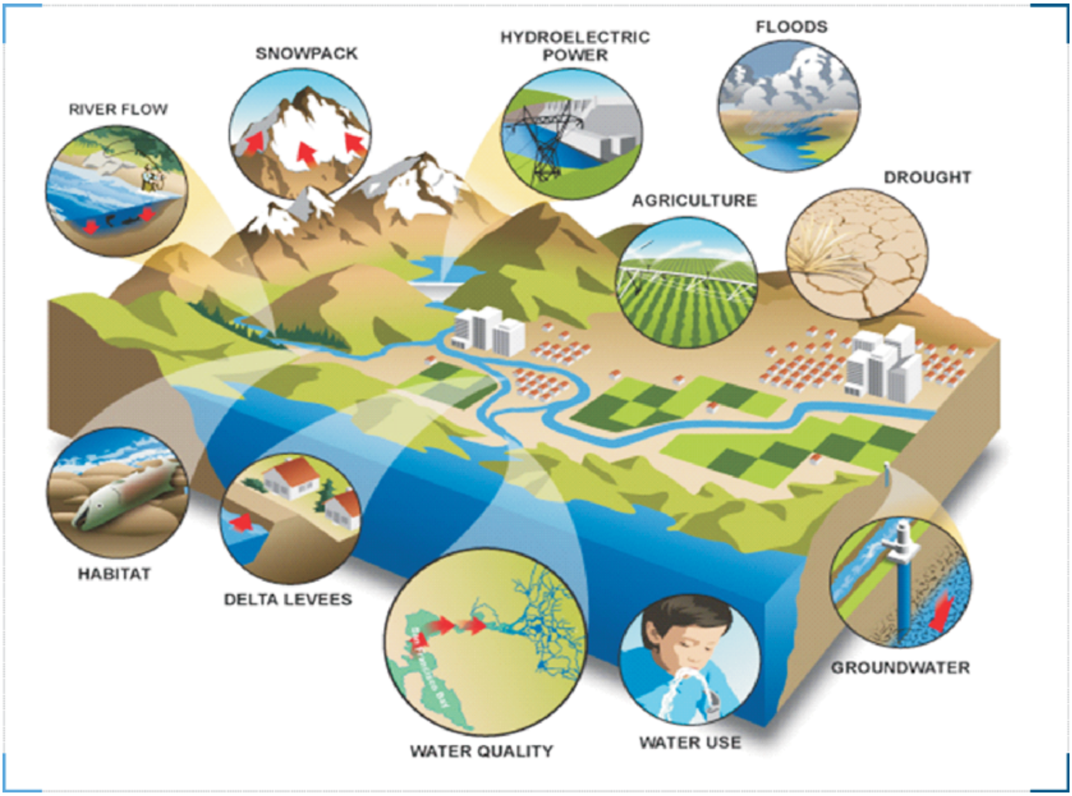


Figure 1.1 Climate change implications enivroment and natural resources
Source: http://www.opengreenspace.com

Learning Unit-A

CONCEPTS AND ISSUES OF CLIMATE CHANGE, DISASTER RISK REDUCTION AND DEVELOPMENT

2

2.1 Introduction

This chapter focuses on the conceptual understanding and inter-relation between disaster, development and climate change. Over the decades, with the increasing physical and financial losses due to increasing frequency of disasters, have shifted focus of planners and policy makers towards inclusion of disaster management in development practices. In fact certain studies have proved that climate change have also enhanced frequency of disasters and its losses.

2.2 Learning Objectives: To enable understanding of

(i) Basic concepts of disaster risk reduction, climate change adaptation and development.

(ii) Issues of Climate Change in Disaster Risk and Development

(iii) Climate Change and its inter-relation with Disaster Risk Mitigation and Sustainable Development

(iv) Climate Resilience Framework

2.3 Training Method, Duration & Faculty

The first session include theoretical mode of teaching. However, informal discussions shall be facilitated by the trainers to make the sessions interesting. A table-top exercise and quiz session have been suggested to facilitate the discussions. The time duration in total delineated as 6 hours including 1 hour of inaugural session and, hence, the Module will take 1 day in completing it. The session could be divided into three presentations (training between 90 minutes to 120 minutes each), by each of the faculty member, i.e., Concept & terminologies, Issues of Climate Change on Disaster Risk & Development context and Climate Change and its inter-relation with Disaster Risk Mitigation & Sustainable Development.

2.4 Concepts & Terminologies

The Module includes several terminologies and concepts which are essential to create an

understanding towards disaster management and risk reduction. Many of these terminologies are very often used. However, this part is essential to introduce definition and concepts related to disaster management as a subject.

2.4.1 Hazard

The potential occurrence of a natural or human-induced physical event that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environment (ISDR, 2007[3]). More simply, any condition, material, process or event having the potential to cause harmful effect is understood as a hazard.

2.4.2 Vulnerability

Vulnerability means the characteristics of a person, group of persons (community) or their resources (property, infrastructure, environment or ecosystems) and the concerned situation that influences their capacity to anticipate, cope with, resist and recover from the impact of a natural or anthropogenic hazard. It involves a combination of factors that determine the degree to which someone's life, livelihood, property, ecosystems and other assets are put at risk by a discrete and identifiable event in nature and in society. Social vulnerability enumerates upon the fact that in our society some groups are more prone to damage and losses in context to different hazards. Key variables explaining variation of impact include class, occupation, caste, ethnicity, gender, disability and health status, age and immigration state and social networks[4].

Vulnerability could be divided into four types, viz.

(i) Physical vulnerability,

(ii) Environmental vulnerability,

(iii) Socio-economic vulnerability, and

(iv) Systemic vulnerability.

Physical vulnerability includes the risk to the tangible things having physical structure or configuration, viz. infrastructure, amenities, houses, buildings, bridges, and other assets which can be directly hit by a hazard event. Environmental vulnerability primarily represents the risk to land and landscape, land-use, existing ecological settings including natural resources and ecosystem services, and thereby, also referred to as underlying causes of socio-economic vulnerability. Natural resources include a range of aspects like agro-ecosystems, bioproductivity and biodiversity, forests and wetlands, hills and slopes, grasslands, watersheds, river systems and ground waters, coasts, etc. which form basic resource system for social well being and economic activities as well.

Social vulnerability means threat to life, caste, ethnicity, children, gender, disable persons, health status, etc. Economic vulnerability includes probable financial losses held to occupation, income,

[3] http://www.unisdr.org/we/inform/terminology
[4] http://www.preventionweb.net/files/670_72351.pdf

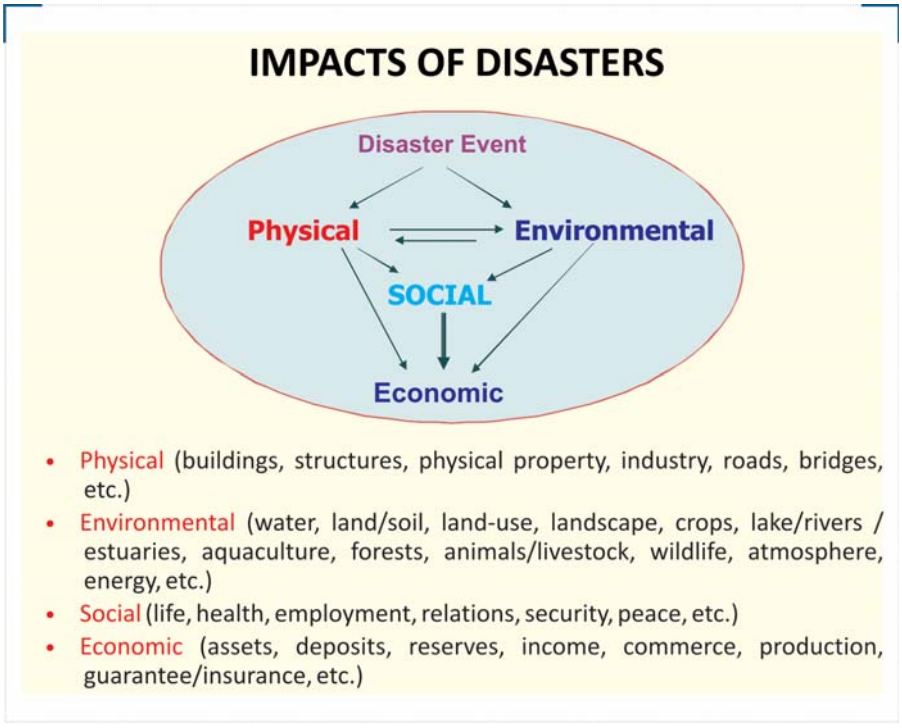


Figure 2.1 Set of vulnerable components which face the impact of disasters.

funds, gross domestic product of a country etc. Systemic vulnerability represents the state of intactness in the Governance and administration against the risk of disaster incidences. This includes management and inter-relationship between different level of Governments, and within and among organizations, agencies and, thus, represents the effectiveness of coordination even during a disaster situation.

2.4.3 Disaster

Disaster is an unfortunate incident caused due to some natural or human-induced hazard, which disturbs normal functioning of a society or particular community resulting in enormous loss of lives, property and livelihood. Sometimes level of disaster is too high for the affected society to cope up with and requires external aid to come out of the situation.

The United Nations defines disaster as "the occurrence of sudden or major misfortune which disrupts the basic fabric and normal functioning of the society or community".

As per the Disaster Management Act, 2005[5], disaster is defined as 'a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident

[5]Disaster Management Act 2005, Chapter 1, Section 2 (d)

or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property or damage to, or degradation of environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected areas'.

$$\text{DISASTER} \sim \frac{\text{HAZARD RISK} * \text{VULNERABILITY}}{\text{CAPACITY}}$$

$$\text{RISK} \sim P_O * E_d$$

Where,
P_O = Probability of Occurrence
E_d = Extent of damageability

2.4.4 Disaster Risk

Risk is indicative function of the probability of occurrence of a hazardous event and extent of its damageability in terms of lives lost, persons injured, damage to property, environment, infrastructure and disruption of economic activity. Disaster risk is an expression if likelihood that a particular hazard or hazard event can become a disaster (by causing damage and losses) and may be expressed mathematically as a function of hazard, vulnerability, amount and capacity. The amount refers to the quantification of the elements at risk (in another term – is expression of degree of exposure). For example, a flood hazard can exist in an uninhabited region but a flood disaster risk can occur only in an area where people or their possessions (property, ecosystems, infrastructure or resources) exist.

Disaster Risk conglomerates around the dimensions of hazard (frequency and intensity) and components of vulnerability (viz. location, exposure and sensitivity).

(i) Hazards (any physical effects generated in the naturally occurring process or event or by an agent – material or living being);

(ii) Vulnerability (conditions that allow human being, assets, resources and ecosystems to be harmfully affected by a hazard), its subsets are like:

(a) Location (physical and geographical positioning of the element (person or community, properties, ecosystems and other resources) known to be at risk,

(b) Exposure (time factor and duration determining the probability of meeting/interaction with the hazard and extent of its prevalence);

(c) Sensitivity (characteristics that determine weaknesses, lack of resistance or capacity to withstand or flexibility for resilience after the stress) of physical and natural infrastructure, community components or person(s) (like based on gender, age, economic status, caste/community/religion/ethnicity), resources, and economic systems, etc.

An example of identifying hazards, vulnerabilities, risk and probable losses in Gorakhpur district has been illustrated in Table 2.1.

Table 2.1 Identification of Local Hazards, Risk, Vulnerabilities & Suspected Losses in the Gorakhpur District

Local Hazards	Factors of Risk	Vulnerabilities	Anticipated Losses
Frequent Floods (years: 1998, 2000, 2001, 2007, 2009 and 2010) Droughts (2002 and 2004) Earthquakes (falls in seismic Zone IV)	• River basins of Rapti and Rohini rivers. • Erratic Rainfall • Proximity to Himalayan region- dominates natural and physical characteristics of the district. • Deforestation in lower Himalaya • Changing landuse	• Population located in the nearby districts/ blocks viz. Campiarganj, Chorachouri, Sadar, Khajni, Sahjnawa, Gola and Baasgaon • Social infrastructure • Physical Infrastructure- Bridges and roads • Economy - Agriculture and Industries • Animals-cattle • Flora-Fauna	• Deaths, injuries and casualties • Collapse of social infrastructure • Collapse/destruction of roads, bridges, communication including transportation, power and telephone/mobile systems, houses, schools, offices, industries, shops and hospitals etc. • Loss of crops • Dead or missing livestock and cattle • Devastation of flora and fauna.

2.4.5 Risk Assessment

Risk assessment is a process to determine nature and extent of risk by analyzing potential hazards (frequency and intensity) and evaluating existing conditions of vulnerability that could allow a potential threat or harm to people and their property, environment and livelihoods. It serves as the first step towards adopting Disaster Risk Reduction (DRR) measures. Following are the essential steps required to conduct risk assessment:

(i) Identification of the nature, location, intensity and probability of threat (Hazard Risk Assessment).

Figure 2.2 Understanding risk acceptance (Gupta et al., 2010)

(ii) Determining the existence and degree of vulnerability and exposure to the threat (Vulnerability Assessment).

(iii) Assessing the likelihood of impacts given the occurrence of a hazard event in the backdrop of current and future vulnerability (Risk Characterization).

(iv) Identifying the capacities and resources available and accessible (Capacity Assessment).

(v) Determining acceptable levels at risk.

A new approach called as Mitigation Analysis also has been suggested (Gupta et al., 1999) that determines the extent and range of activities with their direct and indirect benefits in terms of hazard risk mitigation or vulnerability reduction implemented on ground. This helps evaluate direct measures to address disaster risk due to natural/anthopogenic hazard, and other developmental programmes/schemes and actions/policies of Government, communities and other entrepreneurs for their DRR benefits (Gupta and Nair, 2013).

Capacity assessment is a term for the process by which the capacity of a group is reviewed against desired goals, and the capacity gaps are identified for further action (ISDR, 2009). Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management. Capacity also may be described as capability. It is the combination of all the strengths, attributes, and resources available to an individual, community, society, or organization, which can be used to achieve established goals.

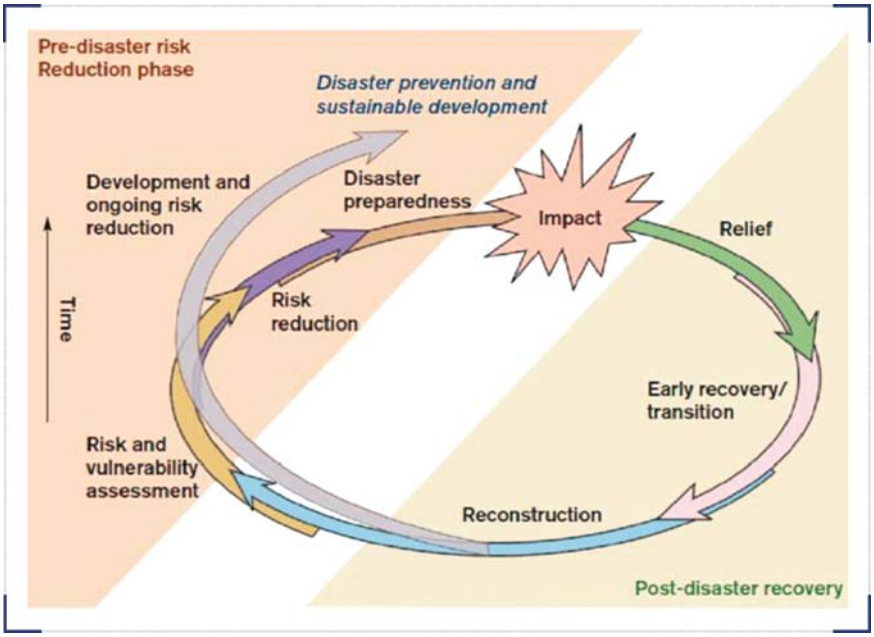


Figure 2.3 Disaster Risk Reduction Cycle. (Source: RICS,2009).

2.4.6 Disaster Management

As per Disaster Management Act, 2005, "disaster management" means a continuous and integrated process of planning, organising, coordinating and implementing measures which are necessary or expedient for:

(i) Prevention of danger or threat of any disaster;

(ii) Mitigation or reduction of risk of any disaster or its severity or consequences;

(iii) Capacity-building;

(iv) Preparedness to deal with any disaster;

(v) Prompt response to any threatening disaster situation or disaster;

(vi) Assessing the severity or magnitude of effects of any disaster; evacuation, rescue and relief;

(vii) Rehabilitation and reconstruction;

2.4.7 Disaster Preparedness

Preparedness means state of readiness to deal with a threatening disaster situation or disaster and the immediate effects thereof. It includes pre-decided administrative, individual and community actions to minimise loss of life and damage and facilitate effective rescue, relief and rehabilitation. It includes:

(i) Forecasting and disseminating warnings of potentially damaging phenomena or event.

(ii) Developing and testing response (and emergency coordination) plans for both disaster warning and impact of such events.

(iii) Assuring the rapid availability of appropriate material resources, transport, equipments and funds when and where needed.

2.4.8 Disaster Mitigation

Mitigation refers to a sum of human interventions taken for reducing the risk (by preventing or containing the hazard, avoiding or reducing exposure, enhancing tolerance and reducing sensitivity, and inducing resilience and capacity), minimizing impact or effects of a hazard or threatening disaster situation, towards achieving objective of 'sustainable development'. Mitigation is generally categorized into two main types of activities, i.e., Structural and Non-Structural mitigation.

Structural mitigation refers to engineering measures or any physical construction to reduce or avoid possible impacts of hazards, through construction or modification activity for hazard-resistant structures and infrastructure. ***Non-structural mitigation*** refers to policies, awareness generation, knowledge development, public commitment, legal interventions, methods and

operating practices, including participatory mechanisms and the provision of information etc., which can reduce risk with related impacts.

However, recently mitigation measures have been identified into categories, viz. ***physical, environmental, social and economic measures of mitigation,*** addressing the underlying causes of vulnerability, from DRR point of view, with perspective of more pro-active and holistic approach towards sustainability. Besides, the interventions can also be categorized as ***'short-term*** or ***immediate', 'medium-term'*** and ***'long-term'*** on implementation time scales.

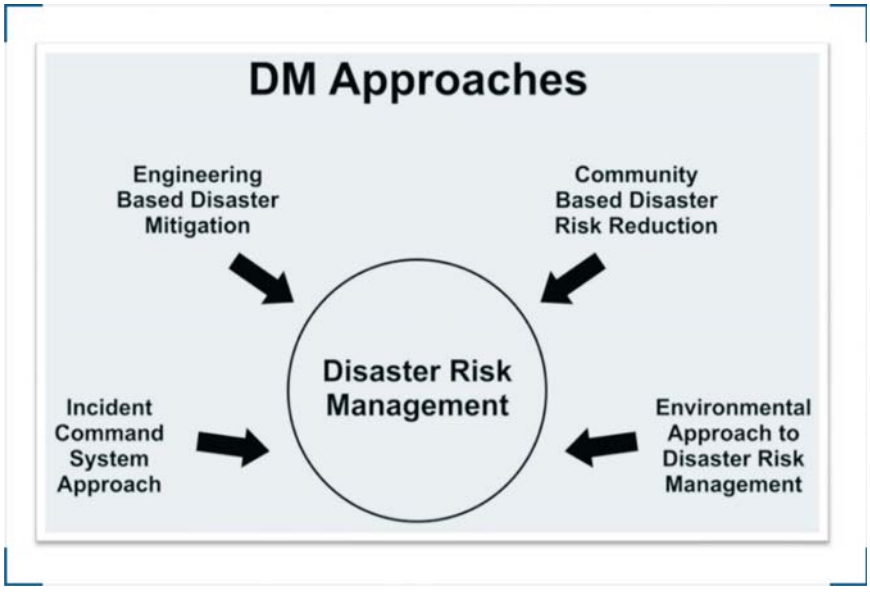


Figure 2.4 Integration of different approach to DM into holistic disaster risk management. This allows better avenues for CCA-DRR integration.

Broadly, there have been four principal approached to dealing with disaster risk and its management, viz. (i) Engineering centric structural mitigation, (ii) Community centric preparedness based approach, (iii) Centralized coordination based Incident Command System (for emergency response), and (iv) Environmental approach to disaster management (figure 2.4). The recent development of Ecosystem Approach to Disaster Risk Reduction (ecoDRR) (Gupta and Nair, eds, 2012) and ecosystem based adaptation (eBA) have significant overlap in their objectives and approaches, the integrated DRM envisages range of opportunity for integrating CCA with DRR and the other way round.

2.4.9 Capacity Building

As per the Disaster Management Act, 2005, "Capacity-Building" includes:

(i) Identification of existing resources and resources to be acquired or created;

Figure 2.5 Guiding principles for DRR capacity development

(ii) Acquiring or creating resources;

(iii) Organisation and training of personnel and coordination of such training for effective management of disasters;

Thus, capacity building incorporates a broad range of concerns starting from creating enabling environment, resources (acquiring, creating, and facilitating access when needed), and more importantly human resource development – through education (higher and professional), training and extension/awareness on all aspects and spheres of disaster risk management. Strategic approach to capacity building towards holistic DM, aims at enabling the shift from the prevailing scenario through (as per National Human Resource Plan on DM):

- Reactive and Compensatory to 'Preventive & Proactive Culture'
- Improving Isolated and Compartmentalized to 'Inte grated & Holistic' approach
- From State and Engineering Centric to broad 'People & Environment Centric" approach
- Changing "Externally Assistance Centric" to 'Local/Regional & Self Reliance' approach
- Enhancing training and Command to Interdisciplinary 'Education & Management' oriented
- Integrating 'Disaster Management' into Academic system, R&D, Extension and Governance.

'Resources' include – equipment, materials, infrastructure, information, tools and methods (manuals, handbook, guidelines, etc.), law and policies (regulatory framework and instructions), institutions, and an effective system of interdisciplinary coordination equipped with relevant expertise and proficiency at all appropriate levels.

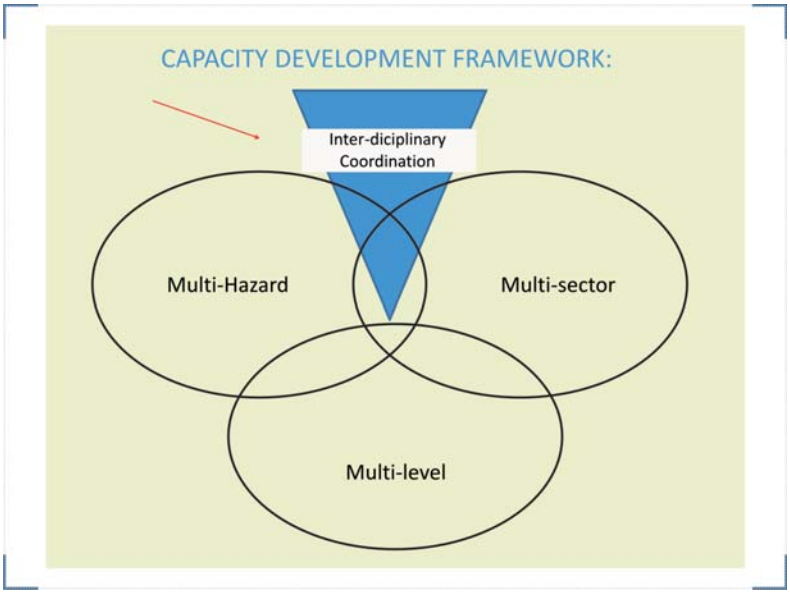


Figure 2.6 Integrated approach of capacity building to holistic disaster management

2.4.10 Disaster Risk Reduction (DRR)

DRR denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience (Lavell et al., 2012).

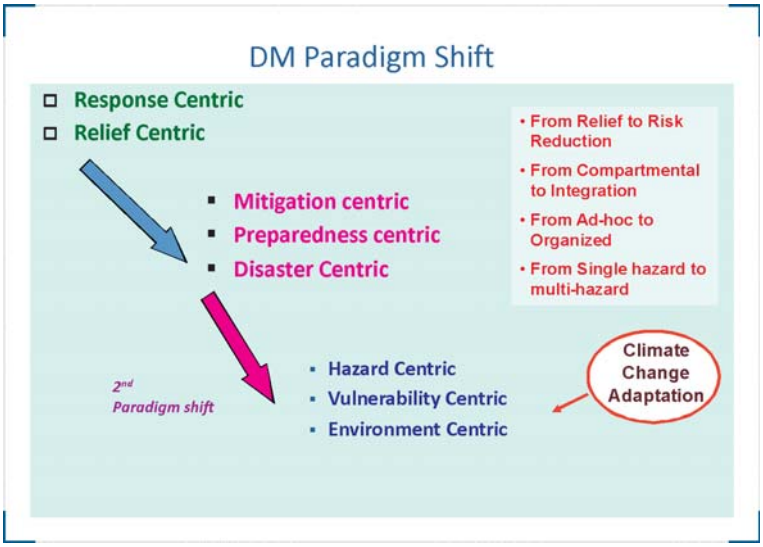


Figure 2.7 Integration of CCA and DRR leading to a 2nd Paradigm shift in disaster management (modified after, Gupta and Nair, 2010)

DRR concepts and practices relate to the paradigm shift in approach from 'response and relief centric' to 'prevention and preparedness (mitigation) centric' approach. However, now the focus is taking a new shift away from concentrating on 'disaster event' and 'minimizing effect of disasters' towards more on 'addressing hazards, reducing vulnerability and ensuring sustainability along environment centric approach' This change is offering better opportunities for CCA and DRR convergence, and is now referred to as 2nd paradigm shift in disaster management.

2.4.11 Climate Change

A change in the state of the climate that can be identified (e.g. by using statistical tests) by

Global Warming Vs. Climate Change

Impacts of Climate Change: IPCC - IV Assessment (2007)

Results of IPCC work on observed and ongoing / projected impacts on climate-change on natural and human environment has been given in its IV assessment report released in 2007 December. The observed impacts have been termed as the high confidence impacts, whereas the evidence of likeliness are emerging are called as medium confidence impacts. These observations, depicting the global challenges, are summarized below:

- **With regard to snow, ice and frozen ground:**
  - enlargement & increased numbers of glacial lakes
  - increasing ground instability in permafrost regions, & rock avalanches in mountain regions
  - changes in some Arctic and Antarctic ecosystems, including those in sea-ice biomes, and also
  - predators high in the food chain
- **Effects on hydrological systems**
  - increased run-off & earlier spring peak discharge in many glacier- & snow-fed rivers
  - warming of lakes & rivers in many regions, effects on thermal structure & water quality
- **Effects on terrestrial biological systems**
  - earlier timing of spring events, such as leaf-unfolding, bird migration & egg-laying
  - poleward & upward shifts in ranges in plant and animal species
- **Changes in Marine & Freshwater systems**
  (associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels and circulation)
  - shifts in ranges & changes in algal, plankton and fish abundance in high-latitude oceans
  - increases in algal & zooplankton abundance in high-latitude and high-altitude lakes
  - range changes & earlier migrations of fish in rivers
  - The uptake of anthropogenic carbon since 1750 has led to the ocean becoming more acidic with an average decrease in pH of 0.1 units.
  - effects of observed ocean acidification on the marine biosphere are as yet undocumented
- **Medium confidence observations (Effects of temperature increases)**
  - effects on agricultural and forestry management at Northern Hemisphere higher latitudes, such as earlier spring planting of crops, and alterations in disturbance regimes of forests due to fires and pests
  - some aspects of human health, such as heat-related mortality in Europe, infectious disease vectors in some areas, and allergenic pollen in Northern Hemisphere high & mid-latitudes
  - some human activities in the Arctic (e.g., hunting and travel over snow and ice) & in lower elevation alpine areas (such as mountain sports)

changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing, or persistent anthropogenic change in the composition of the atmosphere or in land use (Solomon et al., 2007).

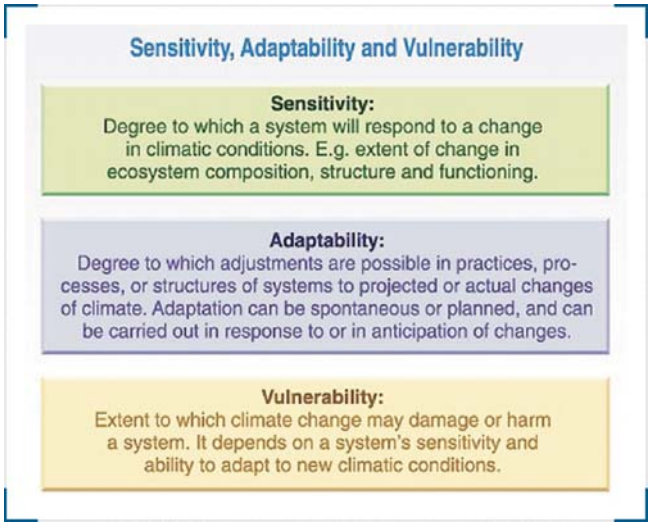
Climate change is for real?

The debate is over about whether or not climate change is real. Irrefutable evidence from around the world-including extreme weather events, record temperatures, retreating glaciers and rising sea levels-all point to the fact that climate change is happening now and at rates much faster than previously thought. The overwhelming majority of scientists who study climate change agree that human activity is responsible for changing the climate. The United Nations Intergovernmental Panel on Climate Change (IPCC) is one of the largest bodies of international scientists ever assembled to study a scientific issue, involving more than 2,500 scientists from more than 130 countries. The IPCC has concluded that most of the warming observed during the past 50 years is attributable to human activities. Its findings have been publicly endorsed by the national academies of science of all G-8 nations, as well as those of China, India and Brazil.

2.4.12 Coping Capacity

It is the ability of people, organizations, and systems using available skills, resources, and opportunities, to address, manage, withstand and overcome adverse conditions or shocks. The capacity to cope requires continuing awareness, resources and good management, both in normal times as well as during crisis or adverse conditions. Coping capacities contribute centrally to the reduction of disaster risks (ISDR, 2007[6]).

[6] http://www.unisdr.org/we/inform/terminology



Source: **Climate change 1996.** UNEP & WMO, Cambridge University Press.

2.4.13 Adaptation

The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. The broader concept of adaptation also applies to non-climatic factors such as soil erosion or surface subsidence. Adaptation can occur in autonomous fashion, for example through market changes, or as a result of intentional adaptation policies and plans. Many disaster risk reduction measures can directly contribute to better adaptation. (ISDR, 2009)[7].

The word 'adaptation' has been widely and variedly defined and used primarily in ecology, physiology/medical science and now a broader perspective in the sense of 'adaptation to climate-change' as an explanation of ecological adaptation by humankind. Following are few definitions or concepts of 'adaptation'.

The components of adaptation, therefore, refer to following:			
(a) Reducing the risk of occurrence of a hazard event by:	(i) hazard prevention	(ii) mitigation or	(iii) control
(b) Reducing exposure to hazardous event:	(i) avoidance/migration	(ii) resilience	(iii) impact control
(c) Capacity to contain:	(i) prevent damages	(ii) prevent losses	(iii) early normalcy

Thus, the term ¨adaptation¨ refers to the ability of different species with different genetic make-ups to cope with a specific range of circumstances such as climate, food supply, habitat, defense and movement. Adaptation to climate is the process through which people reduce the adverse effects of climate on their health and well-being, and take advantage of the opportunities that their climatic environment provides (Olmos, 2001). Adaptive capacity is known as the potential or capability of a system to adapt to (to alter to better suit) climatic stimuli whereas the 'Adaptability' is understood as the ability, competency or capacity of a system to adapt to (to alter to better suit) climatic stimuli.

ADAPTATION

- Something, such as a device or mechanism, that is changed or changes so as to become suitable to a new or special application or situation.
- A composition that has been recast into a new form: *The play is an adaptation of a short novel.*
- The responsive adjustment of a sense organ, such as the eye, to varying conditions, such as light intensity (*Physiology)*.
- Change in behavior of a person or group in response to new or modified surroundings.
- Change in an organism so that it is better able to survive or reproduce, thereby contributing to its fitness. (Source: PHC)

[7]http://www.unisdr.org/we/inform/terminology

2.4.15 Community Based Disaster Risk Management

The process in which local actors (citizens, communities, government, non-profit organizations, institutions, and businesses) engage in and have ownership of the identification, analysis, evaluation, monitoring, and treatment of disaster risk and disasters, through measures that reduce or anticipate hazard, exposure, or vulnerability; transfer risk; improve disaster response and recovery; and promote an overall increase in capacities.

2.4.16 Development

Development is a complex issue, basically equates development with economic growth. The United Nations Development Programme (UNDP) defines development as 'to lead long and healthy lives, to be knowledgeable, to have access to the resources need for a decent standard of living and to be able to participate in the life of the community.

2.4.17 Sustainable Development

Sustainable development recognizes the need to consider economic growth and development within a sustainable strategy that meets the needs of the present without compromising the ability of future generation to meet their own needs. It includes sustainable development of humans (quality of life and well-being over time), environment and natural resources (water, land, agriculture, ecosystems, etc.).

2.4.18 Resilience

The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions (ISDR, 2007).[8]

[8]http://www.unisdr.org/we/inform/terminology#letter-r

Box 2.1

Table Top Exercise: Identification of Hazards and Vulnerabilities

(Based on local conditions)

The classroom will be divided into four groups. Each group will be assigned any district along with copies of District Disaster Management Plans, map indicating multiple hazards and administrative boundaries and any other statistical information available on natural disasters.

Each group will be given 20 minutes for completing the exercise (15 minutes to identify local hazards and vulnerabilities and 5 minutes for presentation).

2.5 Issues of Climate Change in Disaster Risk Reduction and Development

It is evident that the excessive use of fossil fuels, deforestation and changes in land-use pattern has led to an increase in greenhouse gases (e.g. carbon, methane, water vapour) in the atmosphere, causing the Earth's temperature to rise. This has already and will continue to result in changing rainfall patterns, increase in the frequency & magnitude of extreme weather events such as storms, floods and droughts; changes in temperature; and rising sea levels.

The studies indicate that since 1850, temperature rise of + 0.74°C and sea level rise in 20th century to 17 cm which is going to have significance on the impacts of cyclones and coastal flooding. Historic data clearly shows that there is a steady rise in temperature since 1900. Carbon dioxide levels are highest in last 6,50,000 years. Global average sea level has risen since 1961 at an average rate of 1.8mm/yr and since 1993 at 3.1mm/yr. There are observed changes in the sea level temperature as well (Gupta et al., 2010).

As per a report of World Water Council[9] , there were 26 major flood disasters worldwide in

Climate change Impacts

Climate change impacts can be roughly divided into two groups:

Environmental impacts

- physiological effects on crops, pasture, forests and livestock (quantity, quality);
- changes in land, soil and water resources (quantity, quality);
- increased weed and pest challenges;
- shifts in spatial and temporal distribution of impacts;
- sea level rise, changes to ocean salinity;
- sea temperature rise causing fish to inhabit different ranges.

Socio-economic impacts

- decline in yields and production;
- reduced marginal GDP from agriculture;
- fluctuations in world market prices;
- changes in geographical distribution of trade regimes;
- increased number of people at risk of hunger and food insecurity;
- migration and civil unrest.

(Gupta and Nair, 2012)

[9]www.worldwatercouncil.org/

the 1990s, compared to 18 in the 1980s, 8 in the 1970s, 7 in the 1960s and 6 in the 1950s. These events, and associated impacts such as decreasing water availability, changes in agriculture and fisheries, inundation of coastal areas, spread of respiratory, vector and water-borne diseases, and population displacement, will dramatically alter ecosystems and the lives and livelihoods of women, men and children. However, from years of DRR work, we have learned that climate hazards happen, but climate disasters are created by human behaviour[10].

India is one region where the heavy rainfall event has increased in certain states like floods in Mumbai, Uttar Pradesh, Bihar and Odisha. For example, over the decades, the state of Uttar Pradesh has become sensitive to floods due to change in pattern of rainfall and climate, resulting vulnerabilities to agro-climatic conditions causing land degradation and deforestation (Wajih, 2008), which resulted in increased frequency of flash floods, dry spells during floods, longer or delayed flood timings and increased duration and area of water-logging.

As per recent studies by US scientists, worldwide, the proportion of hurricanes reaching categories 4 or 5 has risen from 20% in the 1970s to 35% in the 1990s, more impact observed in Atlantic

Hydro-meteorological Disasters: Risks and Management

Among all observed natural and anthropogenic adversities, hydro-meteorological disasters are undoubtedly the most recurrent, and pose major impediments to achieving human security and sustainable socio-economic development, as recently witnessed with disasters such as the Indian Ocean tsunami in 2004, Hurricane Katrina in 2005, Cyclone Sidr in 2007, Cyclone Nargis in 2008 and many others. During the period 2000 to 2006, 2,163 water-related disasters were reported globally in the EM-DAT database, killing more than 290,000 people, afflicting more than 1.5 billion people and inflicting more than US$422 billion in damages. The factors that have led to increased water related disasters are thought to include natural pressures, such as climate variability; management pressures, such as the lack of appropriate organizational systems and inappropriate land management; and social pressures, such as an escalation of population and settlements in high-risk areas (particularly for poor people). The United Nations University Institute for Environment and Human Security (UNU-EHS) warns that unless preventative efforts are stepped up, the number of people vulnerable to flood disasters worldwide is expected to mushroom to two billion by 2050 as a result of climate change, deforestation, rising sea levels and population growth in flood-prone lands (Bogardi, 2004).

In general, all water-related disasters events increased between 1980 and the end of the twentieth century. Floods and windstorm events increased drastically from 1997 to 2006, but other types of disaster did not increase significantly in this period. Floods doubled during the period 1997 to 2006 and windstorms increased more than 1.5 times. Drought was severe at the beginning of the 1980s and gained momentum again during the late 1990s and afterwards. The numbers of landslides and water-borne epidemics were at their highest during the period 1998-2000 and then decreased. Waves and surges increased between 1980 and 2006.

(Gupta and Nair, 2012)

[10] ibid

and Pacific region. During last 50 years, cold days, cold nights and frost have become less frequent, while hot days, hot nights, and heat waves have become more frequent. While most land areas have witnessed increase in frequency of heavy precipitation events, regions like Sahel and Mediterranean have recorded long term decreasing trend in the total precipitation (Gupta et al., 2010).

Numbers of windstorms have increased for 150-350 per year during the last three decades. Climate change is affecting storm tracks, winds and temperature patterns. The Global frequency of most destructive Tropical Storms, during 1980– 2006, shows that there is an increase since the 1970s. The integrated intensity of tropical cyclones has increased. Certain example in India may be seen in increased frequency of cyclonic conditions at costal area of Andhra Pradesh and Odisha.[11]

Droughts, globally (1980 – 2006), had shown a notable increase in terms of the frequency and severity. 1975 onwards drought events were increased drastically. The most important spatial pattern of the monthly Palmer Drought Severity Index (PDSI), for 1900 to 2002, shows that droughts are also increasing due to decrease rain in tropical and sub-tropical region and increased atmospheric warming. Increase in drought conditions and global warming has resulted increase in heat waves. For example in Europe due to heat waves in 2003, insured losses were increased to several times and 90% of the insured losses were due to wind storms.

Trend in occurrence of extreme temperature events over India in 100 years shows that until 1990 there were up and downs in temperature. Since 1990 the temperature was always above normal. There is an increase of about 0.50C as compare to global increase of 0.70 C. Reasons of this is monsoons rainfall has increased and North-western part the temperature has decreased and hence compensated increase in other part.

The monsoon rainfall at All India level does not show any trend but there are some regional patterns of change. Areas of increasing trend in monsoon rainfall are found along the west coast, north Andhra Pradesh and north-west India, and those of decreasing trend over east Madhya Pradesh and adjoining areas, north-east India and parts of Gujarat and Kerala (-6 to -8% of normal over 100 years).

Surface air temperature for the period 1901-2000 indicates a significant warming of 0.40 Celsius for 100 years. The spatial distribution of temperature changes indicated a significant warming trend which has been observed along the west coast, central India, and interior Peninsula and over northeast India. However, cooling trend has been observed in northwest and some parts in southern India.

Glacier melting in the Himalayas Rock Avalanches shows that Glacier Lake Outburst Flows are increasing and less water downstream in the dry season, more flooding downstream in the wet season and long-term overall reduction of water supply.

Retreat of the Gangotri Glacier terminus between 1780 and 2001 shows that the glacier is receding of 7.3 m per year between 1842 and 1935; compared to 23 m per year between 1985

[11] ibid

and 2001. Instrumental records over the past 130 years do not show any significant long-term trend in the frequencies of large-scale droughts or floods in the summer monsoon season.

The total frequency of cyclonic storms that form over Bay of Bengal has remained almost constant over the period 1887-1997. Vulnerability mapping of areas with present and projected scenarios of climate change in relation to extreme events and developing capacities to adapt climate change in highly vulnerable regions is under way. It is also important to increase the capability to detect and predict extreme events with greater accuracy and longer lead time. Improved communication of climate changes and options to adapt to them is the need of the time[12].

As per a study from the World Bank, impact of Climate Change on disaster risk and development in India, may be as seen below:

Table 2.2 Impacts of Climate Change on Disaster Risk & Development in India and Mitigation & Preventive measures

Sl. No.	Events	Projected Impacts	Mitigation & Preventive Measures
1	Extreme Heat	Under 4°C warming, the west coast and southern India are projected to shift to new, high-temperature climatic regimes with significant impacts on agriculture	Built-up urban areas rapidly becoming "heat-islands", urban planners will need to adopt measures to counteract this effect.
2	Changing Rainfall Patterns	Trend of Monsoon has already observed change since 1950. A 2°C rise in the world's average temperatures will make India's summer monsoon highly unpredictable. At 4°C warming, an extremely wet monsoon that currently has a chance of occurring only once in 100 years is projected to occur every 10 years by the end of the century. An abrupt change in the monsoon could precipitate a major crisis, triggering more frequent droughts as well as greater flooding in large parts of India. India's northwest coast to the south eastern coastal region could see higher than average rainfall. Dry years are expected to be drier and wet years wetter.	Improvements in hydro-meteorological systems for weather forecasting and the installation of flood warning systems can help people move out of harm's way before a weather-related disaster strikes. Building codes will need to be enforced to ensure that homes and infrastructure are not at risk.

[12] ibid

3.	Increased Droughts	Drought conditions have increased since 1970's led huge fall in crop production. Impact is severe in north-western region of India. The state of Jharkhand, Odisha and Chhastisgarh may expect fall in crop yield because of extreme events by 2040's	Investments in Research and Development for the development of drought-resistant crops can help reduce some of the negative impact.
4.	Over-exploitation of Ground Water	In India, more than 60 percent of the agriculture is rain fed, makes it highly dependent of ground water. Erratic rainfall pattern may lead to more dependency on ground water resulting in over-exploitation of ground water resource and, falling of water table,	The efficient use of ground water resources will need to be incentivized.
5.	Melting of glaciers	The Himalayan glaciers, which provides substantial amount of water content to south-west monsoon have been retreating since last 100 years. The snow cover of the Himalayan is expected to threaten the stability and reliability of glacier –fed rivers such as Brahmaputra and Indus. Flow of water in the glacier fed rivers may be changed. They may have more flow of water in spring season than during summers. This can lead to significant impact on irrigation pattern of agriculture based land affecting livelihood of millions of Indians.	Major investments in water storage capacity would be needed to benefit from increased river flows in spring and compensate for lower flows later on.
6.	Rise of Sea Level	India, being close to Equator can observe major changes in sea levels. Already Mumbai had world's largest flooding. Rapid urbanization increases negative impact of the risk of flooding and water intrusion. Intrusion of salt water into agriculture land can result to destruction of crops and increase in saline land.	Building codes will need to be strictly enforced and urban planning will need to prepare for climate-related disasters. Coastal embankments will need to be built where necessary and Coastal

7.	Agriculture & Food Security	Seasonal water scarcity, rising temperatures, and intrusion of sea water would threaten crop yields, jeopardizing the country's food security. The current trend may result to substantial yield reductions in both rice and wheat can be expected in the near and medium term. Under 2°C warming by the 2050s, the country may need to import more than twice the amount of food-grain than would be required without climate change.	Crop diversification, more efficient water use, and improved soil management practices, together with the development of drought-resistant crops can help reduce some of the negative impacts. Increase food production to deliver to the hunger of people
8.	Energy Security	Hydropower and Power generation plants both function on the sufficient availability of water. Increasing vulnerability and long-term decreasing flow of water in rivers can result to reduction in hydropower and thermal power generation.	Projects will need to be planned taking into account climatic risks.
9.	Water Security	Increase in variability of monsoon season can lead to decrease of water availability in some areas. Another reasons, which could impact the water security are increasing population and urbanization.	Improvements in irrigation systems, water harvesting techniques, and more-efficient agricultural water management can offset some of these risks.
10.	Health	Climate change is expected to result in major impacts on chronic diseases such as malaria, diarrheal and other vector borne diseases.	Health systems need to strengthen to respond to such events.
11.	Migration & Conflict	Climate change can result to major refugees from north-eastern region due to reduction in agriculture. Already Bramhaputra river basin is a region of conflict between neighbouring countries due to water scarcity.	Regional cooperation of water issues is needed.

Source: India Climate Change Impacts, World Bank, 2013[13]

[13]http://www.worldbank.org/en/news/feature/2013/06/19/india-climate-change-impacts

There is clear evidence that the observed change in surface temperature, rainfall, evaporation and extreme events and climate change is a significant environmental challenge and disaster. The main impact of global climate change will be felt due to changes in climate variability and weather extremes.

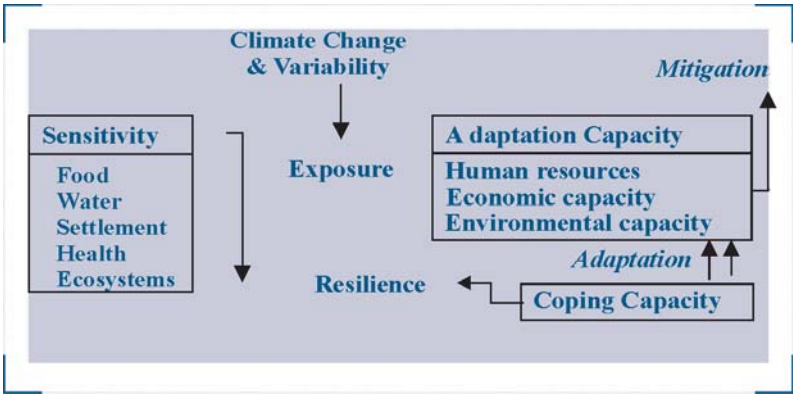


Figure 2.8 Sensitivity-adaptation framework to climate-change

Observations during the last decade and projections indicate that extreme events i.e. heat waves, cold waves, more floods, more droughts, more intense cyclones and flash floods will increase. Extreme rainfall has substantially increased over large areas, particularly over the west coast and west central India. There is thus an urgent need for a paradigm shift in Disaster Management, especially under changing climate.

2.6 Climate Change and its inter-relation with Disaster Risk and Development

Change in climate and weather patterns have predicted increased exposure and vulnerability due to extreme events such as high intensity floods, frequent droughts and increase air temperature etc. As per IPCC 2013 report, increased exposure and vulnerability are generally the outcome of skewed development processes such as those associated with environmental degradation, rapid and unplanned urbanization in hazardous areas, failures of governance, and the scarcity of livelihood options for the poor. Increasing global interconnectivity and the mutual interdependence of economic and ecological systems can have sometimes contrasting effects, reducing or amplifying vulnerability and disaster risk. Countries more effectively manage disaster risk if they include considerations of disaster risk in national development and sector plans and if they adopt climate change adaptation strategies, translating these plans and strategies into actions targeting vulnerable areas and groups. Hence, closer integration of CCA and DRR measures, along with the incorporation of both into local, sub-national, national, and international development policies and practices, could provide benefits at all scales.

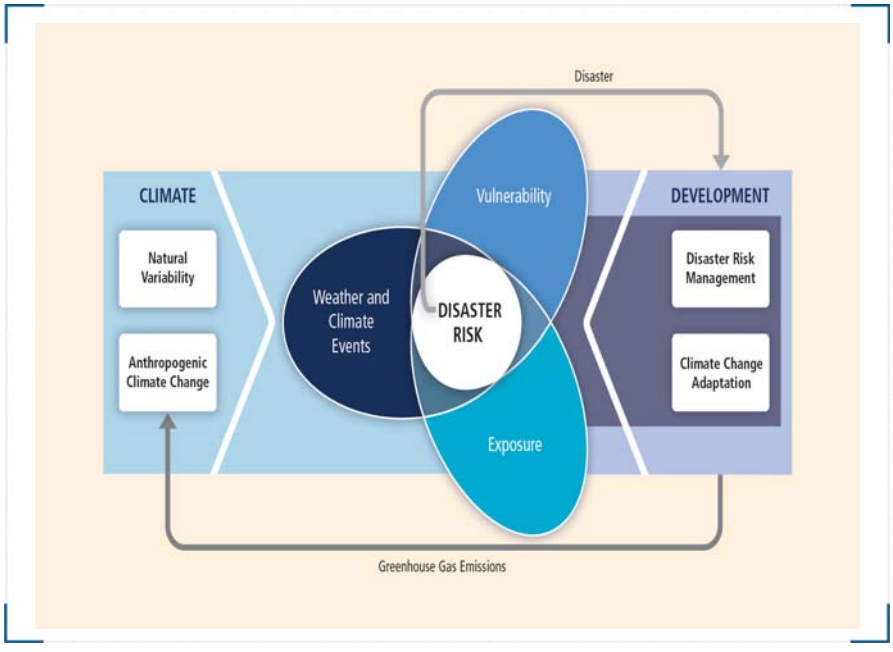


Figure 2.9 Climate Change and its impact on Disaster Risk and Development

The figure 2.9 indicates that how exposure and vulnerability to weather and climate events determine impacts and the likelihood of disasters (disaster risk). It evaluates the influence of natural climate variability and anthropogenic climate change on climate extremes and other weather and climate events that can contribute to disasters, as well as the exposure and vulnerability of human society and natural ecosystems. It also considers the role of development in trends in exposure and vulnerability, implications for disaster risk, and interactions between disasters and development. ***Source: Managing the Risk of Extreme Events and Disasters to Advance climate Change Adaption - Special Report of Intergovernmental Panel of Climate Change, Cambridge University Press, USA, 2012***

The issues related to climate change and DRR have indicated negative impact of development pattern in the country like India, where development is under transition stage and the parameters related to socio-economic development such as social welfare, quality of life, infrastructure development, livelihood etc. are on stake due to increasing nos. of disastrous events with increased intensities.

The social, economic, and environmental sustainability can be enhanced by disaster risk management and adaptation approaches. A prerequisite for sustainability in the context of climate change is addressing the underlying causes of vulnerability, including the structural

inequalities that create and sustain poverty and constrain access to resources. There is need to take proactive measures for sustaining the efforts made for development gain by incorporating a multi hazard approach into planning and action for disasters in the short term, adaptation to climate extremes in the long terms, as reco gnised under IPCC report. There is a need to improvise CCA & DRR measures into developmental policies so that integrated effort for development could take place. For an effective approach for mainstreaming CCA & DRR, the approaches need to be combined for considering the broader challenge of sustainable development. Measures such as early warning systems, risk communication, risk transfer, community participation, land-use planning, eco-system management, water & sanitation management, climate & disaster resilient infrastructure development, adoption of diversified agriculture methods, enforcement of building codes and better awareness & training etc. should be adopted for promoting sustainable development. In addition, strengthening of institutional structure by integrating techno-legal framework and good governance etc. may help in promoting better disaster resilience and development.

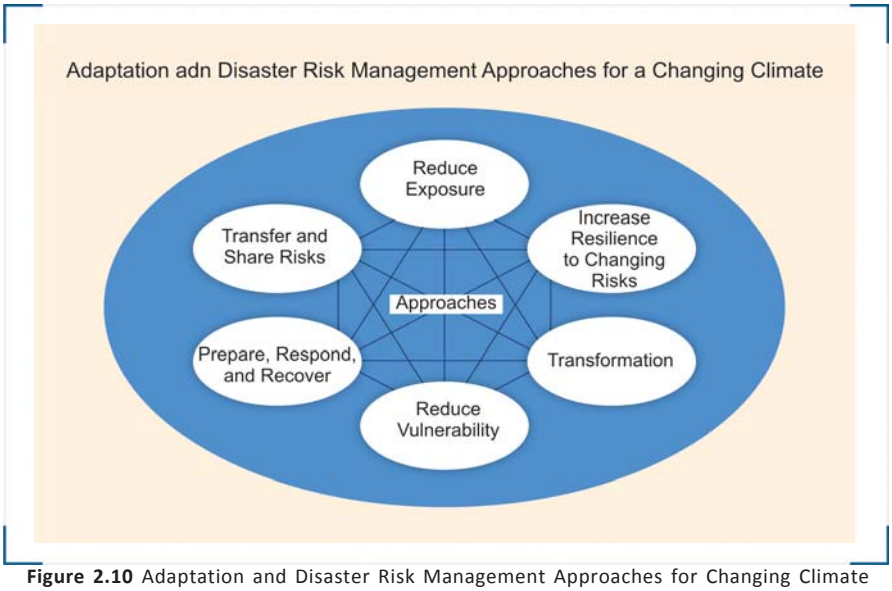


Figure 2.10 Adaptation and Disaster Risk Management Approaches for Changing Climate

Source: Managing the Risk of Extreme Events and Disasters to Advance Climate Change Adaptation -Special Report of Intergovernmental Panel on Climate Change, Cambridge University Press, USA, 2012

Resistance and Resilience

'Disaster Resistance' as a part of climate-change adaptation agenda, and similarly on the other hand 'climate-change adaptation' as a core facilitator of 'disaster risk reduction' paradigm is the set of focused activities comprising of exposure or impact reduction due to likely hazard event, thus by avoiding, controlling or responding in a prepared and organized ways. 'Adaptation' entails to a series of naturally occurring or designed adjustments with the prevailing and upcoming environmental characteristics including resources (agriculture, forestry, soil, animals, industry, health, etc.) lifestyles, practices, socio-economic patterns and overall development. Search for alternatives, whether for example, alternative livelihood options, or alternative crops or alternative cropping patterns, alternative production systems – be it nature or industry, are the indicative features of adaptation regime.

Thus, adaptation is aimed towards adjustment for sustainability – environmental, social and also economic. It opens up many new and innovative opportunities for growth and productivity, for example search of the suitable economic species that may be grown in usar (waste or dry) lands, suitable agro forestry model, or land-water integrated management for year-round water availability and also flood control in the rainy season, alternative foodstuffs with nutritional values, local medicinal knowledge, disaster preparedness, etc. Diversification of livelihood and production systems reduces the risk of damages and losses to a greater extent providing disaster resilience in the communities. Hazard prevention or control actually implies of developing sound awareness and understanding that what (may be due to climate-change impact or) local-regional environmental alternations may result in a hazardous condition that may, in case of occurrence, may result in a disaster, for example, flood, drought, landslide, etc.

Thus, reducing the chance of a flood occurring to a certain level of heavy rainfall by improving catchment conditions, channel features, storages, etc. are actually considered as disaster reduction. The following options are containing the disaster event from affecting land-uses and resources. And ultimately, in case of an occurrence of breach of disaster management, reducing the impact by putting in place the coping capacity and response mechanism are the actions to be envisaged within the framework of adaptive capacity.

2.7 Climate Resilience Framework

The Climate Resilience Framework (CRF) is an analytical approach to building resilience to climate change in urban areas. The goal of using this structured framework is to help you build your city's resilience and ability to address multiple climate change hazards—emerging, indirect, rapid or slow-onset—as well as current hazards, within the economic, political, and population dynamics that characterize a city.

The CRF process begins with having a vision of a resilient city and to define principles that will guide the city's vision and process into the future. The city will be built resilient through identifying existing factors that contribute to your overall city vulnerability & risk and developing strategies that shift existing development & policy processes to address those vulnerabilities and meet

future challenges. Core to this approach is an assessment of vulnerability and risk that takes into account not just currently vulnerable groups or systems but the reasons for those vulnerabilities, including exposure to climate hazards, low capacity for handling climate shocks, fragile supporting systems, and the governance, social conventions and cultural behavioural norms that act to reduce or exacerbate vulnerabilities and capacity[14].

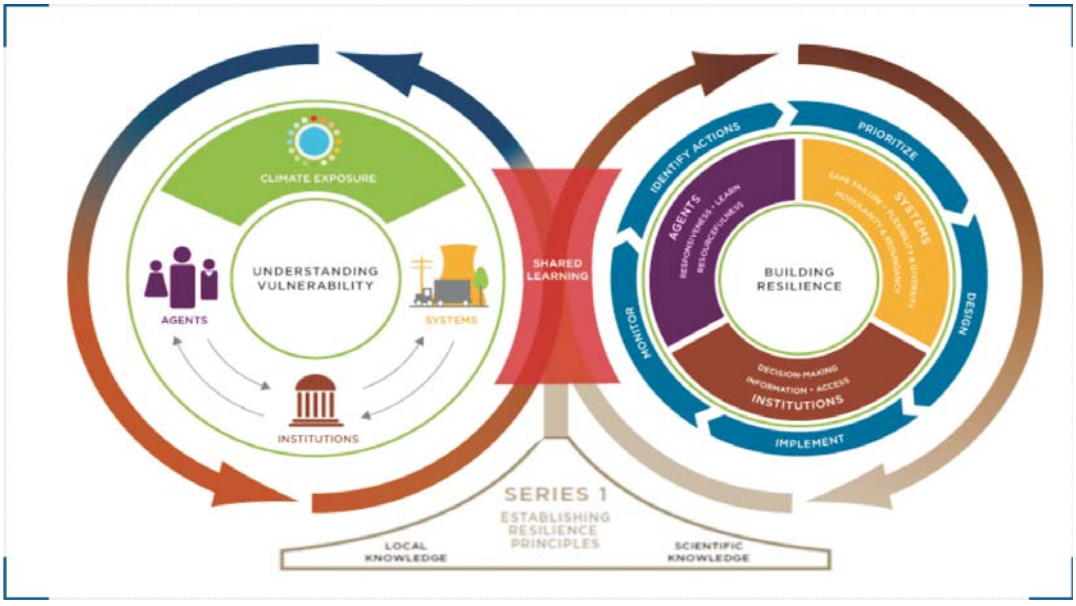


Figure 2.11 Climate Resilience Framework

The Climate Resilience Framework (CRF) is an analytical, systems-based approach to building resilience to climate change. The goal of this structured framework is to build networked resilience that is capable of addressing emerging, indirect and slow-onset climate impacts and hazards.[15]

2.7.1 Key Elements of the Framework[16]

The key elements of the CRF are urban systems, social agents, and institutions, and, for each, the

[14] http://training.i-s-e-t.org/module

[15] ISET-International is using this framework with cities across Asia to build local capacity for climate change resilience with funding from The Rockefeller Foundation, USAID and The American Red Cross, and the Climate Development Knowledge Network. The Climate Resilience Framework emerged from the initiation of resilience building activities in the Asian Cities Climate Change Resilience Network (ACCCRN) and the need to put activities into a conceptual context for dissemination and replication.
The CRF is informed by years of work in Asia and elsewhere by multiple actors and was refined through the M-BRACE program with support from USAID, and co-funded by The Rockefeller Foundation through the ACCCRN program.
The CRF has proven helpful for cities working with numerous multi-stakeholder, cross-sector issues that arise when trying to address issues of climate change, uncertainty, and planning. Ten cities in Asia have produced resilience plans from which over 35 proposals have been written and over 20 of which have been funded. As such the CRF proves itself practical in hollistically addressing issues of local need while offering an avenue to reach clear, specific actions.

[16] ibid

degree to which it is exposed to climate change hazards. Within the framework, building resilience means:

- Identifying the exposure of city systems and agents to climate hazards;
- Identifying and strengthening fragile systems by strengthening the characteristics that reduce their vulnerability to climate hazards;
- Strengthening the capacities of agents to both access city systems and develop adaptive responses;
- Addressing the institutions that constrain effective responses to system fragility or undermine the ability to build agent capacity.

2.7.2 Characteristics of Resilience

The CRF considers the way that agents, systems, and institutions interact under the threat of climate hazards, and the characteristics of each that contribute to resilience and adaptive capacity in urban areas. Characteristics for systems, agents, and institutions are listed below (Tyler and Moench, 2012), but can also be seen in the right hand loop of the CRF diagram in Figure 2.11. For more information on the Characteristics of Resilience, please see Annexure 5.

Systems:

Flexibility and diversity: Flexibility and diversity refer to the ability to perform essential tasks under a wide range of conditions, and to convert assets or modify structures to introduce new ways of achieving essential goals. A resilient system has key assets and functions physically distributed so that they are not all affected by a given event at any one time (spatial diversity) and has multiple ways of meeting a given need (functional diversity).

Redundancy, modularity: A redundant and modular system is one that has spare capacity for contingency situations in order to accommodate extreme or surge pressures or demand. It also has multiple pathways and a variety of options for service delivery; or interacting components composed of similar parts that can replace each other if one, or even many, fail. Redundancy is also supported by the presence of buffer stocks with in systems that can compensate if flows are disrupted (e.g., local water or food supplies to buffer imports)

Safe failure: Safe failure refers to the ability to absorb sudden shocks (including those that exceed design thresholds) or the cumulative effects of slow-onset stress in ways that avoid catastrophic failure. Safe failure also refers to the interdependence of various systems that support each other; failures in one structure or linkage are thus unlikely to result in cascading impacts across other systems.

Agents:

Responsiveness: Ability to organize, reorganize, and act; ability to establish function, structure,

and basic order in a timely manner, both in advance of and immediately following a disruptive event or organizational failure.

Resourcefulness: Capacity to identify and anticipate problems, establish priorities, and mobilize resources for action. This includes the ability to access financial and other resources, including those of other agents and systems.

Capacity to Learn: Ability to internalize past experiences, avoid repeated failures and innovate to improve

Institutions

Decision Making: Decision-making processes related to key urban systems are transparent, representative, and accountable. Diverse stakeholders have a way to provide input to decisions. Dispute resolution processes are accessible and fair.

Information: Agents have access to relevant information in order to determine effective actions and to make strategic choices for adaptation.

Access: Institutions encourage inquiry, application of evidence, critical assessment, and application of new knowledge. Structures of rights and entitlements do not systematically exclude specific groups from access to critical systems or capacities. They enable groups to form and act, and foster access to basic resources.

2.8 Question Answer Session

a. Define natural hazards and name various types of hazards.

b. What is vulnerability? Write two examples of social, economic and physical vulnerabilities.

c. How to conduct risk assessment in a region?

d. Is climate change increasing probability and frequency of disasters? Name any three such disasters which have been affected due to climate change.

e. Do we have any inter-relation of climate change and disasters? Explain with examples.

f. What are the key components of Climate Resilience Framework? Explain with examples.

Environment and Disaster Risk Reduction

The U.N General Assembly had designated 5th June as the World Environment Day in the wake of the United Nations Conference on the Human Environment held in Stockholm in June 1972. The objective was to stimulate awareness of the environment and enhance political and public action to protect and improve environment for the benefit of present and future generations. Faltering global economy, food and energy insecurity, conflicts, global climate change, declining ecosystems, extreme poverty and the threat of disease outbreaks are amongst the factors challenging the progress towards improving human well being and economic stability in many developing countries.

The Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate, 2009, identifies ecosystems decline as a key driver in exacerbating the natural hazards in the future. It is important to analyze and understand the two way linkage between environment and disasters. Disasters can have adverse environmental consequences, while degraded environments cause or amplify the detrimental impacts of disasters.

Global climate change accelerate ecosystems degradation and disaster risk due to increasing and extreme weather events like heat and cold waves, floods, landslides and prolonged droughts. Healthy and well-managed ecosystems, on the other hand, are more robust against hazards. Adopting an integrated approach to environment and ecosystem management for sustainable livelihoods, climate change adaptation and disaster risk reduction is the need of the time. Everyone can do their bit.

After all, while we think globally, we have to act locally!

- M. Shashidhar Reddy, Vice Chairman,
National Disaster Management Authority, India

(Message in "Environmental Extremes – Disaster Risk Management: Addressing Climate Change", (Gupta and Nair, 2012 NIDM)

Learning Unit-B

PATHWAYS AND APPROACHES OF INTERGRATION

3

3.1 Introduction

There are several ways and methods through which DRR and climate change adaptation (CCA) measures have been integrated to reduce the risk of natural disasters. In this Learning Unit of the Module, an effort has been made to consolidate various approaches adopted at national, regional and local level for reduction of risk. The LU revolves around to capture national level techno-legal framework, inclusion of CCA & DRR through development planning and by promoting local adaptation practices used by the local communities.

3.2 Learning Objectives

To enable participants understanding on:

- Mainstreaming of climate change and DRR measures in legal and policy frameworks at various levels.
- Integrating convergence of the climate change and DRR measures into schemes and projects.
- Local adaptation practices used by the local communities to reduce impacts of climate change and DRR measures.

3.3 Training Method, Duration & Faculty

This LU includes knowledge sharing sessions on various schemes and programmes being run in the specific states. The facilitators shall use the various mode of presentation i.e. through electronic media, power point presentations, case studies, examples, group work etc. Classroom sessions, group work and field visit, are included in this unit and hence will take 1 to 1.5 days for completing it. The session could be divided into three presentations to cover up each objective of the Module.

3.4 Methods and Approaches for including DRR into Development Planning

Disaster Risk Management covers all aspects from prevention, mitigation, preparedness to rehabilitation, reconstruction and recovery. It provides for:

- Establishing techno-legal and institutional framework for effective planning, implementation and finance.
- Inclusion of multi-sectoral DM concerns into the developmental process and mitigation measures through schemes and projects.
- Integration of disaster risk reduction planning and policies in a holistic, participatory, inclusive and sustainable manner.

> We parliamentarians will: Review our laws and legislation related to climate change adaptation, environment and disasters to make sure that they are complementary to each other and take necessary action to foster synergy between climate change adaptation and disaster risk reduction.
>
> *Parliamentarians' Plan of Action for Making Millennium Development Coal Programmes Disaster Resilient, Adopted at the Consultative Meeting for Wes Affrican Parliamentarians, Dakar, 2 June 2010*

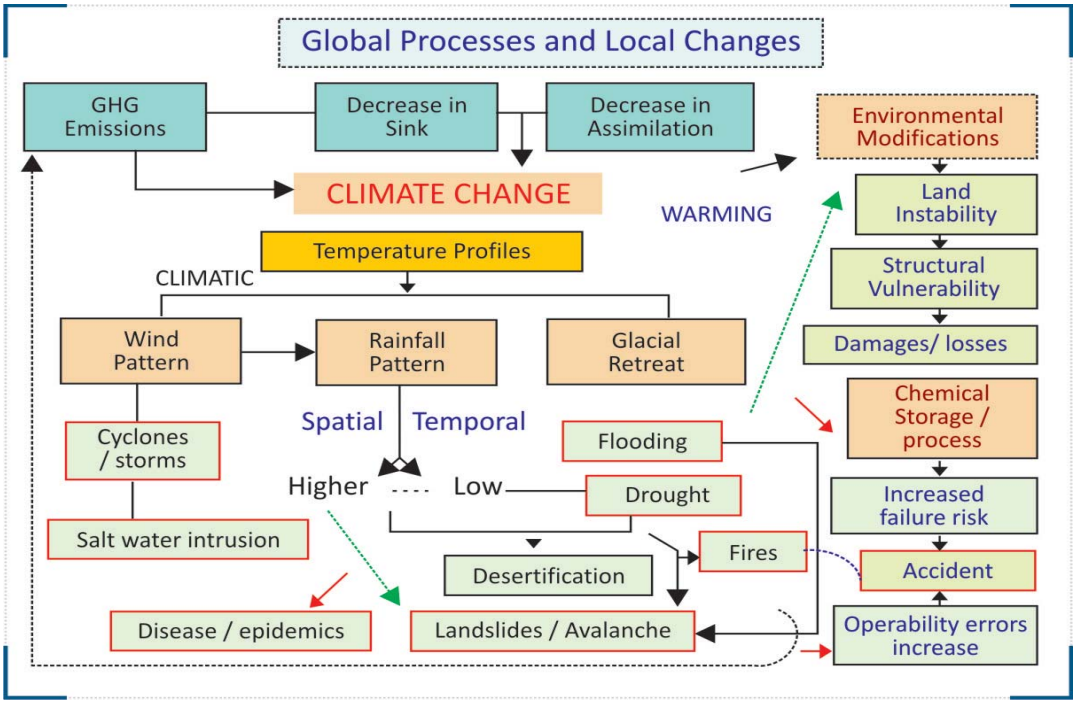


Figure 3.1 Relationship of environment, climate and disasters

3.4.1 Legal Policy Framework for Disaster Management

The institutional structure for Disaster Management (DM) is in a state of transition. The salient features of institutional mechanism at national level are as follows:

(i) At national level, the Ministry of Home Affairs is the nodal Ministry to deal with all matters concerning with the disaster management. The Central Relief Commission is constituted in Ministry of Home Affairs for coordinating with the relief operations.

(ii) The National Institute of Disaster Management (NIDM) is responsible for human resource development through planning and research development, capacity building and documentation & policy advocacy. The institute works in tandem with the MHA, NDMA and Central, State and local governments as well as various other stakeholders to build their capacities towards promoting a culture of prevention and preparedness at all levels.

Box 3.1 Provisions of Mainstreaming DRR Measures into Development Process (as per DM Act, 2005)

(i) Chapter 4, Section 32 provides for DM Plans by different district disaster management authorities and their implementation by setting out the following, namely:- (i) provisions for prevention & mitigation measures assigned to the department or agency concerned; (ii) provisions for taking measures relating to capacity-building and preparedness as laid down in the District Plan; (iii) the response plans and procedures, in the event of, any threatening disaster situation or disaster; (iv) coordinate the preparation and the implementation of its plan with those of the other organizations at the district level including local authority, communities and other stakeholders.

(ii) Chapter 2- Section 11 indicates that the National Plan shall be prepared by the National Executive Committee having regard to the National Policy and in consultation with the State Governments and expert bodies or organisations in the field of DM shall include preventive and mitigation measures, integration of mitigation measures in the development plans, measures for capacity building and roles & responsibilities of different ministries and departments of Government of India.

(iii) Chapter 5, Section 36 and Section 37 provides for the responsibilities of Ministries or Departments of Government of India to take measures for prevention, mitigation, preparedness and capacity building, to integrate into its development plans and projects, the measures for prevention or mitigation of disasters, to review the polices, acts, rules with a view of incorporation of provisions for prevention, mitigation and preparedness and to allocate necessary funds for such activities.

(iv) Chapter 6, Section - 41. Local authority shall ensure trained staff in DM, resources related to DM are readily available and maintained to tackle the event of disaster, to ensure all construction based projects under its jurisdiction conform to the standards and specification laid down for prevention and mitigation by national, state and district level authority.

(iii) Disaster Management Act enacted in 2005 provides for institutional framework for disaster management. As provided under the Act, National Disaster Management Authority (NDMA) has been constituted for laying down policy and guidelines for Disaster Management in India. The NDMA has issued several guidelines on various aspects of disaster management. Similarly, Disaster Management Authorities at state and district level are being constituted for laying down guidelines for state\district level. Some of the important provisions for mainstreaming DM into development process are indicated in Box. 3.1.

(iv) The National DM Policy announced in 2009 for building a safe and disaster resilient India. It elaborates importance of disaster management into development process, creation of mitigation reserve, risk assessment & vulnerability mapping and other mitigation measures etc. The policy has been circulated to the State Governments to take actions for its implementation.

(v) The National Disaster Response Force (NDRF) has been constituted under section 44 of DM Act, 2005 for strengthening response system of the country. The battalions of NDRF comprising specialized teams trained in various types of natural, man-made and non-natural disasters have been set up in the states for handling disasters.

(vi) Initially, a High Powered Committee was setup under the chairmanship of Mr. J.C. Pant for formulating a systematic, comprehensive and holistic approach to all the disasters. The committee prepared model plans for Disaster Management at national, state and district levels. Of late Section 23 of the DM Act, 2005 provide for preparation of disaster management plans for the states and districts by the State and District level DM Authorities. It also provides for annual review and updating of the DM plans, and enjoins upon the state governments to make provisions for financing the activities to be carried out under the DM plans. It provides

Provisions for Disaster Management under Other National Laws

The National Rural Employment Guarantee Act (NREGA) is an Indian law that aims to guarantee the 'right to work' and ensure livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work. In accordance with the Article 23 of the Universal Declaration of Human Rights that defines the right to work as a basic human right and further conforming to the Article 21 of the Constitution of India that guarantees the right to life with dignity to every citizen of India, this act imparts dignity to the rural people through an assurance of livelihood security, proper environment free of danger and diseases. The Government is liable to pay allowance incase it is unable to provide work opportunity. Article 51-A(g) fundamental duty of every citizens and States to protect and improve environment including forests, lakes rivers and wildlife and to have compassion for living creatures. Article 48(A) 42nd Amendment Act 1976 added a new directive principle. States shall endeavor to protect and improve the environment and safeguard the forests and wild life of the country.

for the departments of the state governments to draw up their own plans in accordance with the state/district plan.

(vii) **Other National Laws:** There are several Acts framed by several ministries on protection on environment and natural resources, urban sanitation, agriculture, forests, land-use, water resources, bio-diversity, and industrial protection, etc. which covers various aspects of DM by protecting and safe guarding environment and ecosystems such as human rights, ecological security (Livelihood, Food Security), control of pollution, deforestation, ensuring safety measures and health, clearing of cases, assurance of compensation, risk transfer, long term sustainability issues etc. Some of such legislative frameworks are given in the Box.

3.4.2 Environment & Natural Resource Laws in DRR: Integrating CCA-DRR

Regulatory provisions related to environment and its constituents, natural resources - water, land, agriculture, forests, wildlife, habitats, ecosystems; procedures and planning - Environmental clearance, EIA, audit, risk analysis, land-use and zoning, emergency preparedness; and environmental services - drinking water, sanitation, waste management, preventive-health, including climate mitigation and adaptation etc. although primarily aiming at environmental quality and resource management, the provisions play significance role in addressing hazards, reducing underlying causes of vulnerability and enhancing capacity, and thereby, relate to Disaster Risk Reduction. A detailed training module on role of environmental legislation in DRR has been developed by NIDM jointly with GIZ Germany (Gupta et al., 2012b).

Figure 3.2 Specialized Training Module on Environmental Legislation for DRM (NIDM)

An assessment of environment and natural resource laws in context of their potential role in climate related disaster risk reduction is given in Table 3.1 to 3.7.

Table 3.1 Land resource laws and policies (wetlands, soil, agro-ecosystems, landscape, wastelands, watershed, catchment, river-basin, land-use)

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Desertification control and reducing drought, flood and fire, storm attenuation, preventing disease and conflicts	Alternative cropping, livelihoods and em-ployment, ecosystem services, food, water, health resources	Alternative options; Safer sites/ landscapes, Migration, Rapid recovery capacities	Neighbouring resources for response supplies

Table 3.2 Water related (resources and quality, flood &drought mitigation, disease prevention livelihood options, ecosystem services, recreation, health, waste disposal etc).

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Flood control, drought reduction, disease prevention	Livelihood options, agriculture, ecosystem -health and services, recreation, health, transport	Water reserves for meeting drought; levees for flood-water relief, water/waste treatment	Water and sanitation, waste disposal, disease control

Table 3.3 Forests protection and conservation laws (related to protected and reserved areas, village forests and common property resources, forest produce, species diversity, regeneration, ecology, rights of forest dwellers)

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Reducing catchment degradation and erosion, climate-change effects, flooding, drought, fire, invasion; increasing water recharge, land-stability	Increasing livelihoods, ood, recreation, health fresources, watershed services, clean air and water; reduces migration to cities	Alternative resources, Shelter-belt, Green-belt, Wind-breakers, Mitigation/ protection, Climate-resilience	Timber, fuel-woods/ other produces, for shelter, food, lighting, medicinal resources

Table 3.4 Biodiversity Laws (Habitat, bio-resources, gene pool, eco-balance)

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Reducing drought/ water scarcity, flood-ing, pest and diseases, fire, wilt, rodents	Alternative crop, food, diversifying liveli hoods, health, eco-aesthetics and cooperation	Resistance (avoidance, tolerance, resilience), alternative/sustain-able resources	Local resources and emergency support - medicinal, timber, food, fodder, shelter, water, etc.

Table 3.5 Wildlife conservation and laws. (animal-plant-soil relations, habitat conservation and regeneration, ecotourism)

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Protecting habitats, preventing man -animal conflict	Ecotourism, forest produce, handicrafts, ecosystem services Eco-education	Alternative employment, Coastal, mountain / watershed protection	Medicinal resources, food, fuel-wood, etc.

Table 3.6 agricultural laws. (diversification, agro-forestry livestock, waste reuse, biofuels, alterna-tive cropping, land-use, soil & water)

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Reducing drought/ water scarcity, flood -ing, pest and diseases, fire, wilt, rodents	Alternative crop, food, diversifying livelihoods, health, eco-aesthetics and cooperation	Resistance (avoidance, tolerance, resilience), alternative/sustain-able resources	Local resources and emergency support - medicinal, timber, food, fodder, shelter, water, etc.

Table 3.7 Coastal area management laws (land-use, natural resources, ecosystems, conservation, disaster risk reduction)

Addressing hazards	Reducing vulnerability	Coping Capacity	Emergency Response
Reducing storm surge, sea ingression, salt-water intrusion, erosion	Reducing exposure, losses; enhancing livelihoods - fisheries, ecotourism	Critical infrastructure, cyclone shelter, warning systems,	Food, medicinal resources, shelter, material transport, etc.

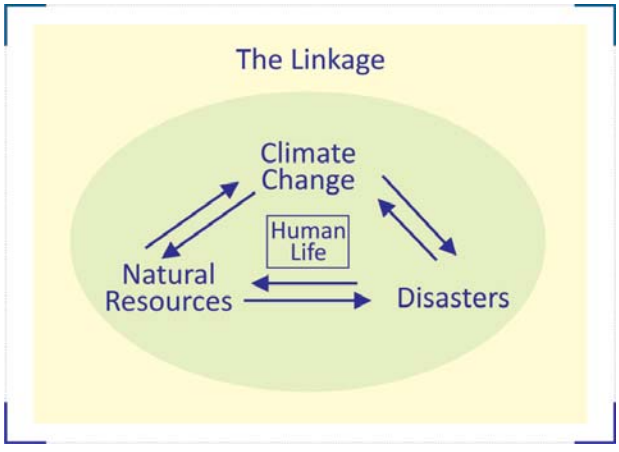
Environmental law in India has developed tremendously in the last couple of decades in parallel and complimentary to the development of International Environmental Law. The table below summarizes status of India vis-à-vis International Environmental Conventions. Table 3.8 enlists India's participation in international environmental conventions and treaties providing significant guidelines and concerns on issues addressing hazards and vulnerability factors associated with climate-change impacts and related natural (hydro-meteorological) disasters.

Table 3.8 Status of India Vis-à-vis International Environmental Conventions

International Law Relevant to Climate-change and Natural Disaster Risk Reduction	Year Signed and Enforced
International Convention for the Prevention of Pollution of the Sea by Oil (1954)	1974
The Antarctic Treaty (Washington, 1959)	1983
Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (Ramsar, 1971)	1 October 1981
Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)	1977
Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington, 1973)	1974

Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 1979)	1979
United Nations Convention on the Law of the Sea (Montego Bay, 1982)	1982
Protocol on Substances That Deplete the Ozone Layer (Montreal, 1987)	19 June 1992 (ac)
Amendments to the Montreal Protocol on Substances that Deplete the Ozone Layer (London, 1990)	19 June 1992 (ac)
Protocol on Environmental Protection to the Antarctica Treaty (Madrid, 1991)	1992, 1996
United Nations Framework Convention on Climate Change (Rio de Janeiro,1992)	1 November 1993
Convention on Biological Diversity (Rio de Janeiro, 1992)	5 June 1992
Convention to Combat Desertification in those Countries Experiencing Serious drought and/or Desertification (Paris, 1994)	14 October 1994
International Tropical Timber Agreement (Geneva, 1994)	17 October 1996
Protocol to the United Nations Convention on Climate Change (Kyoto, 1997)	1997
Cartagena Protocol on Biosafety (Nairobi, 2000)	17 January 2003

Source: Handbook on International Environment Agreements: An Indian Perspective. Accessed at http://awsassets.wwfindia.org/downloads/mea_handbook_cel.pdf



Linkage between climate change, Naural Resources & Disasters

Indian Statutory laws primarily concerned with environment and its different constitutes also provide in indirect ways to address the issues related to climate change adaptation and related disaster risk reduction integration. Important laws providing concerns to climate related DRR are following:

(1) Environment (Protection) Act, 1986, and rules there under - listed following

a) Wetland (Conservation and Management) Rules, 2010 (under EPA, 1986)

b) Environment (siting for industrial projects) Rules, 1999.

c) The Municipal Solid Waste (Management & Handling) Rules, 2000.

d) Plastic Waste (Management and Handling) (Amendment) Rules, 2011)

e) Dumping and disposal of fly ash discharged from coal of lignite based thermal power plants on land, Rules, 1999.

f) Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms, Genetically Engineered Organisms or Cells, 1989.

g) Bio-Medical Waste (Management and Handling) Rules, 1998.

Examples of Notifications issued under EPA, 1986

- Doon Valley Notification (1989),
- Coastal Regulation Zone Notification (1991, 2011)
- Dhanu Taluka Notification (1991)
- Revdanda Creek Notification (1989),
- The Environmental Impact Assessment of Development Projects Notification, (1994 and as amended in 1997, revised in 2006).
- Ash Content Notification (1997)
- Taj Trapezium Notification (1998),
- Disposal of Fly Ash, Notification (1999)

(2) Example of Laws on Natural Resource Management

Water	1. The Shore Nuisance (Bombay and Kolaba) Act, 1853. 2. Obstruction in Fairways Act, 1881. 3. The Indian Fisheries Act, 1897. 4. The River Boards Act, 1956. 5. The Merchant Shipping Act, 1958. 6. Water (Prevention and Control of Pollution) Act, 1974. 7. Water (Prevention and Control of Pollution) Cess Act, 1977.
Air	1. Air (Prevention and Control of Pollution) Act, 1981. 2. The Air (Prevention and Control of Pollution) Rules, 1982.
Forests & wildlife	1. Indian Forest Act, 1865; 1927. 2. The Wildlife (Protection) Act, 1972. 3. The Forest (Conservation) Act, 1980.
Other Laws	1. Biological Diversity Act, 2002. 2. Forest Right Act, 2006. 3. The National Environment Appellate Authority Act, 1997. 4. National Green Tribunal Act, 2010.

3.4.3 Inclusion of DRR into Development Schemes and Projects

For mitigating climatic hazards and minimizing the impacts of hydro-meteorological natural disasters and for improving livelihoods and overall well being of the people, central and state Governments have implemented a number of schemes, whose activities are facilitated further by the involvement of PRIs, NGOS and other non-profit organizations. Some of the important national level programmes are listed herein:

Panchayats (Extension to the Scheduled areas) Act, 1996: An Act to provide for the extension of the provisions of Part IX of the Constitution relating to the Panchayats to the Scheduled Areas and which devolved natural resource management with the Panchayats. The Panchayats are empowered to legislate on matters specified in the Eleventh Schedule. The items that relate to biodiversity include land improvement, soil conservation, watershed development, social forestry, farm forestry, minor forest produce, fuel fodder etc. The Panchayat Act regulates the right to minor forest produce, management of water bodies etc.

(i) Jawaharlal Nehru National Urban Renewal Mission (JNNURM): The JNNURM is a massive city-modernization scheme launched by the Government of India under Ministry of Urban Development. It envisages a total investment of over $20 billion over seven years. Named after Jawaharlal Nehru, the first Prime Minister of India, the scheme was officially inaugurated on 3 December 2005 as a programme meant to improve the quality of life and infrastructure in the cities. One of the important steps of the scheme was to improve existing levels of basic services of urban poor. The scheme was launched in 2005 for a seven-year period (up to March 2012) to encourage cities to initiate steps for bringing phased improvements in their civic service levels. The government has extended the tenure of the mission for two years, i.e., from April 2012 to March 31, 2014.[17]

(ii) Rajiv Awas Yojana (RAY): The scheme has been implemented by the Ministry of Housing and Urban Poverty Alleviation, envisages for slum free India with inclusive and equitable cities in which every citizen has access to basic civic infrastructure and social amenities and decent shelter by focusing on (i) Bringing all existing slums, notified or non-notified (including recognised and identified) within the formal system and enabling them to avail the basic amenities that is available for the rest of the city/urban area; and (ii) Redressing the failures of the formal system that lie behind the creation of slums by planning for affordable housing stock for the urban poor and initiating crucial policy changes required for facilitating the same. RAY is to be implemented in a mission mode and will provide financial support to States/UTs/Urban Local Bodies (ULBs)/ Central Government Agencies, hereafter called implementing agencies, for providing housing and improvement of basic civic infrastructure and social amenities in each selected slums.[18]

(iii) National Rural Health Mission (NRHM): The NRHM was launched by Ministry of Health and Family Welfare in 2005 with an objective to provide support to the health care systems of rural

[17]https://jnnurmmis.nic.in/jnnurm_hupa/jnnurm/broucher.pdf
[18]http://mhupa.gov.in/ray/Ray_index.htm

areas of 18 states through provision of physical infrastructure, human resources, equipment, emergent transport, drugs, diagnostics and other support. It provides managing, funding and institutional support to all the selected states to all the facilities starting from sub centre, public health centres, community health centres, sub-district and district hospitals[19].

(iv) Sarva Shiksha Abhiyan (SSA): The SSA is Government of India's flagship programme for achievement of Universalisation of Elementary Education (UEE) in a time bound manner, as mandated by 86th amendment to the Constitution of India making free and compulsory Education to the Children of 6-14 years age group, a Fundamental Right. SSA is being implemented in partnership with State Governments to cover the entire country and address the needs of 192 million children in 1.1 million habitations. The programme seeks to open new schools in those habitations which do not have schooling facilities and strengthen existing school infrastructure through provision of additional class rooms, toilets, drinking water, maintenance grant and school improvement grants. Existing schools with inadequate teacher strength are provided with additional teachers, while the capacity of existing teachers is being strengthened by extensive training, grants for developing teaching-learning materials and strengthening of the academic support structure at a cluster, block and district level[20].

(v) Pradhan Mantri Gram Sadak Yojana (PMGSY): The PMGSY was launched in 2000 as a fully funded Centrally Sponsored Scheme to provide all weather road connectivity in rural areas of the country. The programme envisages connecting all habitations with a population of 500 persons and above in the plain areas and 250 persons and above in hill States, the tribal and the desert areas. As per latest figures, this programme involves construction of about 3.71 lakh kms. of roads for new connectivity and 3.68 lakh km. under upgradation.[21]

(vi) Indira Awas Yojana (IAY): The IAY was launched in May 1985 as a sub-scheme of Jawahar Rozgar Yojana by Ministry of Rural Development. It is being implemented as an independent scheme since 1 January 1996. The scheme aims at helping rural people below the poverty-line (BPL) belonging to SCs/STs, freed bonded labourers and non-SC/ST categories in construction of dwelling units and upgradation of existing unserviceable kutcha houses by providing assistance in the form of full grant. From 1995-96, the IAY benefits have been extended to widows or next-of-kin of defence personnel killed in action, ex-servicemen and retired members of the paramilitary forces. Three per cent of funds are reserved for the disabled persons living below the poverty-line in rural areas. Since 2006-07, IAY funds are also being earmarked for minorities.[22]

(vii) National Rural Livelihood Project (NRLP): The Government of India has availed a credit from the International Development Association (IDA) for implementing the NRLP. The NRLP would be implemented in 13 high poverty states accounting for about 90 percent of the rural poor in the country. Intensive livelihood investments would be made by the NRLP in 107 districts and 422 blocks of 13 states (Assam, Bihar, Chhattisgarh, Jharkhand, Gujarat, Maharashtra, Madhya

[19]http://nrhm.gov.in
[20]http://ssa.nic.in/
[21]http://pmgsy.nic.in/
[22]http://iay.nic.in/netiay/home.aspx

Pradesh, Orissa, Rajasthan, Uttar Pradesh, West Bengal, Karnataka and Tamil Nadu). Distribution of project funds among the states would be based on the relative share of rural BPL population in the total states. NRLP will broadly support the following components:

- Institution and human capacity development at the national, state, district and sub-district level such that support institutional structures are created,
- State livelihood support towards establishment of institutional platforms of the rural poor for improved access to financial, livelihood and public services,
- Innovation and partnership to identify and partner innovative ideas which address the livelihood needs of the rural poor and help pilot or scale them,

(viii) Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT): The UIDSSMT is one of the components of JnNURM scheme launched by GoI in 2005 for promoting planned development of the towns and cities. . The objectives of the scheme are:

- Improve infrastructural facilities and help create durable public assets and quality oriented services in cities & towns,
- Enhance public-private-partnership in infrastructural development and
- Promote planned integrated development of towns and cities.

All towns/cities as per 2001 census, except 63 mission cities/ Urban Agglomeration are eligible to be covered under the scheme. The components for assistance under the Scheme include all urban infrastructure development projects such as water supply, roads, parking space, drainage, solid waste management, sewerage, urban renewal, preservation of water bodies and prevention of soil erosion.[23]

(ix) Accelerated Rural Water Supply Programme (ARWSP): The ARWSP was introduced in 1972-73 to assist states with 100 percent grants-in-aid to implement drinking water supply schemes in such villages. The programme was given a mission approach when the technology mission on drinking water management, called the National Drinking Water Mission (NDWM) was introduced as one of the given missions in social sector in 1986. The NDWM was renamed as Rajiv Gandhi Drinking Water Mission in 1991[24].

(x) Special Package for Drought Mitigation Strategies: Government of India in 2009 approved a special package for implementing drought mitigation strategies in Bundelkhand region at a cost of Rs.7266 crore comprising Rs.3506 crores for Uttar Pradesh and Rs.3760 crores for Madhya Pradesh, to be implemented over a period of 3 years starting 2009-10. It is envisaged to provide an additional central assistance (ACA) to the tune of Rs.3450 crore for implementation of the package. The share of Uttar Pradesh and Madhya Pradesh in ACA is envisaged to be Rs.1596 crore and Rs.1854 crore respectively. The balance cost of the package will be met by converging resources from ongoing central sector and centrally sponsored schemes. Also, keeping demands

[23]http://urbanindia.nic.in/
[24]http://rural.nic.in

of the state governments, ACA of Rs.200 crore (Rs.100 crore each for the State Governments of Uttar Pradesh and Madhya Pradesh) a component to provide drinking water in the Bundelkhand region was approved. In continuation of the special Package during the 12th Plan period (2012-2017) a financial outlay of Rs. 4400 crore was approved under the Backward Regions Grant Fund (BRGF).

The project objectives are to restore ecological balance by harnessing, conserving and developing natural resource like soil, water and forest and improve the ecosystem by checking soil erosion and deforestation. Forest products like fodder, fuel-wood and small timber would be improved to provide alternative employment. The productivity of agricultural land could be improved by an increase in the soil moisture regime of the water sheds. One of the objectives of the project is to empower the local community to manage natural resources using traditional knowledge.

(xi) Other Projects & Schemes: There are several other schemes and programmes being implemented by the state government with the support of the central ministries on the issues related to water & sanitation, wasteland, droughts, backward region etc. A brief of such schemes are as given below:

Table 3.9 Brief of Other Schemes and Programmes

Sl. No.	Name of the Schemes	Brief
1	Swajal	In 1996, when the World Bank supported SWAJAL was started in the Bundelkhand and the hill districts of the then undivided UP, a paradigm shift in both approach and institutional structure was initiated to facilitate integrated service delivery that included drinking water, sanitation and hygiene promotion, effective community participation and long term sustainability of facilities, services and the overall sector in terms of effective policies and institutions. SWAJAL also envisaged setting into motion the decentralised process as envisaged in the 73rd Constitutional Amendment. Under SWAJAL at the community level the Village Water and Sanitation Committees were the key institutions. Initially delinked from the constitutionally mandated Gram Panchayats (GPs), subsequently, they were brought within the scope of GPs through a government order, although still outside the constitutional framework.
2	Swajaldhara	Swajaldhara was launched on 25.12.2002 in rural drinking water supply sector. The scheme provides a choice for any village to participate in the reform programme directly and scope for an entire district to participate in the reform programme if more than 50% of the villages in the district are ready to participate in the reform programme. This project was implemented in 356 villages.

3	Total Sanitation Campaign (TSC)	TSC also called as Nirmal Bharat Abhiyan is a community-led and demand-driven programme stated in 1999 with a goal to eradicate the practice of open defecation by 2017. As a part of scheme, GoI gives cash incentives to poor rural households for construction of toilets and baby-friendly toilets in anganwadis. It also gives a 60% grant for construction of community toilets and toilets in schools; the rest of the money has to come from the state government and village communities.
4	National Watershed Development Project for Rainfed Areas (NWDPRA)	The scheme NWDPRA was launched in 1990-91 in 25 States and 2 Union Territories based on twin concepts of integrated watershed management and sustainable farming systems. During IX Plan, the scheme was extended to 3 newly formed States of Uttaranchal, Jharkahand and Chhattisgarh. Under the scheme, Agricultural Department, Ministry of Agriculture, GoI has accorded high priority to the sustainable integrated farming systems of rainfed areas on watershed basis. The project aims at in-situ moisture conservation primarily through vegetative measures to conserve rainwater, control soil erosion and generate the green cover both on arable and nonarable lands. The scheme is implemented at the field level by an inter-disciplinary team of members from line departments of state government and the beneficiaries of the watersheds.
5	Integrated Wasteland Development Programme (IWDP)	The IWDP of the GoI was started in 1989-90 and seeks to develop government-owned wastelands and common property resources (CPRs), on the basis of village-level or micro-watershed plans.
6	Drought Prone Areas Programme (DPAP) (1995-2006)	The basic objective of the DPAP is to minimise the adverse effects of drought on production of crops and livestock and productivity of land, water and human resources ultimately leading to drought proofing of the affected areas. The programme aims to promote overall economic development and improving the socio-economic conditions of the resource poor and disadvantaged sections inhabiting the programme areas. DPAP was in operation in 627 blocks of 96 districts in 13 States.
7	Backward Region Grant Fund (BRGF)	The BRGF is designed to redress regional imbalances in development. The fund will provide financial resources for supplementing and converging existing developmental inflows into 250 identified districts, so as to (i) bridge critical gaps in

		local infrastructure and other development requirements that are not being adequately met through existing inflows (ii) strengthen, to this end Panchayat and Municipality level governance with more appropriate capacity building, to facilitate participatory planning, decision making, implementation and monitoring, to reflect local felt needs, (iii) provide professional support to local bodies for planning, implementation and monitoring their plans. BRGF, set up in 2006 under the Union Ministry of Panchayati Raj, provides a good opportunity to identify challenges and opportunities in backward districts and make realistic plans with involvement of people and elected representatives up to the district level.
8	Rashtriya Krishi Vikas Yojana (RKVY)	RKVY, launched in 2007, provides 'additional central assistance' to Central government and state schemes related to agriculture. Among the projects funded by RKVY is region-specific agriculture research and preparation of district agriculture plans, taking into account local needs and conditions.
9	Integrated Child Development Services (ICDS)	ICDS seeks to provide supplementary nutrition, health care and pre-school education to children below the age of six. Under a Supreme Court order of December 13, 2006 in the Right to Food case, all settlements that have at least 40 children under the age of six have to set up anganwadis within three months of the rural communities and slum dwellers making such a demand.
10	Mid-day Meal Scheme	The Mid-day Meal scheme is the result of a November 28, 2001 order of the Supreme Court in the Right to Food case, directing state governments to provide cooked mid-day meals in all government and government-assisted primary schools.
11	Integrated District Approach (IDA)	The IDA was launched in late 2004 and early 2005 in seventeen districts across 14 States in the country, and is the culmination of key strategies outlined by UNICEF India since the mid-eighties. These strategies focused on promoting community action and the integrated delivery of services by establishing horizontal linkages between line agencies on the one hand and establishing an interface between the communities and the line agencies on the other to ensure responsive, relevant and convergent delivery of services. Development of village plans for health, nutrition, education, water and sanitation resulting in the ownership of the process and activities at the community level is central to almost all national programmes.

Table 3.10 Disaster precursors and components of DRR for CCA and development components

Environmental conditions for disaster risks	Adaptation		Development Goals
	Risk Reduction (pro-active)	Disaster Response	
• Desertification • Drought • Floods • Cyclones • Landslides • Earthquakes effects • Hazards: • Fire (Forests/ Mine/ Residues) • Biological • Diseases/ epidemic/ pandemic	• Soil-water management • erosion • waste land reclamation • Slope protection & remediation • Afforestation • Crop diversification • Alternative crops & cropping patterns • Forestry-produce • Wetlands • Fisheries/aquaculture • Housing designs • Land-use • Alternative employment • Fiscal measures	• Emergency response. • Medical Response, • Relief/ Rehabili-tation	• Agriculture production and sustainability • Natural Resources Resources renewal and management • Water resource/supply • Health & nutrition • Poverty eradication and employment • Housing • Urban development • Transport/Roads • Service sectors • Industrial development • Economic/equity

As envisaged in the DM Act, 2005, the ongoing schemes and programmes can be used as access points for mainstreaming Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) measures into development planning. An approach to mainstream CCA & DRR measures into the ongoing developmental programme may be delineated as following:

i. Classification of key programmes/projects at ministerial level along with the area of implementation.

ii. Integration of structural and non-structural measures in the programme objectives. Guidelines shall be prepared for identifying structural and non-structural measures in programmes/schemes. For example all the programmes with objectives to construct physical infrastructures such as roads, houses, schools and sanitation & water facilities must confirm to the structural measures to ensure disaster resilient construction. Similarly, the social projects shall have objectives to mainstream non-structural measures viz. awareness generation, capacity building and preparedness activities as a part of their schemes/projects. An exercise shall be conducted to identify access points within the programmes for inclusion of DRR measures at several administrative levels.

iii. The state/national authority shall coordinate at ministerial and state level for promoting CCA & DRR measures through developmental programmes. Infact, the new programmes shall be sanctioned only if they meet the clause for ensuring disaster resilient construction activities.

iv. Certain fund shall be allocated in each of the programmes for implementing CCA & DRR measures within departmental plans.

Box 3.2 Group Exercise

Identification of Areas for Mainstreaming of DRR & CCA Measures into Development Plans

Divide the class room in the groups of four persons. Each group shall be given details of any ongoing flagship scheme. Each group shall propose mainstreaming of structural and non-structural measures into the ongoing schemes. The same shall be discussed in the class and finalized as draft recommendations.

3.4.4 Schemes/Projects on Disaster Management and Climate Change

The Ministry of Home Affairs (MHA) being a nodal ministry for handling DM measures have implemented several schemes/projects as centrally sponsored schemes or externally aided programmes. The thirteenth Finance Commission has allocated funds to the state governments as capacity building grant of Rs. 525 crore for disaster response, grant in aid of Rs. 472 crores to seven states for revamping of fire services. The GoI has also approved state disaster response fund (SDRF) of an amount of Rs. 33580.93 crores for all the 28 states as 75 percent central (90 percent for special category states) and 25 percent as state contribution. A brief on the important schemes on DRR & CCA is as given below:

Table 3.11 Brief on schemes for Disaster Management

Sl.	Schemes	Brief
Plan Schemes		
1	Strengthening of Fire & Emergency Services (2009-2012)	The Centrally Sponsored Scheme was implemented at an outlay of Rs. 200 crore, with 75 percent as centrally contribution (90 percent for special category states) and 25 percent as state contribution. The objective of the scheme was to strengthen the fire services by providing equipments for search & rescue upto district level, capacity building programmes for fire service officials, awareness programmes for communities on fire emergencies and strengthening of regional training centres etc.

2	Revamping of Civil Defence (2009-2012)	In order to revamp the civil defence organization, the GoI had implemented a centrally sponsored scheme during 2009-2012 with an objective to strengthen and revitalise the Civil Defence setup in the country to play a significant role in disaster management and assist the police in internal security and law and order situations while retaining their primary role.
3	School Safety Programme	The School Safety programme was initiated with a vision to promote culture of preparedness in the schools through education, public awareness and training. Also, structural and non-structural mitigation measures are to be incorporated in certain school buildings as demonstrative units in order to promote culture of resilience. The programme is being implemented by NDMA.
4	National Earthquake Risk Mitigation Programme	The project is being implemented by NDMA in order to enhance the preparedness of the country to face earthquakes and to reduce the loss to life and property caused by earthquakes. The objectives of the programme are capacity building of construction practitioners, awareness generation, strengthening of techno-legal regime, institutional strengthening and application of research & development activities.
Externally Aided Projects		
5	GoI-UNDP Disaster Risk Management Programme (2002-2009)	The UNDP in partnership of Ministry of Home Affairs, GoI had implemented the community based disaster risk management programme between2002-2009. The programme was implemented in 176 multi-hazard district spread over 17 states. The major objectives of the programmes were: • Community based Disaster Risk management planning • Strengthening of techno-legal framework • Capacity building of the stakeholders • Awareness generation • Knowledge management and networking
6	GoI-UNDP Disaster Risk Reduction Progrmame (2009-2012)	UNDP launched a new programme for DRR in 26 states and 57 cities across the country for implementation of two components viz. Institutional Strengthening & Capacity Building for DRR and Urban Risk Reduction (URR). The focus areas of the scheme was to strengthen the institutional structure to undertake DRR activities at various levels (state, district, city, urban local body) including risks being enhanced due to climate change, and develop preparedness for recovery. The scheme was closed in the year 2012.

7	GoI-USAID Disaster Management Support Project (2002-2015)	With the support of USAID, GoI had initiated a programme to reduce vulnerability to disaster and build capacity of key institutions in India. The programme focused on strengthening of forecasting and early warning systems, technical support for computer modeling, designing & demonstration of retrofitting of buildings as models and to provide training to government officials. Of late the programme was extended to support DRR, climate change and training activities.
8	National Cyclone Risk Mitigation Programme (2011-2015)	The NCRMP programme is being implemented by the GoI in partnership with the World Bank as Centrally Sponsored Scheme. The programme is to be implemented in cyclone prone coastal States/UTs. The Project is being implemented in three phases as with 75 percent contribution by the Central Government and 25 percent contribution by the State Governments for the component consisting of structural and non-structural measures. In the first phase, the states of Andhra Pradesh and Orissa are being covered at an estimated cost of Rs. 1496.71 crore.

Source: Government of India, Ministry of Home Affairs, "State Level Programmes for Strengthening of Disaster Management in India", 2011.

Weblinks: undp.org, ndma.nic.in, nidm.nic.in, ndmindia.nic.in

From the above table, it is evident that a concrete scheme focusing on climate change adaptation is yet to be formulated.

3.3.5 National Action Plan on Climate Change (NAPCC)[25]

India, recognizing the climate change issue at global level, committed to engage in multi-lateral negotiations in the UN framework, in a constructive, positive and forward looking manner, with an objective to establish an effective, coordinated and equitable global approach. The NAPCC was developed by Prime Minister's office in 2008, identifies measures that promote out development objectives while also yielding co-benefits for addressing climate change effectively. It outlines a number of steps to simultaneously advance India's development

EIGHT NATIONAL MISSION

- National Solar Mission
- National Mission on Enhanced Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for sustaining the Himalayan Eco-system
- National Mission for Green India
- National Mission for Sustainable Agriculture
- National Mission for Strategic Knowledge about Climate Change.

[25]Government of India, Prime Minister Office, National Action Plan on Climate Change, 2008, New Delhi

and climate change-related objectives of adaptation and mitigation. The NAPCC clearly indicates that maintaining a high growth rate is essential for increasing living standards of the vast majority of our people and reducing their vulnerability to the impacts of climate change. The path of sustainable development should be guided by the following principles:

(i) Protecting the poor and vulnerable sections of society through an inclusive and sustainable development strategy, sensitive to climate change.

(ii) Achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability leading to further mitigation of greenhouse gas emissions.

(iii) Devising efficient and cost effective strategies for end use demand side management.

(iv) Deployment appropriate technologies for both adaptation and mitigation of greenhouse gases emissions extensive as well as at an accelerated pace.

(v) Engineering new and innovative forms of market regulatory and voluntary mechanisms to promote sustainable development.

(vi) Effecting implementation of programmes through unique linkages, including with civil society and local government institutions and through public-private-partnership.

(vii) Welcoming international cooperation of research development, sharing and transfer of technologies enabled by additional funding and a global IPR regime that facilitates technology transfer to developing countries under the UNFCCC.

The plan provides for eight national missions, represeting multi-pronged, long-term and integrated strategies for achieving key goals in context of climate change, namely National Solar Mission, National Mission of Sustainable habitat,National Mission for Enhanced Energy Efficiency, National Water Mission, National Mission for Sustaining the Himalyan ecosystem, National Mission for Green India, National Mission for Sustainable Agriculture and National Mission on Strategic Knowledge for Climate Change. These missions will be institutionalised by respective ministries.

3.3.6 Integration CCA-DRR within Policy-Planning Instruments

In view of the Hyogo Framework of Action (HFA), the UN-ISDR Global Joint Work programme for 2008-2009 sought to ensure that "national and local authorities are better equipped to protect environmental services in coastal areas, flood and fire-sensitive basins and mountain ecosystems". Disaster management highlights the interdependence of economy, environment and inclusive development (Srivastava, 2011). Instruments useful in the formulation of policy and/or implementation of policy are called 'policy instruments'. Certain important environmental-policy instruments directly useful in developing and implementing CCA and DRR (and their convergence) are discussed in Table 3.12.

Table 3.12 Modern Environmental-policy Instruments and their Role in DRR

Instrument	Brief Description/Examples	Role In Cca-drr Integration
• Strategic Environmental Assessment (SEA)	EIA of policies, plans and programmes	Mainstreaming CCA & DRR towards sustainable development with ecosystem approach, climate-risk mitigation and post-conflict recovery context (OECD, 2011).
• Environmental Impact Assessment (EIA(s)	Regional EIA, Country EIA, Cumulative EIA, Carrying Capacity Based Planning Process	Anticipation of hazards, risk hotspots, vulnerability – spatial contexts; Projected mitigation and capacities; Residual risks for emergency response/plan
• Life Cycle Assessment (LCA)	Environmental impacts during different stages of life-cycle of a material or a major project	Prediction and forecasting of changing patterns of hazards and risk profiles over time to cause a disaster
• Ecological-footprint	Human demand of natural resources and ecosystem services bearing to regeneration capacity	Anticipation of ecosystem fragility or biotic pressure on land & water resources that lead to hazards and aggravate disaster risks
• Environmental Legislation	Policy Statements, Acts & Rules, Ordinances, Notifications, Standards and Codes, Treaties	Provides legal support for reducing hazard precursors, vulnerability causes; offers capacity and recovery potentials, health, livelihood and sustainability.
• Auditing / Environmental Management System (EMS)	Environment audit, Water-balance audit, Safety & Health audit, Eco-auditing	Impact of a strategy or activities of an organization/facility, person or business on environment leading to hazards, vulnerability or mitigation, and related data/documentation
• Cess / Levees	Charges for natural resource exploitation, environmental services - water & clean-up, etc.	Reduces pressure on landscape and ecosystems; facilitates conservation – reduces hazard intensities, susceptibi-lity and improves response resources
• Natural Resource Accounting (NRA)	Transformation of data on environmental features for use in economic decisions	Assessment of prevailing and anticipation of vulnerability; resilience and recovery potentials
• Eco-labelling / Eco-mark	Public information on eco-friendly production and product	Promoting peoples contribution and concern to reducing hazards in nature and disaster prevention
• Environmental Taxes	Polluter pays principle; payments to curb the ill-effects on environment	Curbing environmental precursors of hazards and vulnerability; financing mitigation and sustainability

3.3.6.1 Applying EIAs for CCA and Disaster Risk Reduction

EIAs applied in the disaster prevention and mitigation phase can help integrate issues of climate change adaptation along disaster risk reduction in the planning, for instance by providing guidance on choices of mitigation methods (Gupta and Yunus, 2004), technology investments and site locations for activities. In a post-disaster context, conducting rapid EIAs (REA) helps to ensure that sustainability concerns are factored into relief, reconstruction and recovery planning stages (Gupta et al., 2002a). Blaikie et al. (2005) suggested that effective recovery and reduction of future vulnerability for local people depended on:

- Recognizing that ecosystem services provide the basis for sustainable reconstruction and reduction of future vulnerability;
- Long-term monitoring of both ecological and socioeconomic parameters and a management strategy that encourages adaptation to changing circumstances;

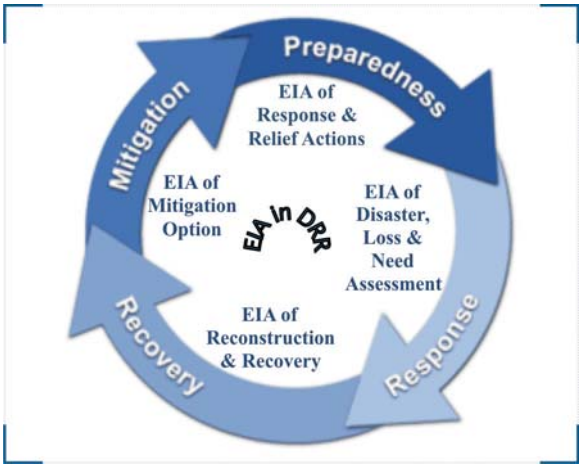


Figure 3.3 EIA applications in DRR phases (Gupta and Nair, 2012).

EIA can provide significant avenues for integrating climate change adaptation and disaster risk reduction into development through effective planning and decisions, by reporting on current and anticipated future environmental conditions and identifying drivers of change. There are many types and forms of traditional and innovative EIA options, for example:

1. EIA of projects (e.g. development projects like water resources, highway, airport, tourism, housing complex, railway, or an industrial project in manufacturing, mining, food, dairy, etc.);
2. Strategic Environmental Assessments;
3. Regional EIA (also known as Country EIA or Cumulative Impact Assessment);
4. Carrying Capacity Assessment-based developmental planning process (Gupta et al., 2004);

5. Environmental Risk Mapping-Based Developmental Planning (Gupta et al, 2002b);
6. Health Impact Assessment (as part of EIA or Risk Analysis) (Gupta et al., 1999).

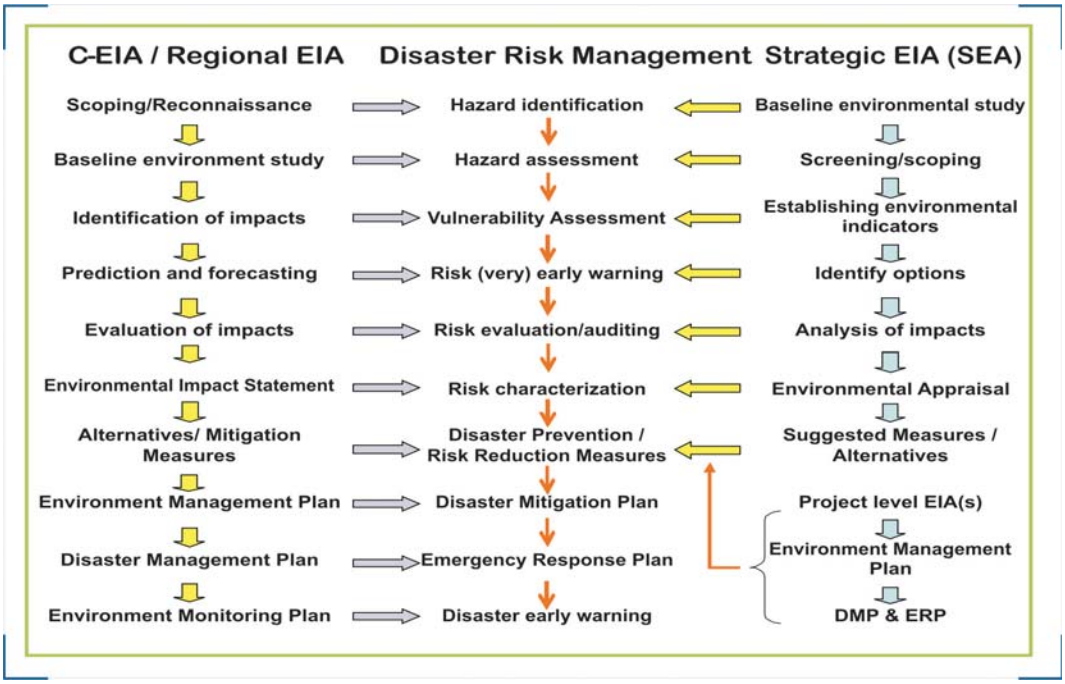


Figure 3.4 Inputs of EIA and SEA to DRR (C-EIA – Cumulative EIA; DMP – Disaster Management Plan)

Early EIAs focused primarily on project impacts on the natural or biophysical environment (such as effects on air and water quality, flora and fauna, noise levels, climate and hydrological systems). Over time, increased consideration has been given to social, health and economic aspects of environmental consequences. This trend has been driven partly by public involvement in the EIA process, and is reflected by the evolving definition of 'environment' in EIA legislation, guidance and practice, which include effects on the following (Bhatt and Khanal, 2009):

- Human health and safety,
- Flora, fauna, ecosystems and biological diversity,
- Soil, water, air, climate and landscape,
- Use of land, natural resources and raw materials,
- Protected areas and designated sites of scientific, historical and cultural significance,
- Heritage, recreation and amenity assets, and
- Livelihood, lifestyle and well-being of those affected by a proposal

The REA[26] is designed for natural, technological or political disasters, and is viewed as a best practice tool for effective disaster assessment and management. In recent years, there have been innovative applications of EIA in the context of recovery and reconstruction. For example, WWF-US and American Red Cross published the Green Recovery and Reconstruction Toolkit (GRRT)[27] which contains a dedicated module on the role of EIA in recovery. (Box 3). Moreover, the Benfield Hazard Research Centre and CARE International have developed more detailed and comprehensive guidelines on rapid environmental assessment (REA) in the context of disaster response.

The National Environment Policy (NEP) 2006 of India is an inter-sectoral policy that envisages the integration of many national policies and strategies on environment and natural resource related issues, like, National Forest Policy, 1988; National Conservation Strategy and Policy Statement on Environment and Development, 1992; Policy Statement on Abatement of Pollution, 1992; National Agriculture Policy, 2000; National Population Policy, 2000; National Water Policy, 2002, etc. National Urban Sanitation Policy, 2008, and National Disaster Management Policy, 2009, which came afterwards have significantly related to NEP (2006) on many aspects of environmental management for disaster risk reduction and post-disaster response, relief and recovery – for example, land-use, habitat protection, coastal zone, Himalayan ecosystems, climate-change, desertification, wetlands, water & sanitation, chemical risks, waste disposal, etc.

3.3.6.2 Environmental Policy and DRR - Strategic Avenue for CCA

All these policies have recognized the need for sustainable development in their specific contexts and formulated necessary strategies to give effect to such recognition. The National Environment Policy does not displace, but builds on the earlier policies, and intends to mainstream environmental concern in all developmental activities. For example, National Urban Sanitation Policy of India, 2008, provides for city sanitation plans and state urban sanitation plans addressing environmental health, pollution and waste management and prevention and control of epidemic disasters, flooding, water scarcity, etc. and directly offers CCA-DRR integration opportunities.

Sustainable human development is the core principle of NEP, as its definition of the “Environment” comprises all entities, natural or manmade, external to oneself, and their interrelationships, which provide value, now or perhaps in the future, to humankind. Environmental concerns relate to their degradation through actions of humans. Other principles of NEP which are relevant for DRR are the ‘legal liability’ and ‘preventive action’. NEP (2006) focuses on the ‘environmental resilience’ which is the key objective of climate change adaptation and disaster risk reduction.

NEP’s other emphasis which are equally important in addressing climate-change and hydro-meteorological disasters like floods, drought, cyclone, fire, landslide, tsunami, epidemics, are particularly - The National Environment Policy (NEP) 2006 of India is an inter-sectoral policy that envisages the integration of many national policies and strategies on environment and natural resource related issues, like, National Forest Policy, 1988; National Conservation Strategy and

[26]Rapid Environmental Impact Assessment Guidelines, USAID, Version 4.4, April 2005, p.5.
[27]http://green-recovery.org/?page_id=278

BOX 3.3 CCA-DRR Integration Opportunities in a National Policy

Government of India released a National Policy on Disaster Management in 2009. Introduction to disaster risks in India (1.2.1) recognized environmental degradation and climate change in increasing people's vulnerability. Paradigm Shift in Disaster Management (1.3.1) emphasizes "…to a proactive prevention, mitigation and preparedness-driven approach ….. to minimize loss of life, livelihood and property". Life forms here shall include all living beings including human, animals and plants including microorganisms, ecosystem services for livelihood and the environmental resources as an attribute of property.

Objective (2.4.1) (ii) Encouraging mitigation measures based on technology, traditional wisdom and environmental sustainability, and (iii) Mainstreaming disaster management into the developmental planning process. Developmental planning process precisely involves environmental instruments, for example, EIA and risk analysis, environmental law, ISO/EMS and other tools of taxation/incentives, environmental audit to ensure feasibility, sustainability and compatibility with environmental capacities, and therefore, recognizes environmental approach to DRR and post-disaster green recovery notions.

Section on 'Environmentally Sustainable Development' (5.1.6) reiterates the need to integrate environmental compatibility in development in general and in particular in Himalayan regions, and coastal areas, with emphasis on islands, rivers, agricultural, urban and industrial environment for ecological balances. Zonal regulations for preservation of natural habitats are recognized as important tools. It provides for Climate Change Adaptation (5.1.7) for focus on glacial reserves, water balance, agriculture, forestry, coastal ecology, bio-diversity and health in order to reduce disaster risks and vulnerability.

Public environmental services in disaster response and relief's Standard Operating Procedures (SOPs) (7.5.1) incorporates food safety, drinking water, sanitation including waste management and refers to minimum relief with links to SPHERE standards. Livelihood Restoration (9.5.1) has been recognized as key to sustainable recovery.

Institutional Arrangements (12.2.1) enumerates for the close interaction with Ministries and Departments of Agriculture, … Earth Sciences, Environment & Forests, Health, Industry, Science & Technology, and Space, and thus provides for cooperation and environmental approach to DRR, with Promotion of Research (12.3.1) emphasis on climate change and global warming.

(Source: National Policy on Disaster Management, India, 2009)

Policy Statement on Environment and Development, 1992; Policy Statement on Abatement of Pollution, 1992; National Agriculture Policy, 2000; National Population Policy, 2000; National Water Policy, 2002, etc.

National Urban Sanitation Policy, 2008, and National Disaster Management Policy, 2009, which came afterwards have significantly related to NEP (2006) on many aspects of environmental management for disaster risk reduction and post-disaster response, relief and recovery – for

BOX 3.4 CCA Approaches in National Disaster Management Guidelines

Government of India has developed specific guidelines for management of different disasters. Many approaches based on environmental knowledge and management of natural resources and ecosystems are manifested in their contents. A pilot assessment of the three guidelines*, viz. Flood, Cyclone and Drought, has been undertaken to identify ecosystem and environmental based approaches referred therein:

Reference	Flood Management Guidelines	Cyclone Management Guidelines	Drought Management Guidelines
Environmental rights	Lives and livelihoods, Livelihood systems	Livelihood	Livelihoods, Alternative livelihood
Climate-change	Snow melt, GLOF, LLOF	Climate-change and sea level rise	Climate-change impact on drought and agriculture
Natural Resource Management	Catchment area treatment, Anti-erosion measures, Coastal protection, Carrying capacity of rivers and drainage, River-bank erosion, Sediment load from river catchments, Drainage congestion, Wetlands, Integrated water resource management, Environmental-health, Encroachment of waterways, Waste management	Coastal afforestation, Aquaculture, Coastal resources, Bio-shields, Mangroves, Shelterbelt plantations, Coastal flood plain management, Coastal erosion, Crop and livestock protection, Environmental-health responses, Shelterbelt plantation monitoring	Agriculture, Land resource management - Soil-moisture, Soil amendment, Integrated Nutrient and Pest management Water scarcity and management, Reservoirs and wetlands, Groundwater, Streams, Drought prone area programme, Desert development programme, Alternative cropping, *In-situ* conservation, Horticulture, Ecosystems, Forest management, Crop phenology, Coastal & marine resources, Pollution control
Land-use / land-cover	Afforestation, Watershed management,	Alternative developmental scenario, preferred scenario, Land-use	Afforestation, Alternative land-use, Agroforestry, Biofuel cultivation
Environmental Impacts / Risk Analysis, Environmental statistics	Ecofriendly structural & non-structural mitigation, Environmental database for forecasting & damage assessment, Dam safety	Coastal zone management, EIA, Assimilative capacity estimation, Regional Environmental Management Plans	Environmental impacts of drought – environmental health risks, livelihood impacts, Environmental indicators for risk and impact assessments including databases, Environmental planning,
Environmental regulations	River regulation zone, Flood-plain zoning	National environmental policy, Coastal zone management, EIA	Environmental law
Date of release	January 2008	April 2008	September 2010

example, land-use, habitat protection, coastal zone, Himalayan ecosystems, climate-change, desertification, wetlands, water & sanitation, chemical risks, waste disposal, etc. 5.2.5 Freshwater Resources: (i) River Systems (ii) Groundwater (water use needs for drinking water, irrigation and agricultural use, hydropower, ecological services, industrial, navigation, and tourism), 5.2.7 Coastal Resources, 5.2.10 Climate Change, 5.3 Environmental Standards and Indicators, etc. (Environmental standards also need to relate to other measures for risk mitigation in the country, so that a given societal commitment of resources for achieving overall risk reduction yields the maximum aggregate reduction in risk), (26. Environmental quality is not the only source of societal risk; virtually every activity of humans is fraught with risk. Other sources of risk, which may be regulated, include safety standards for vehicles, aircraft, water, food and pharma, contagious diseases (quarantine and immunizations), etc. Risk mitigation in each case involves societal costs; these must be weighed against the potential benefits), 5.3.2 Environmental Management Systems, Ecolabeling and Certification (….. may significantly ease the public burden of monitoring and enforcement. Global harmonization of EMS however relates to achievement of national, not externally imposed emission standards).

3.3.7 Reducing Risk through Local Adaptation Practices

Climate change phenomena have largely impacted on season and frequency of floods which normally damages crops, houses, physical infrastructure and property. In order to reduce losses caused by seasonal floods, the local communities have adopted certain methods, which have been evolved by their experience. Some of the predominant methods adapted by the communities or local institutions may be as given below:

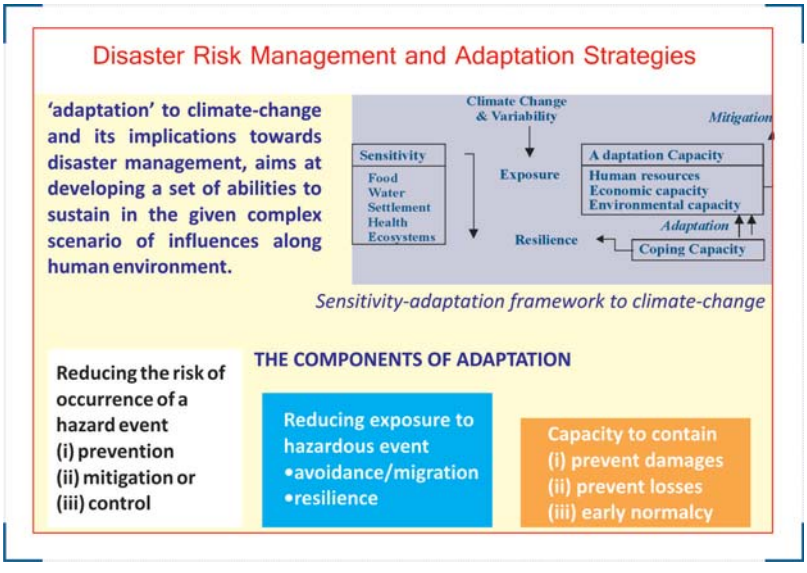


Figure 3.5 Local adaptation concerns and objectives along DRR

(i) For reducing damage of the crops

a) *Growing Paddy in the Flood Prone Areas:* The paddy plant can survive even if the flood flows over the crop for 7 days at a stretch. Only where the current is strong and uproots the plants, real damage can occur. Crop Cycle Management: To cope with the flooding, farmers have adapted the crop cycle so as to reduce crop losses. The main strategies are: pre-flood cultivation (so farmers can harvest before the floods); cropping with floods (crops which grow well even in floods); and post-flood cultivation (planting late varieties or those which withstand water logging) (Wajih, 2008).

b) *Diversification of Farming Skills:* The farmers have adapted to various methods of cultivation by growing more variety of crops, trees, plants, horticulture, mushroom cultivation and other ways of commercial farming. Local women's groups are engaged in processing activities to add value to paddy, milk, sugar cane or vegetables. However, due to lack of resources and information, the initiatives by farmers remain incompletely harnessed as yet.

(ii) For reducing damage of lives and property: The community adapted to several ways and means to reduce risk of lives, property and economy, belongings and property by construction of houses, elevate d stores, protection of the walls, drinking water and transportation and diverting the streams.

a) Shifting to Raised Places: The communities living in the flood prone areas use elevated structure to store important and valuable materials like food grains, gold, documents, and clothes, locally named as 'chakka' or 'machan' (SAARC, 2008). People also shift themselves to raised places like bamboo or tree houses temporarily.

b) *Construction of brick houses:* People have started constructing brick houses, which are considered better during floods. However, such houses are very less in numbers.

c) *Stocking fodder and preserving food:* The villagers stores food and fodder as much as they can in advance to meet the requirement of rainy season.

d) *Construction of raised platform for bamboo housing or shifting to relative houses:* these are other options which are opted by the community to be safe from the floods.

BOX 3.5 CCA Integration through Improving Disaster Response: Minimum Standards of Environmental Services in Emergencies

SPHERE (2004, 2010) is a multi-year project sponsored by NGOs, the International Red Cross and Red Crescent, donor governments, and UN agencies has produced The Humanitarian Charter and Minimum Standards in Disaster Response, with aim to improve the quality of assistance provided to people affected by disasters and to enhance the accountability of the humanitarian system in disaster response.

Includes standards for environmental services in disasters and emergencies e.g. water; sanitation; food; shelter and health and concerning other aspects of environment safeguards for human well-being, besides process standards (www.sphereproject.org).

Source: Tools for Mainstreaming Disaster Risk Reduction: Environmental Assessment (Guidance Note 7) by IFRC / Prevention Consortium available from http://www.proventionconsortium.org

e) *Alternative Source of Income Generation:* Some people especially male members of the family seeks alternative source of income in other villages to compensate the losses made by the floods. Few gets loan from a bank or some other money lender; opts for fishing, ferrying small boats or pulling rikshaw etc.

f) *Migration for livelihood:* People living in the flood prone areas are gradually shifting to other states such as Delhi, Punjab and Haryana for want of job opportunities. In fact, now people are engaged as wage labourer to generate their monthly income.

c) Other Coping Mechanisms

a) *Provision of Drinking Water Facilities:* For combating with drinking water facility during floods, the villagers uplifted their tube well at higher places. People also construct mound with mud so that animal could be kept there during floods.

b) *Warning signals:* Village community predicts warning signals through animal behaviours such as change in behaviours of reptiles, birds and inspects. Also, constant rain for 15 days or so gives signs of flooding, due to which villagers adopt to alternate ways to save them.

c) *Post repair work for housing:* The community volunteer to work for repairing and reconstruction after floods until the situation normalizes.

d) *Temporary Shelters:* the community engage themselves in construction of temporary shelters by using local available materials.

e) *Disintegration to Nuclear family:* the families are disintegrating into small size as it has become difficult for them to survive into joint family.

Box 3.6 Field Survey Analysis of Indigenous Knowledge Practices in the disaster prone areas

Steps:

(i) Identify communities (villages or urban areas), which are affected by any local disaster viz. flood, drought or cyclone regularly.

(ii) Divide the class in the groups of 4-5 persons for conducting the field work in different communities.

(iii) Design a primary survey schedule for conducting survey in the villages.

(iv) Collect the primary data on demographic composition, religion based composition, economic activities, connectivity with the town, types of roads, telecommunication facilities, power and sanitation facilities, nos. of houses, nos. of offices, schools, temples and other important buildings.

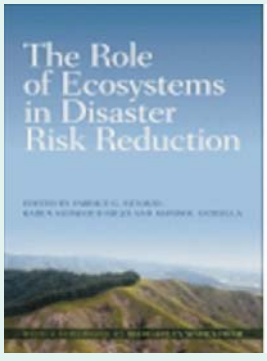
(v) Each group shall interact with about 25-30 community members through interview process to collect the data on using indigenous knowledge for local disasters management practices.

(vi) Analyse collected information in order to identify the local adaptation practices.

Box 3.7 Ecosystem-based Adaptation and ecoDRR

The Millennium Ecosystem Assessment 2005 (ME) refers to natural systems as humanity's "life-support system" providing essential "ecosystem services" for existence and socioeconomic well being. "Ecosystem-based adaptation (EBA) is the management, conservation and restoration of ecosystems to provide services that help people adapt to climate variability and change."

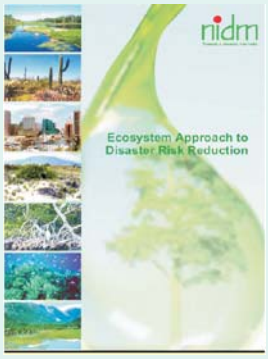
EbA integrates the use of biodiversity and ecosystem services into an overall adaptation strategy. Examples include: integrated water resource management; landscape restoration (wetlands, forests, coastal habitats); agro-forestry; protected area systems, etc.



Role of Ecosystems in DRR (Book), Recently Published by UNU, 2013

Decline in the ecosystem services influence the resources available to the people and hence lead to increasing vulnerability to hazards and also will affect the human well being.

Regulating ecosystems services are crucial for enhancing resilience of the human ecosystems by moderating the extreme weather events like heat wave and cold wave, protecting the coastal areas from tsunami and storm surges and so on.



Ecosystem Approach to DRR (Compendium of Case Studies), NIDM 2012

ECOSYSTEM SERVICES	
	PROVISIONING Food Fresh water Wood and Fibre Fuel
SUPPORTING Nutrient cycle Soil Formation Primary Production	**REGULATING** Climate Regulation Flood Regulation Disease Regulation Water Purification
	CULTURAL Aesthetics Spiritual Educational Recreational

Decline of these services exposure to hazards and resilience. Decline in the reduce the ability of the climate change. Similarly recreational services can Groups and the countries depended primarily on

can lead to increased also decrease the disaster regulating systems also human beings to adapt to decline in cultural and affect the Small Island where the economy is tourism.

It is argued that reducing disaster risk in First, ecos ystems, such as coastal systems, can ecosystems contribute to two important ways. wetlands, forests and reduce physical exposure to natural hazards by serving as natural protective barriers or buffers and thus mitigating hazard impacts. Well-managed ecosystems can provide natural protection against common natural hazards, such as landslides, flooding, avalanches, storm surges, wildfires and drought.

"Hard" infrastructure can be a risky, costly adaptation option, can compromise the ability of ecosystems and people to adapt, resulting in maladaptation. Local solutions are needed. Nature-based approaches that promote human rights and build socio-ecological resilience: ecosystem-based adaptation.

From the above, it may be noticed that coping strategies evolved by the communities are very diverse and depends upon the physical, social and cultural organization, technology and economy. Indigenous knowledge can help government to develop people's friendly plan for mitigation by empowering communities through their local systems. Integrating such mitigation measures into disaster management and development planning will enhance credibility of the plans amongst the people and increase participation of local community and their ownership, which will facilitate easy implementation of the plan.

3.3.8 Adaptation by Local Institutions

Over the years, with the increased frequency of local disasters such as floods, droughts & cyclones, the departments viz. District Collectorate Office, Water & Irrigation Department, Fire Services, Police Services and other line departments have taken certain initiatives to increase their response time. In fact, with the increasing awareness about disaster management, departments have also prepared their plans for preparedness and mitigation. However, such initiatives remains standalone from the district level collective initiative of DM planning and a cohesive response is missing. Such adaptation practices shall be integrated with the regular disaster management plan. Following exercise will initiate a discussion between various departments for promoting a collaborative thinking towards CCA and DRR and its integration into DM planning. In fact, the open dialogue will help the departments to develop their capacities towards integrating planning for climate change, disaster management into development planning, which is overall objective of this exercise.

Box 3.8 Case Study: Gorakhpur district

A workshop for having an open dialogue with the line departments on DRR & CCA was held in Gorakhpur district as a part of pilot study. The open consultative workshop facilitated an interactive session with the line departments on department-wise plans on disaster management. Some of the observations noticed during the workshop are as follows:

(i) Most of the plans were response centric and not updated based on existing situation.

(ii) Documentation on flood response or best practices was absent.

(iii) The open dialogue facilitated sharing of good initiatives and documentation of best practices resulted to information collection and compilation.

(iv) Guidelines for the departments on climate change and disaster management plan were drafted. These guidelines were circulated to the departments for its finalization and implementation.

(v) Department-wise gaps and recommendations were identified.

The outcome of the consultative workshop was further discussed and finalized in the second round of the workshop. Further these information were added in the District Disaster Management Plan.

Box 3.9 Classroom Exercise

In order to identify the role of local institutions and line departments in managing disaster situations occurring due to floods, a district level meeting shall be kept. Since, it is assumed that all the representatives from various line departments are already present in the training programme, adaptation by local institutions shall be discussed as open dialogue in the class room session. This exercise shall help in preparing department-wise disaster management plans. Each representative from the department shall be given chance to make a presentation and explain their preparedness, mitigation and response plan during flooding season. Also, the group shall identify the gaps which required attention of the district authorities.

3.4 Quiz Session

(i) Are you aware about the natural and anthropogenic hazards?

(ii) What do you understand by mainstreaming of Climate Change Adaptation and Disaster Risk Reduction?

(iii) What are the impacts of climate change on frequency of disasters?

(iv) Do you think that climate change has changed rainfall pattern in your area? If yes, what are those impacts?

(v) Has your department adopted any preventive or mitigation measures for coping with flood or drought situation?

Learning Unit-C

MAINSTREAMING DRR & CCA CONCERNS INTO DEVELOPMENT PLANNING

4

A Case Study of Gorakhpur, Uttar Pradesh

4.1 Introduction

In the previous learning units, we have already seen that several measures and approaches have been adopted at national, state and local level to address climate change and disaster risk reduction issues and mainstreaming in developmental plans. At national level, various steps have been taken to mainstream DRR measures into development planning. However, concrete approach for including CCA & DRR concerns into district level/local level planning is yet to be evolved.

This Learning Unit has been designed to share the experience of Gorakhpur district in which the DRR & CCA concerns have been mainstreamed into development planning as a part of research project done by NIDM, ISET and GEAG. Based on the case of Gorakhpur, an approach has been developed (generic), which could be replicated in other districts of India in order to integrate CCA & DRR concerns into development plans.

4.2 Learning Objectives

(i) To understand the tools, techniques and methods adopted in Gorakhpur district for mainstreaming CCA and DRR.

(ii) To learn the processes of mainstreaming DRR into departmental level development plans.

(iii) To draw a strategy for mainstreaming DRR & CCA concerns at district level plans.

4.3 Training Methods, Duration and Faculty

The unit may be delivered using multiple approaches including Shared Learning Dialogues (SLDs) between stakeholders, group work, field visit, institutional gap analysis etc. This unit is focused on facilitating district level departments to coordinate with each other so as to formulate district level and departmental DM plans. The unit will also help in capacity building of the trainees in various aspects of mainstreaming CCA & DRR into district level disaster management planning. This learning is divided into three parts viz. design of the case study, process involved in the case study and drawing of generic guidelines for mainstreaming CCA & DRR concerns to development planning. This unit will also take 8-10 hours to complete, which means 1 to 1.5 days.

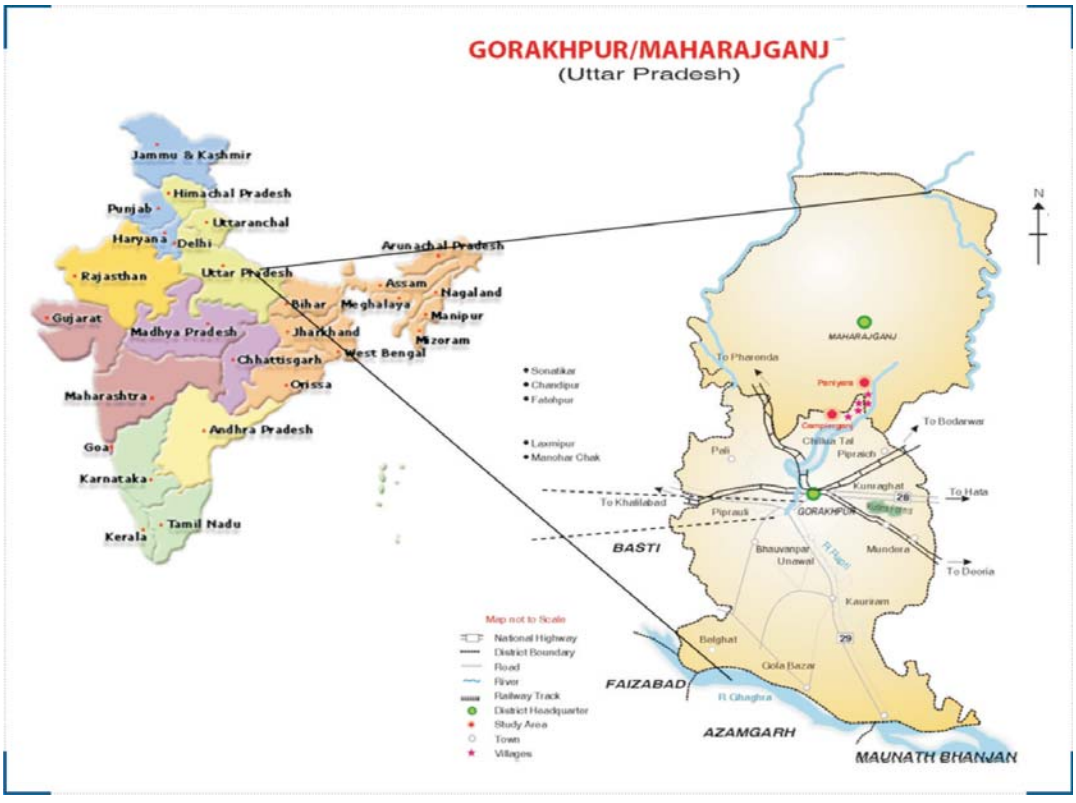


Figure 4.1 Map of Gorakhpur, UP

4.4 Target Groups/Audience

The representatives of governmental, non-governmental, academic and research institutes have participated in the workshop. Some of the departments may be as given below:

- Participating Government Departments/Agencies: Nagar Vikas (Urban Development)- Local Bodies, Jal Nigam; Environment & Forest, Dairy Development, Revenue, Fisheries, Horticulture, Indian Meteorological Department, Remote Sensing Application Centre, Health, State Disaster Management Authority, Rural Development, State Institute of Health & Family Welfare, Animal Husbandry.
- International and Non-governmental Organizations: Inter Agency Group, SSK, AIM, CARE INDIA, ISET etc.
- National Institute of Disaster Management.

4.5 Objectives, Data Sources and Methods Adopted

The study revolves around mapping of key departments, analysis of vulnerabilities under climatic

conditions, analysis of institutional arrangements and analysis of current planning process. As may be seen from the Table 4.1, in order to meet out the objective specific methodology was developed and implemented. A broad glimpse of objectives, data sources and methods adopted for conducting the study is given as below:

Table 4.1 Objectives, Data Sources and Methods Applied in Gorakhpur Case

Objectives	Data Sources	Methods
To understand the factors within the flood prone districts of Gorakhpur that contributes to resilience or exacerbates vulnerability.	• Review of secondary sources exposure and fragility of key systems considering the recent events of floods of 2007 and 2008. • Reports generated on climate change by ISET/GEAG or any other local agency. • Past records on failures across the systems/ departments	• Mapping of key departments such as water supply, health, power, communication, housing and agriculture etc. at district level. • Analysis of their vulnerability in terms of exposure, fragility or failure rates and risks to flooding under current and projected changes in climate. • Overlaying of the climate change projections on current vulnerability mapping for systematic resilience planning process developed by ISET/ ACCRN for evaluation of impact of Climate Change on key systems. • Analysis of climate change impacts which causes failure of key natural or social systems.
To 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 DRR and CCA practice	• Collection of District Disaster Management Plans of the districts of Uttar Pradesh • Collection of byelaws, codes and regulatory framework of various sectors. • Collection of information on various ongoing sectoral programmes	• Institutional analysis through shared learning dialogue, workshops, policy roundtables and interactive learning sessions with the government organizations (including DDMA, SDMA, NDMA and allied government departments and Ministries) at state and national levels. • Desk review of District Disaster Management Plan of the selected district/s including review of ongoing sectoral schemes, techno-legal framework.

		• Understanding relationship between departmental programmes and reduction/ exacerbation of climate vulnerability by using Causal-loop-diagramming tool of GEAG
To build capacity of scientists and engage young researchers from two key academic institutions for promoting DRR and CCA by seeking contributions development and sharing of knowledge.	• Identification of academic and research institutes located in the concerned district/s.	• Creating a pool of young scientists and researchers engaged in academic institutes and universities. • Engaging researchers as interns and involving them in regular interactive sessions organized through workshops in universities on the theme of integration of DRR and CCA in development processes.
To document and disseminate the lessons learned from the case study		• Documentation and dissemination of knowledge obtained from objectives (1 to 3) through Shared Learning Dialogues (SLDs) as a tool for combining local knowledge with global science on climate change • Workshops at district, state and national levels.

4.5.1 Downscaling Climate Change Projections for Gorakhpur and Extreme Event Analysis[28]

A detail downscaling of Climate Projections was carried out for Gorakhpur's rainfall in 2050's. Subsequently, to capture changes in extreme precipitation events Intensity-Duration-Frequency (IDF) curves were developed for key duration and intensities (Opitz-Stapleton, 2013).

Methodology

Global circulation models (GCMs) project how the climate might change, given changes to these human-controlled factors, which are accounted for as representative concentration pathways (RCPs) in the IPCC 5th Assessment models (van Vuuren et al., 2011). Because no single model can project exact changes to an area's climate, it is necessary to use projections from multiple GCMs, each driven by a couple of RCPs, to capture the possible range and trend of changes. Furthermore, climate is a description of an area's average weather over a period of time, typically 30 years.

[28]The section presents key excerpts from the "Policy Brief" ISET produced in 2013.

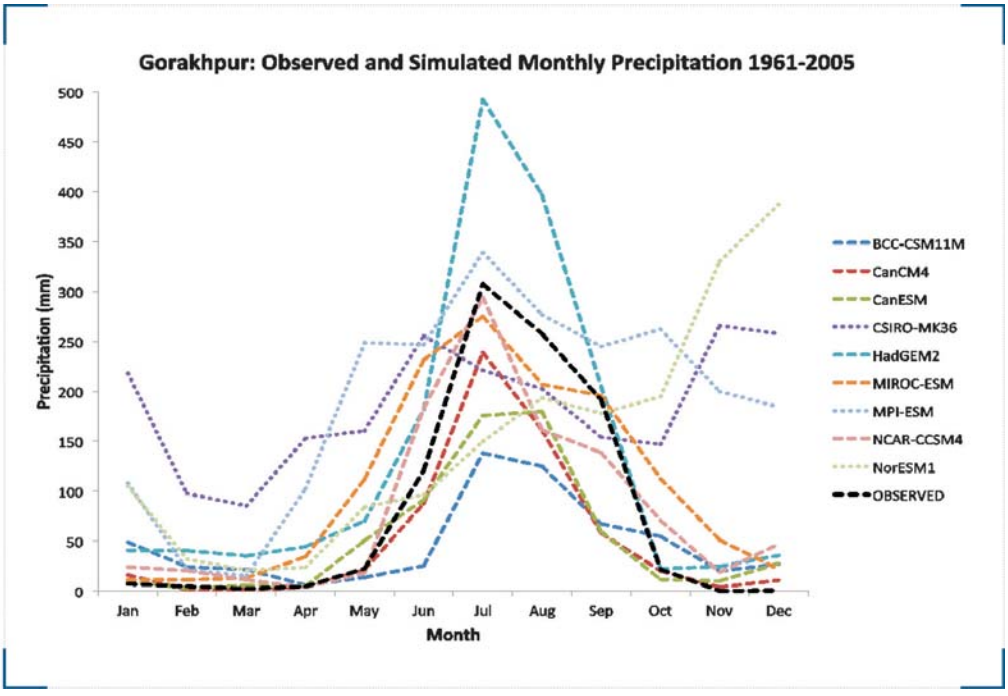


Figure 4.2 Climate Change Projections for Gorakhpur (*Based on Technical Brief produced by ISET*)

Therefore, climate change anal ysis involves comparing the statistics of an area's particular weather as projected for a period in the future that is at least 30 years long, with a period of historical climate of the same length.

With these two caveats, ISET downloaded daily precipitation data (simulated historical and projected future) from the CMIP5 Multi-Model Ensemble Database: http://pcmdi9.llnl.gov/esgf-web-fe/. The ensemble set of projected daily rainfall was formed using projections from 9 GCMs, each running the RCP 4.5, for a total of 9 ensemble members against which to compare future rainfall with past rainfall. Simulated historical rainfall by the GCMs covered the period 1961–2005, whereas future projected rainfall spanned 2006–2055. At the time of data access from the CMIP5 Database (November 2012), only projections from RCP 4.5 were available, precluding the use of other RCPs for comparison.

A 'super' historical daily rainfall dataset for Gorakhpur was compiled and interpolated from a number of data sources due to the incompleteness of available records. Additional historical data covering the period of 1961–2005 were accessed from the APHRODITE project database (Yatagai et al., 2012) to validate and supplement gaps in the sparse station records. The data were cleaned and underwent several quality control checks that are standard for meteorological and climatological data.

Six out of the nine GCMs were able to reasonably replicate the seasonality of Gorakhpur's rainfall,

as well as the median and standard deviation (the first and second moments) of monthly rainfall totals. Hence, these 6 models were used for Climate Projections downscaling.

Possible Changes to Gorakhpur's Extreme Rainfall by 2050s

In the future, according to a range of a combination of different climate model and emission scenarios, the intensity and frequency characteristics of rainfall events for Gorakhpur are likely to change. For 24-hour and longer duration events of all return periods, all of the models project a potential increase in precipitation intensity. That all models are in agreement about the direction of the change in trend (increasing) provides some measure of confidence in the projections.

Table 4.2 Percentage change in rainfall intensity for 24-hour duration events between multi-model projected (2006-2055) and historical observed (1961-2005) events for Gorakhpur.

	Return Period				
Model	2 Year	5 Year	10 Year	20 Year	50 Year
HadGEM2	9.6%	6.1	4.3	3.4	2.2
NCAR-CCSM4	10.0	16.1	19.1%	20.1	22.5
BCC-CSM1.1M	20.4	22.7	23.4	24.1	24.8%

Table 4.3 Percentage change in rainfall intensity for events of select durations (1, 12 and 24 hours) for select return periods (2, 10 and 50 years). Percent changes are derived from comparing IDF curves from multiple GCMs for the future (2006-2050) with historical IDF curves (1961-2005).

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

There is greater uncertainty (larger spread in the model projections and/or unclear direction of increasing or decreasing intensity) in how climate change might alter short duration events—those lasting less than 12 hours—than in events lasting longer than 12 hours as shown in the table and the following figures. Some of this uncertainty is due to gaps in the historical observation records that affected the statistical distributions and will improve with time through efforts such as GEAG's automatic weather station, and coordination with the local Indian Meteorological Department office. Other sources of uncertainty are due to natural climate variability (not influenced by climate change), the differences between GCMs in how they model interactions between the land, ocean, and atmosphere to influence climate, and the fact that no-one really knows what the world's population, energy use, greenhouse gas emissions, and land-use will look

like in 2050. This is why it is important to use projections from multiple models, and build cities smartly to reduce natural hazard risks.

4.6 Processes Adopted for Mainstreaming CCA & DRR concerns into Development planning

The project team has carried out mainstreaming of DRR and climate change concerns into district level development planning through the following steps. A brief description of activities under each step has been given as following:

4.6.1 Initial Planning

Initial planning was carried out in close consultation with various line departments at district level. The project team provided support to the district administration for maintaining coordination and preparation of departmentwise plan. This support helped government to establish regular communication and sharing of information between research team and district level departments. A database was prepared by collecting data on frequency and history of natural hazards and their impacts for analysis of issues and gaps at various levels.

Flood Risk Management in Gorakhpur

The District Disaster Management Authority [DDMA] in Gorakhpur is responsible for preparation and implementation of the Disaster Management Plan for the district. The DDMA has a Disaster Management Cell, which comprises representatives of all important state line departments for coordination and implementation of Disaster Management Plans. The Irrigation Department is responsible for maintenance of embankments and flood warning systems. Under the State Water Policy, it is also doing water resources planning and management at the catchment level and resettlement and rehabilitation in case of floods and droughts. The State Department of Medical Health and Family Welfare, through the District Hospital (in coordination with GMC and DDMA), is responsible for public health management in case of outbreak of diseases in the aftermath of floods.

4.6.2 Project Initiation workshop

After completing initial planning, a project launching workshop was organised by the GEAG and DDMA with the concerned line departments. The meeting was chaired by the Additional District Magistrate of Gorakhpur. Almost 54 government officials from various departments participated in the workshop and expressed their view point of implementation of the pilot project. Representatives of NIDM, ISET and GEAG made presentation on the various conceptual and technical aspects of DRR and Climate Change and its integration with sectoral plans.

Key decisions of the workshop were-

(i) Additional District Magistrate (Finance and Revenue) was nominated as nodal Officer in-charge of the project from the district.

(ii) GEAG to provide technical support in DDMA to manage the project and to coordinate with the various line departments.

(iii) A Project Steering Committee at the district level was proposed to be constituted with the officers/members from DDMA, Municipality, Gorakhpur Development Authority, representatives from GEAG and NIDM.

(iv) A quarterly meeting to review the progress of the project and preparation of action plan was proposed to be organised in association with GEAG.

(v) It was decided to organise separate meeting with each of the line department to make department-wise disaster management plans.

During the project launching workshop, it was observed that the government officials from various line departments were not have clarity about to process of preparation of Disaster Management plan with the concerns of climate change inculcated into it. After initial consultation dialogue, it was decided to provide additional dialogues with the line departments to facilitate the DM plans with climate change perspective.

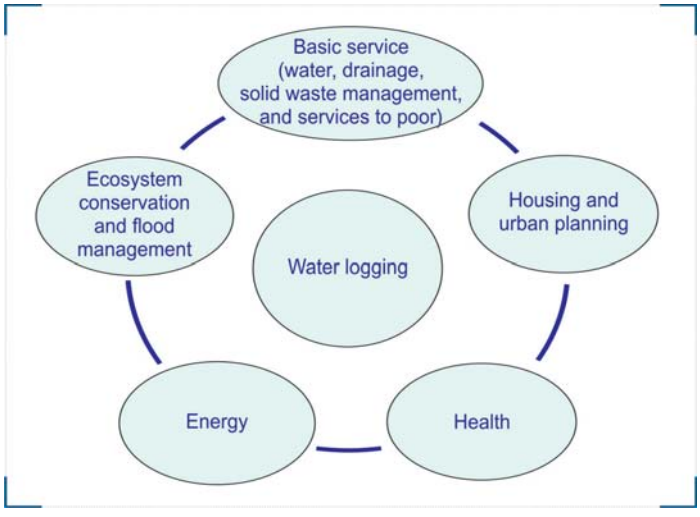


Figure 4.3 Options to address water logging risks. Sharma et al, 2012.

4.6.3 Department-wise workshops

As decided in the consultative workshop, a series of department-wise workshops were organised for creating an understanding of climate change issues in disaster management planning and collection of data for sectoral assessment. Departments such as Panchayati Raj, Irrigation and Flood Control, Nalkup, Jal Nigam, Minor Irrigation, Animal Husbandry, Forest, Public Works, Agriculture, Education, and Health were separately covered in a series of events. A detailed discussion on the roles and responsibilities of line departments during various facets of disasters were discussed.

Climate Change - District Disaster Management and Reduction Management

Workshop to prepare Guidelines with different Departments Problems & Opportunities

Workshop Schedule

Sl. No.	Date	Department
1	21 September 2012	District Development Officer's Office
2	24 September 2012	Chief Medical Officer Office
3	26 September 2012	District Basic Education Officer and District School Inspector
4	28 September 2012	District Agriculture Officer
5	01 October 2012	Chief Veterinary Officer
6	04 October 2012	Zilla Panchayat Raj and Jal Nigam
7	08 October 2012	Flood Division/Flood Division-2 and Drainage Division
8	10 October 2012	Saryu Nahar Division, Tube well Division, Irrigation Department

District Development Officer

- Development programmes should be designed keeping in mind the local disaster threats and disaster reduction should be an integral part of the development programmes
- Lack of adequate human resources adversely affects the quality of construction works and hence creates hurdles
- The policies and schemes are made taking into consideration the whole area. Within these areas, there are smaller areas which have specific problems which are completely ignored. Formulation of policies/schemes should also take into consideration these smaller problems.
- Lack of information on the amount of money given to the beneficiaries under the disaster relief fund

Flood Division/ Flood Division-2 & Drainage Division

- Less number of work supervisors in the departments
- As per the SDRF guidelines, the embankments should be re-established within 45 days. It becomes very difficult to get the work completed within this deadline.
- It is important to activate the flood protection committees
- The embankments get cracked in summer season due to high temperatures. Situation becomes even worse if this is immediately followed by heavy rains.
- Pressure of the embankments increase when all of a sudden, water increases in the rivers which are on the way to Nepal
- Lack of support and cooperation from Tehsil and local government

Agriculture / Agriculture Protection Department

- Crops get affected due to untimely rains, extreme cold and hot temperatures.
- The situation of agriculture godowns at the block level are not god due to which flood water enters the godowns and causes damage to the chemicals stored there.
- Water logging in the crop fields causes problems in controlling pests, insects and diseases. Also, application of pesticides in water logged areas cause water pollution.
- Problems in storage of crops.
- Soil structure gets affected and amount of silt increases
- Floods affect crop cycles
- Works related to land leveling and constriction of farm bunds for the conservation of soil can be done under the MGNREGA programme.
- For enhancing the soil fertility, it will be appropriate to promote formation of vermicompost and nadep compost structures under the MGNREGA programme.

Figure 4.4 Review and Findings – Shared Learning Dialogues

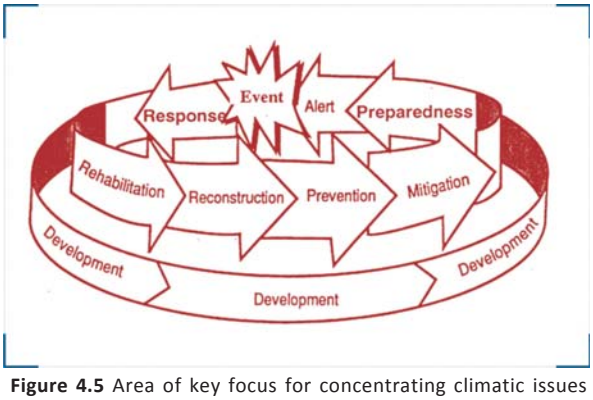


Figure 4.5 Area of key focus for concentrating climatic issues pertaining to DRR in the activities of each Department at District level (in SLDs)

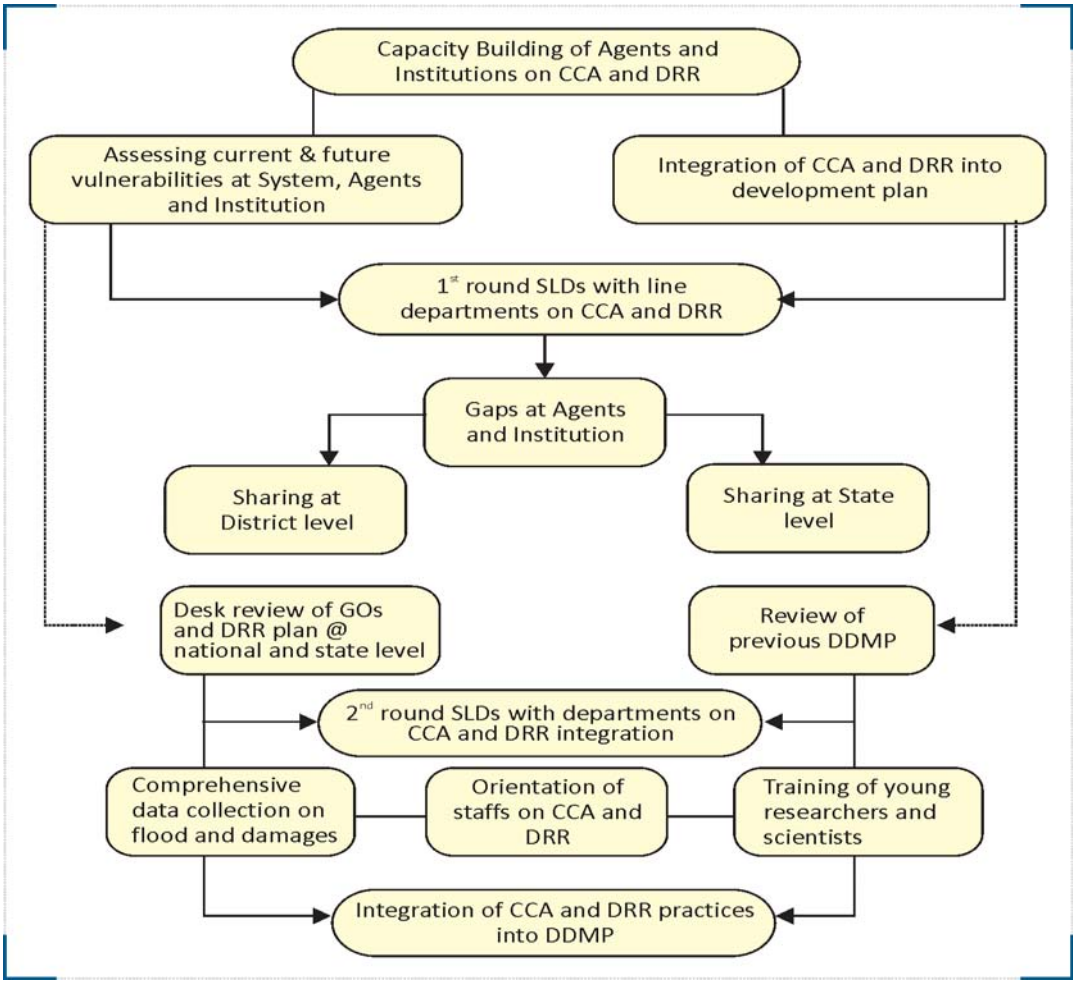


Figure 4.6 Outline of Integration of Climate change adaptation and disaster risk reduction practices in District Disaster Management Plan

4.7 Department-wise Information Collection and Analysis

Various information related to occurrence of floods, response, flood damage, relief distribution, planning document and relevant governmental orders were collected for analysis of gaps at departmental level. The department-wise plans were reviewed and it was observed that departmental plans were primarily response centric. These documents were not updated nor based on updated records available at the time of developing the document. There was neither document available on flood response/relief or any best practices at departmental level in the district.

Group Work:

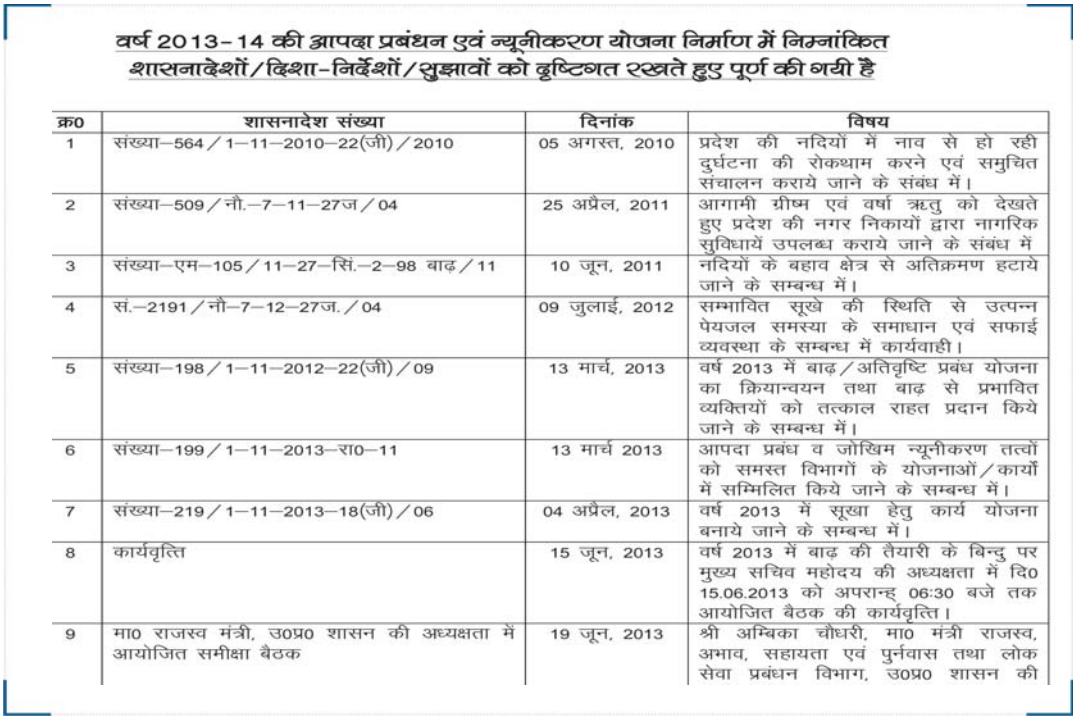
(A group exercise for identification of roles and responsibilities and presentation. This will facilitate preparation of department-wise DM plan)

Name of the Department	**FORMAT** Group No.	
Roles & Responsibilities		
	Existing	Proposed
1. Preparedness		
2. Mitigation		
3. Response & Relief		
4. Rehabilitation		

Note : A table indicating department-wise g aps and recommendations is annexed.

4.8 Preparation of Guidelines

Based on the findings of department-wise meetings and collection of information, a guiding document for preparation of departmental plan (along with planning formats) was prepared. A



वर्ष 2013-14 की आपदा प्रबंधन एवं न्यूनीकरण योजना निर्माण में निम्नांकित शासनादेशों/दिशा-निर्देशों/सुझावों को दृष्टिगत रखते हुए पूर्ण की गयी है

क्र0	शासनादेश संख्या	दिनांक	विषय
1	संख्या–564/1–11–2010–22(जी)/2010	05 अगस्त, 2010	प्रदेश की नदियों में नाव से हो रही दुर्घटना की रोकथाम करने एवं समुचित संचालन कराये जाने के संबंध में।
2	संख्या–509/नौ.–7–11–27ज/04	25 अप्रैल, 2011	आगामी ग्रीष्म एवं वर्षा ऋतु को देखते हुए प्रदेश की नगर निकायों द्वारा नागरिक सुविधायें उपलब्ध कराये जाने के संबंध में
3	संख्या–एम–105/11–27–सिं.–2–98 बाढ़/11	10 जून, 2011	नदियों के बहाव क्षेत्र से अतिक्रमण हटाये जाने के सम्बन्ध में।
4	सं.–2191/नौ–7–12–27ज./04	09 जुलाई, 2012	सम्भावित सूखे की स्थिति से उत्पन्न पेयजल समस्या के समाधान एवं सफाई व्यवस्था के सम्बन्ध में कार्यवाही।
5	संख्या–198/1–11–2012–22(जी)/09	13 मार्च, 2013	वर्ष 2013 में बाढ़/अतिवृष्टि प्रबंध योजना का क्रियान्वयन तथा बाढ़ से प्रभावित व्यक्तियों को तत्काल राहत प्रदान किये जाने के सम्बन्ध में।
6	संख्या–199/1–11–2013–रा0–11	13 मार्च 2013	आपदा प्रबंध व जोखिम न्यूनीकरण तत्वों को समस्त विभागों के योजनाओं/कार्यों में सम्मिलित किये जाने के सम्बन्ध में।
7	संख्या–219/1–11–2013–18(जी)/06	04 अप्रैल, 2013	वर्ष 2013 में सूखा हेतु कार्य योजना बनाये जाने के सम्बन्ध में।
8	कार्यवृत्ति	15 जून, 2013	वर्ष 2013 में बाढ़ की तैयारी के बिन्दु पर मुख्य सचिव महोदय की अध्यक्षता में दि0 15.06.2013 को अपरान्ह 06:30 बजे तक आयोजित बैठक की कार्यवृत्ति।
9	मा0 राजस्व मंत्री, उ0प्र0 शासन की अध्यक्षता में आयोजित समीक्षा बैठक	19 जून, 2013	श्री अम्बिका चौधरी, मा0 मंत्री राजस्व, अभाव, सहायता एवं पुर्नवास तथा लोक सेवा प्रबंधन विभाग, उ0प्र0 शासन की

Figure 4.7 DDMP related Government Orders (Issued by District Disaster Management Authority, Gorakhpur)

consultation exercise was again organised for the fourteen departments to review the guidelines, formats and contents. Afterwards, a compiled document on department-wise planning for disaster management was introduced by the district authority, which has got overwhelmed response from line departments.

संख्या– 199 / 1–11–2013–रा0–11

प्रेषक,

जावेद उस्मानी,
मुख्य सचिव, उ0प्र0 शासन /
मुख्य कार्यपालक अधिकारी,
उ0प्र0 राज्य आपदा प्रबंध प्राधिकरण।

सेवा में,

1. समस्त प्रमुख सचिव / सचिव,
   उ0प्र0 शासन।
2. समस्त मण्डलायुक्त
   उत्तर प्रदेश।
3. समस्त जिलाधिकारी,
   उत्तर प्रदेश।

राजस्व अनुभाग – 11 दिनांकः 13 मार्च, 2013

विषयः– आपदा प्रबंधन व जोखिम न्यूनीकरण तत्वों को समस्त विभागों के योजनाओं / कार्यों में सम्मिलित किये जाने के संबंध में।

महोदय,

उपर्युक्त विषय पर मुझे यह कहने का निदेश हुआ है कि राष्ट्रीय आपदा प्रबंध अधिनियम, 2005 के धारा 39 में किये गये प्राविधानों के अनुसार, राज्य सरकार के विभिन्न विभागों को अपने विभागीय योजनाओं एवं कार्यों मे आपदा जोखिम न्यूनीकरण के तत्वों का समावेश किया जाना आवश्यक है। इस अधिनियम की धारा 39 के प्राविधान निम्नवत हैः–

"39. It shall be the responsibility of every department of the Government of a State to—
(a) take measures necessary for prevention of disasters, mitigation, preparedness and capacity-building in accordance with the guidelines laid down by the National Authority and the State Authority;
(b) integrate into its development plans and projects, the measures for prevention of disaster and mitigation;
(c) allocate funds for prevention of disaster, mitigation, capacity-building and preparedness;
(d) respond effectively and promptly to any threatening disaster situation or disaster in accordance with the State Plan, and in accordance with the guidelines or directions of the National Executive Committee and the State Executive Committee;
(e) review the enactments administered by it, its policies, rules and regulations with a view to incorporate therein the provisions necessary for prevention of disasters, mitigation or preparedness;
(f) provide assistance, as required, by the National Executive Committee, the State Executive Committee and District Authorities, for—
(i) drawing up mitigation, preparedness and response plans, capacity building, data collection and identification and training of personnel in relation to disaster management;
(ii) assessing the damage from any disaster;

Figure 4.3. State Government Order regarding mainstreaming DRR in Plans/Activities of all Departments (screenshot)

4.8.1 State level sharing workshop

SDMA is the apex body at state level that controls, guide and monitor every district level Disaster Management of Authority. The process of preparation of Disaster Management plan was shared at the state level dialogue which was attended by Hon'ble Minister of Revenue and Relief Commissioner of Uttar Pradesh at Lucknow. Officials from 24 flood prone districts of UP state participated in the workshop. The prime objective of sharing the process of preparation of disaster management plans was not only to educate the district level officials but also to get the process approved at state level so that it could be implemented in other

districts with the help of SDMAs. SDMA issued letters to districts to follow the process document of DDMP prepared for Gorakhpur and prepare plans similar to the Gorakhpur district.

4.8.2 Second Round of Dialogues with Departments

Second round interaction was organized with the all the departments to facilitate planning and documentation. Almost 15 dialogues were organised with the departments during April to May under the guidance of the District magistrate. As a result of these dialogues, various points related to climate change were integrated in department level plans. Further, these plans were integrated in district plan document.

4.9 Young Researchers Training Programme

In order to build capacity of the young academicians and researchers, a young research training programme was organised. The Training programme aimed to build capacity of young researchers and scholars from reputed institutions for promoting DRR and CCA by seeking contribution to development and sharing of knowledge. The expected outcomes of the programme may be:

- Development of common understanding in context of current development scenario.
- First-hand experience on process of understanding on assessment of community level vulnerabilities, sectoral gaps and scope of integration of CCA and DRR.
- Creation of a cadre of trained young researchers on CCA & DRR issues.

Process adopted:

(i) All important academic and research institutes in the district were listed down.

(ii) Seminars and workshops were engaged to attract young researchers in the field.

(iii) A pool of young scientists and researchers engaged in academic institutes and Universities was created.

(iv) Eligible researchers were appointed as interns and were involved in regular interactive sessions organized through workshops in universities on the theme of integration of DRR and CCA in development processes.

This programme was a success in the district and was well received by young researchers.

4.10 Major Achievements

The project has demonstrated achievements at various levels, may be as given below:

(i) Development of District Disaster Management Plan with inclusion of component of climate risks and adaptation strategies.

(ii) Countered horizontal gaps by engaging departments in developing plans on DRR & CCA.

(iii) Understanding of process and gaps at Department level and corrective actions taken in planning process and content of DDMP which will possibly contribute to state and national level planning framework in context of DRR & CCA.

(iv) Understanding the use of Communication, Coordination and Convergence at organisational level, right from the planning to implementation level.

(v) Recognition of importance of DDMP preparation and need of considering CCA issues in the process at district as well as state level by officials and ministers.

4.11 Conclusion and Way Forward

This case study was one of its own kinds where capacities of district level officials were developed in understanding the concepts of CCA & DRR and preparation of department level disaster management plan. It was observed that, if suitable capacities of the officials are built, they are receptive towards bringing change in the system. In fact, involvement of young scientists in the planning process was another remarkable achievement of the project, which resulted in capacity building of young generation for mainstreaming CCA and DRR into development planning. Towards the end of the successful implementation of the project at Gorakhpur, the State Government itself promoted the process document and encouraged other districts of Uttar Pradesh to follow the document for integration of DRR & CCA issues into development planning.

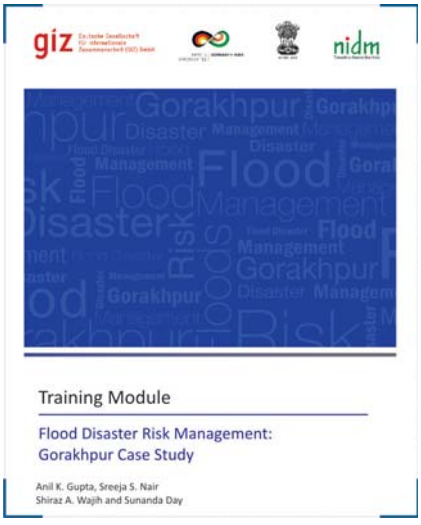


Figure 4.9 Case Study Module (developed using work/study of GEAG and ISET)

4.12 Approach for Integration of DRR and CCA issues in Development Planning of a District

On the basis of above case study of Gorakhpur, (UP) a generic methodology has been developed for mainstreaming DRR & CCA concerns into development planning in any district. This approach can be suitably modified based on the local conditions and administrative structure in the state/ district.

The essential steps of the approach are as given below:

Identify the Focal Point for the Exercise

First and foremost task of promoting mainstreaming DRR & CCA concern is to identify the focal point who could take the responsibility of executing the task. As per DM Act, 2005, DDMA has been setup in each district to deal with the issues of disaster risk reduction. It is recommended that District Authority shall be the nodal authority to take up the task and promote discussions

for integrating DRR & CCA into development planning. As done in the case of the State of Uttar Pradesh, a Government Order from the SDMAs/State Government may be issued to the DDMAs/ District Administration to adopt the process simlar to that do of the Gorakhpur district, UP, and facilitate similar exercise in their respective districts as well.

Creation of Institutional Setup

Identify nodal officer in-charge of the task from the DDMA/District Administration and develop a cell/team under his/her supervision, which will contribute towards managing database, analysis and facilitate workshops and open dialogues between line departments and district administration. A Project Steering Committee under the chairmanship of District Collector along with the members from the various line departments shall be constituted, which shall meet quarterly to formulate strategy for implementation of activities related to integration of DRR and CCA issues into development agenda of the district. The committee will also decide the milestones and review achievements in a time bound manner

Sensitize the Representatives of the Line Departments

As line departments are not much aware about the impacts climate change and DRR issue, their disaster management plans are more response centric than addressing preparedness and mitigation measures. It is essential to sensitize and train them in certain aspects of DRR and CCA. The platform can also be used to collect the data related to history of hazards/disasters, frequent & prominent disaster of the concerned district, corrective measures taken by the departments and their response/management plans.

Department-wise Workshops for Specific Dialogues and Information Collection

After creating awareness amongst the line departments, Project Steering Committee shall draw an action plan to conduct department-wise meetings. Project Cell at DDMA shall coordinate with the departments to fix up meetings along with the officers of the specific department. These meetings shall aim to not only create a common understanding between the department and DDMA but also to identify the schemes and projects being run by the department which can be used to integrate issues of DRR & CCA. Also, departmental disaster management plan will be reviewed in the meeting and discussion upon identification of gaps and recommendations for filling up the gaps shall take place. Such meetings can be facilitated with the help of NIDM/SIDM or specialized agencies such as GEAG and ISET. This exercise shall focus on the collection of data, revision of department-wise disaster management plans and integration of CCA & DRR issues into development planning.

Integration of Department-Wise Plans into District Level DM Planning

Another important step for taking the exercise towards finalization is to integrate all the departmental plans. For this, a second round of dialogue shall be conducted with the line departments, in which department-wise final discussion on the gaps and recommendations shall be done. DDMP shall be updated including concepts and issues of mainstreaming DRR and climate

change issues into development planning. Also, a district level development plan shall be prepared including local issues on DRR and climate change.

Mainstreaming of DRR and CCA issues into Development Planning

Mainstreaming DRR & CCA concerns into development means radically implementing DRR & CCA measures through development plans, ongoing schemes and projects under the aegis of various departments/sectors, so that it becomes a normal practice for emanating risks of natural hazards to be fully institutionalized within an agency's activities and developmental agenda of a district/region. In this step, concerns related to disaster management have been addressed by the departments. Also, concerns which could be addressed through the ongoing schemes have been identified. In the second dialogue, a document on District level Development Plan should be developed by integrating departmental development plans into a single document.

Finalization of the documents

Towards finalization of the documents, it is essential to obtain the approval of competent authority. The district authority shall conduct a meeting with the representatives of the state government, line departments and specialized agencies so that documents could be thoroughly reviewed and then finalized. The finalized document, shall be sent to the implementing partners/stakeholders for implementation in various sectors. The Project Steering Committee shall meet regularly to appraise the progress of the development plan proportion.

4.13 Developing Research Capacity

A best practice from the in project at Gorakhpur district is conduct of a training programme for students academic institutes and Universities on Development Planning with DRR & CCA in Concerns. state training programme may have following objectives:

(i) To create sustainable capacities of young students to take up of new research

(ii) To create cadre of trained researchers at local level on CCA & DRR.

(iii) To develop skills on identification of sectoral gaps and integration of CCA & DRR into development planning.

These researchers shall be involved in the entire exercise as interns or supporting technical staff.

4.14 Final Outcomes

In the end, the final outcome of the complete exercise will be as follows:

(i) Integration of CCA concerns in District Disaster Management Plan (DDMP)

(ii) Mainstreaming of DRR & CCA concerns into departmental plans and ongoing schemes/ projects.

(iii) Preparation of District level development plan with inclusion of DRR and CCA concerns.

Box 4.1 Group Work

Design a strategy on Mainstreaming DRR & CCA concerns into district level departmental planning of your District.

Hints:

(i) Divide the class into 4 groups. Provide relevant material such as district profile, institutional setup, database on line departments, agencies and NGOs, types of disasters, district DM Plans, district map etc.

(ii) Each group shall conduct preparation strategy for the same district, so that innovative ideas could be evolved.

(iii) The groups shall identify the nodal in-charge, stakeholders viz. line departments, local technical agencies, NGOs and academic institutes which could be involved into the planning process. Propose an institutional structure for implementation of the project including monitoring committee, project cell and approving committee etc. Identify the schemes/ projects running within the departments and propose measures for mainstreaming DRR & CCA concerns.

(iv) Identify visible gaps and issues in the DDMPs considering various options on systems, institutions and agents (see CRF illustrations Annexure 5). Also, draw a time-line chart with achievable mile stones.

Annexure1:

List of Hazards (categorized as per High Power Committee Report)

Sl.No.	Categories	Hazards
1	Water and Climate Related Hazards	i) Floods and drainage management ii) Cyclones iii) Tornadoes and hurricanes iv) Hailstorm v) Cloud burst vi) Heat wave and cold wave vii) Snow avalanches viii) Droughts ix) Sea erosion x) Thunder and lightening
2	Geological Related Hazards	i) Landslides and mudflows ii) Earthquakes iii) Dam failures/ bursts iv) Minor fires
3	Chemical, Industrial and Nuclear Related Hazards	i) Chemical and industrial disasters ii) Nuclear disasters
4	Accident related Hazards	i) Forest fires ii) Urban fires iii) Mine flooding iv) Oil spills v) Major building collapse vi) Serial bomb blasts vii) Festival related disasters viii) Electrical disasters and fires ix) Air, road and rail accidents x) Boat capsizing xi) Village fire
5	Biological related Hazards	i) Biological disasters and epidemics ii) Pest attacks iii) Cattle epidemics iv) Food poisoning

Source: High Powered Committee Report, GoI, 2000

Annexure 2:

Gaps and Opportunities Analysis

Departmental Shared Learning Dialogue organized by DDMA and GEAG: Climate Change - District Disaster Management and Risk Reduction Workshop to prepare Guidelines with different Departments: Problems & Opportunities. Below are the details of department wise identified gaps and recommendations.

Departments	Gaps identified	Recommendations to departments
Rural Development/ District Administration	• Lack of adequate human resources adversely affects the quality of construction works and hence creates hurdles • Lack of information on the amount of money given to the beneficiaries under the disaster relief fund • Due to the lack of information on disaster management relief fund, the funds are not utilized comprehensively.	• Development programs should be designed keeping in mind the local disaster threats and disaster reduction should be an integral part of the development programs • Coordination between governmental planning and development projects should be established • MGNREGA scheme should be utilized for cleaning of rivers and removal of silt. Several others developmental works can be done through MNREGA funds in peace time.
Health Department	• Connecting road to PHCs/CHCs gets damaged during rainy season • Long duration power cuts creates problems in attending the patients in the PHCs/CHCs • Women employees feel unsafe working in the late evening hours in the centers because there is no adequate arrangement of lights of the roads • Caution before floods are not given due to which adequate preparations are not made • Most of the health centres get water logged due to heavy rain.	• In the construction of PHCs/CHCs, it is important to include flood resistant techniques along with earthquake resistant techniques. • Training on Do's and Dont's at times of disaster should be organized for the members of Village Health and Sanitation Committee
Education	• School premise is often used for shelter and relief centers during flood disaster. • Lack of knowledge in students regarding basic disaster preparedness and safety. • Many of the schools are not located at elevated land	• In the construction of schools, it is important to include flood resistant techniques along with earthquake resistant techniques • Site selection for construction of schools should be done at a safe and elevated place • Information and awareness on use and management of fire extinguishers installed in the schools should be given not only to the teachers but also to accountants and employees of other departments • In the school campus, the Mark-II hand pumps should have proper water outlet arrangements • -Mock programs in the schools should be organized on relief and management of disasters • In order to assess the amount and extent of damage caused by disasters, proper formats should be developed in which the data should be filled in by the schools. After the assessment of the formats, flood relief fund should be released to the schools immediately. • Tree plantation program can be actively promoted through schools. • At times of disaster, alternate education options should be arranged so that the fear of disaster from children's mind is overcome. • Students beyond the strength capacity should not be accommodated in a class. • The schools should not be used as disaster relief camps or for storage of food grains. This adversely affects education.

Departments	Gaps identified	Recommendations to departments
Agriculture / Agriculture Protection Department	-Crops get affected due to untimely rains, extreme cold and hot temperatures. -The situation of agriculture go-downs at the block level are not god due to which flood water enters the go-downs and causes damage to the chemicals stored there. -Water logging in the crop fields causes problems in controlling pests, insects and diseases. Also, application of pesticides in water logged areas cause water pollution. -Problems in storage of crops. -Soil structure gets affected and amount of silt increases -Floods negatively affect crop cycles	-Works related to land leveling and constriction of farm bunds for the conservation of soil can be done under the MGNREGA program. -For enhancing the soil fertility, it will be appropriate to promote formation of vermin compost and Nadep compost structures under the MGNREGA program. -Effective coordination should be established between soil conservation department, agriculture department and agriculture protection department. -There is a need to bring about awareness among farmers from the flood affected areas to use flood resilient varieties of crops.
Animal Husbandry	-Due to the lack of water in summer season owing to extremely high temperatures, the animals are not able to maintain their internal bodily temperatures because of which problem of infertility is increasing. -Problems of fodder for livestock increases because of water logging -Problem of shelter for animals arises due to continuous rainfall at a time which leads to water logging -Water logging leads to problems of mosquito/fly breeding which causes diseases -At times of flood, it becomes a huge task to shift animals to safer place -Animals suffer because of unavailability of medicines at veterinary hospitals -Unavailability of disaster kit -Death of animals due to outbreak of infectitious diseases such as FMD, HS, BQ, etc. -Lack of fodder for animals is also becoming a cause for their deaths.	-Vaccination of animals should be before flood time. It will especially prevent the deaths of animals from foot and mouth diseases. -Shelter and fodder for animals should be the part of relief package -Medicine availability at village level and awareness in people can save many of the animal's lives.
Jal Nigam	-Most of India Mark-II pumps are not active during disaster -Funds for installing hand pumps at elevated lands are not sufficient enough - The plan for establishing sewerage system for the city of Gorakhpur is ready but due to non-allocation of funds, the work has not yet started - Problems of villages and cities are different and hence the solutions too. The work remains incomplete because there is only one person who looks after both the problems – that of villages and cities too. For every scheme, there should be adequate number of regular staff to carry out the tasks	-The India Mark-II hand pumps should be installed at a high elevated and safe place. -This can be done with the support of Panchayats. -There is a fixed amount for establishing hand pumps. Therefore, it is important that in flood affected areas, support of MGNREGA should be sought for installation of hand pumps are high elevated areas. -While construction of buildings, problem of flood should be kept in mind as people think about rainwater harvesting and problem of earthquake -To enable access of water to entire villages and wards, arrangement of adequate funds under the old programs should be done for the renovation of all the water sources. -The Panchayat (Local body) should get the defunct hand pumps repaired in time. It should not waste time for depending upon Jal Nigam for a long period of time. -For the implementation of schemes, the funds should be made available before the actual work on the ground starts. In many cases what happens is that the

Departments	Gaps identified	Recommendations to departments
		construction work gets started but the funds are not released because of which there are unnecessary delays in the completion of work and the cost of materials and labour goes on increasing. Adequate funds should be made available for maintenance of drinking water projects. Faster availability of funds from the disaster relief scheme In times of disaster, in order to expedite the process of relief and rehabilitation, system of quick communication, decision and implementation should be established
Panchayati Raj Department	-Lack of resources for repairing of destroyed public properties - Lack of active involvement in planning and implementation process -Capacity building of Pradhans and other members are not done at local level. -Lack of infrastructures and other facilities	-Assessment of flood and other disasters in local areas should be done according to which provision for funds should be made for the maintenance of Panchayat bhawan and other public buildings. -Awareness should be brought about among villagers to keep their village surroundings clean and usage of individual, school, Anganwadi and community toilets. Awareness campaigns can be done by using motivation groups, nukkad natak, media, etc. Amount of materials should be also increased. -For the repair of India Mark hand pumps for drinking water, funds under Panchayat Raj, 13th Finance Commission should be increased. -Trainings should be given to cleaning workers, block and village level motivators. -Assessment of damage caused to public properties should be done and accordingly the demand for renovation/repair of these properties should be made. This should be implemented at the Gram Panchayat level for which adequate funds should be allocated.
Flood Division and Drainage Division	- Less number of work supervisors in the departments - The embankments get cracked in summer season due to high temperatures. Situation becomes even worse if this is immediately followed by heavy rains. -Pressure of the embankments increase when all of a sudden, water increases in the rivers which are on the way to Nepal -Lack of support and cooperation from Tehsil and local government	-As per the SDRF guidelines, the embankments should be re-established within 45 days. It becomes very difficult to get the work completed within this deadline. -It is important to activate the flood protection committees
Saryu Canal Division	-Heavy rains ruptures the branch-lets of canals which hampers irrigation facilities -At some places, heavy rainfalls lead to water logging in the villages due to which the canal requires to be closed and opened from some other area. This adversely affects irrigation -Depletion in the groundwater levels due to which the discharge from tube wells is decreased -Low electricity voltage because of which the tube wells get defunct In the Kharif season, the pipelines are destroyed at some places by the farmers	-Construction and re-establishment related works are done during a fixed time. If the funds are not made available at this time, then it gets very difficult to get the work done. -Considering the geographical and environmental situation of an area, it is important to place bans and restrictions on cultivation of water-intensive crops such as peppermint, etc. -Diversity in cropping systems should be strictly implemented -The structural designs of various infrastructures which are related to canals are done as per the orders of respective departments. These infrastructures should also be made earthquake proof and flood resistant. -As a mechanism to adapt to drought and flood situations, various rivers should be joined so that they prevent floods and help in increasing the groundwater table levels -It is important to have convergence between various departments and Panchayats in order to prevent encroachment

Annexure 3:

Department-wise workshops – Proceedings

जलवायु परिवर्तन के दृष्टिगत जिला आपदा न्यूनीकरण योजना निर्माण, गोरखपुर

आपदा के पूर्व/आपदा के दौरान/आपदा के पश्चात् की तैयारियों का सुझाव

(नलकूप विभाग–प्रथम व द्वितीय एवं सरयू नहर खण्ड–प्रथम संयुक्त)

दिनांक : 10.05.2013 को आयोजित बैठक की कार्यवृत्ति

1. नलकूप खण्ड–प्रथम के सहायक अभियन्ता, गौरीशंकर गुप्त द्वारा मानसून के दौरान बखिरा झील के जल स्तर के बढ़ जाने से जल बहाव के कारण आस–पास क्षेत्रों में होने वाले भारी जलजमाव को रोकने हेतु एवं जनुपयोगी उक्त जल का सदुपयोग कर सिंचाई में प्रयोग हेतु मानचित्र के माध्यम से एक प्रस्ताव प्रस्तुत किया गया, जिसे सिंचाई विभाग के अनुसंधान एवं नियोजन मण्डल, लखनऊ में प्रेषित किया जा सकता है।

2. जिन स्थानों पर नहरों के माध्यम से सिंचाई नहीं की जा सकती, ऐसे स्थलों पर नलकूप विभाग द्वारा भूगर्भ जलों का दोहन कर सिंचाई की व्यवस्था सुनिश्चित करायी जाती है, कम से कम जमीन का उपयोग कर के।

3. बाढ़ एवं अतिवृष्टि के कारण विभाग के एवं अन्य ससाधनों के क्षति का आंव सं0–199/1–11–2013–रा0–11 दिनां पर) परियोजना सम्मिलित की जायेगी।

4. विभाग द्वारा जिला प्रशासन से प्राप्त नि अत्यधिक गर्मी पड़ने के कारण पशु–पं जाने हेतु कार्य किया जायेगा।

5. अप्रैल व मई माह में नदियों में जल स्त जाता है, जिससे जलापूर्ति कार्य में बाध की मुख्य धारा से पानी उठाकर विभा व्यवस्था की जाती है, जिसके कारण व्यवस्था के लिए परियोजना तैयार कर प्रेषित किया जायेगा।

6. मानसून से पूर्व एवं पश्चात् नहरों की आदि योजनाओं के माध्यम से कराया उ

7. पंचायतों के साथ समन्वय स्थापित कर की सुरक्षा हेतु समुदाय को जागरूक एव

8. किसी प्रकार के अवैध कटान एवं नहरों व पुलिस प्रशासन को वस्तुस्थिति से अ

9. आपातकाल के दौरान सिंचाई व्यवस्था महोदय एवं विद्युत विभाग से समन्वय स्थापित कर सुचारू रूप से विद्युत आपूर्ति सुनिश्चित कराया जायेगी।

10. विभाग द्वारा विभिन्न जलाशयों/नहरों/तालाबों/पोखरों आदि के जलभराव कार्य का विवरण निर्धारित प्रारूप पर प्रत्येक माह/आवश्यकतानुसार आपदा कार्यालय को उपलब्ध कराया जायेगा।

Annexure 4:

Agenda and Reporting format of Shared Learning Dialogues

Integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA):
Understanding Flood risk and Resilience in Eastern India

Workshop Agenda

Time Frame	Particular	Methodology	Points to be Cover	Facilitation
10:00-10:30	Registration			
10:30-10:40	Welcome & Introduction		Objectives need to be clear whether this is training or workshop	Dr. Shiraz / Prof Verma
10:40-11:00	Project – Intro	PPT		Gautam Gupta
11:00-11:20	Climate Change & Impacts	PPT		Prof. S.S.Verma
11:20-11:40	Department Organogram	Open Discussion	• Draw & Place one chart in meeting hall	*One of the participants to draw organogram on the board. Others to guide*
11:40-12:30	Roles & Responsibilities – according to the structure	Group Work Presentation & Discussion	• Who does what on organogram, *details of schemes programmes* & how does reporting take place (top to bottom and bottom to Top)	*Small groups – each working on the specific positions and their roles/resp. First see how many positions are there and then divide the number of people into groups. Ask which group would want to work on which position*
12:30-01:00	Presentation in plenary and discussions		Presentations by each group and immediate discussions	*Facilitator to take note of missing points that did not come up individual group work but highlighted in plenary*
01:00-01:15	Impact assessment	Group work facilitated by GEAG/Gautam	Impact of flooding (1998/2008/10) Impacts, disruption of services, functions, damages, on/to department's various infrastructure. Nature and extent of damage- spatial and communities	
01:15-2:00	Lunch Break			

POST Lunch Sessions

2:00-02:45	What are the factors within the Departmemnt's structure, management, policies, programmes that contribute to resilience or exacerbate vulnerability?	Group Work Presentation & Discussion	Physical Infrastructure Damage & reasons for it • Causes related to Planning, Operation, Maintenance and monitoring • Flood preparedness and response • Availability of resources (human and finance, equipments, etc.) • Issues of design (spare capacity, Hints: • quality, • design, • codes of construction, • maintenance, • lack of preparedness/prevention, • lack of prior information on arrival of flood • lack of redundancy & flexibility • lack of knowledge • lack of co-ordination between departments • Availability of Resources (Human & Kinds) • Level of Damages in coming years due to frequent disasters or change in climate.	*Again divide these into specific questions (4 nos) and divide the group into four groups. Each group can then work on two questions they are most comfortable with*
02:45-03:00	Tea Break			
03:00-03:30	Actions/ Responses needed to address the above issues as per the following categories: (1) Systems (2) Agents (3) Institutions	Group Work Presentation & Discussion	• Capacity Building of key players • Access to Resources Human/ Knowledge/Financial can be improved • Inter linkages between various departmental programs/ schemes • Need some exposures • Best practices documentation	*These should be divided into specific questions and ask groups to put details on one each*
03:30-03:45	Presentation plenary		*Each group to stand in their table and tell two most important aspects they wrote for the group to comment upon and agree/disagree*	
03:45-04:00	Tea and Vote of Thanks			

Shared Learning Dialogues

Integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA):
Understanding Flood risk and Resilience in Eastern India

Workshop Reporting Format

Date: _____ Department: _____
# of Participants: _____

Facilitator: _____ Co-facilitator: _____

A. Department Organogram

B. Roles & Responsibilities – According to the Structure

C. Departmental Reporting Mechanism (Top to Bottom and Bottom to Top)

D. Factors within the region that Contribute to resilience or exacerbate vulnerability

a. Impact of Flooding (1998/2008/10)
b. Causes of physical infrastructure damage
   i. Quality,
   ii. design,
   iii. codes of construction,
   iv. maintenance,
   v. lack of preparedness/prevention,
   vi. lack of prior information on arrival of flood
   vii. lack of redundancy & flexibility
   viii. lack of knowledge
   ix. lack of co-ordination between departments
   x. Availability of Resources (Human & Kinds)
c. Changes in pattern & extent of damages in the projected climate scenario.

E. Prioritize the Factors between

a. System
b. Agents
c. Institutions

F. Development Programs being implemented by the Department

G. How implemented programs can reduce the vulnerability (Action's needed)

i. Capacity Building of key players
ii. Access to Resources Human/ Knowledge/Financial can be improved
iii. Inter linkages between various departmental programs/ schemes
iv. Need some exposures
v. Best practices documentation

H. Specific Policy innovation's

i. Modification in their departmental practices
ii. Rules & Regulation
iii. Laws
iv. Policies
v. Reporting Mechanism

I. Action Plan

Signature & Date

1. **Facilitator**
2. **Co-facilitator**

Integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA):
Understanding Flood risk and Resilience in Eastern India

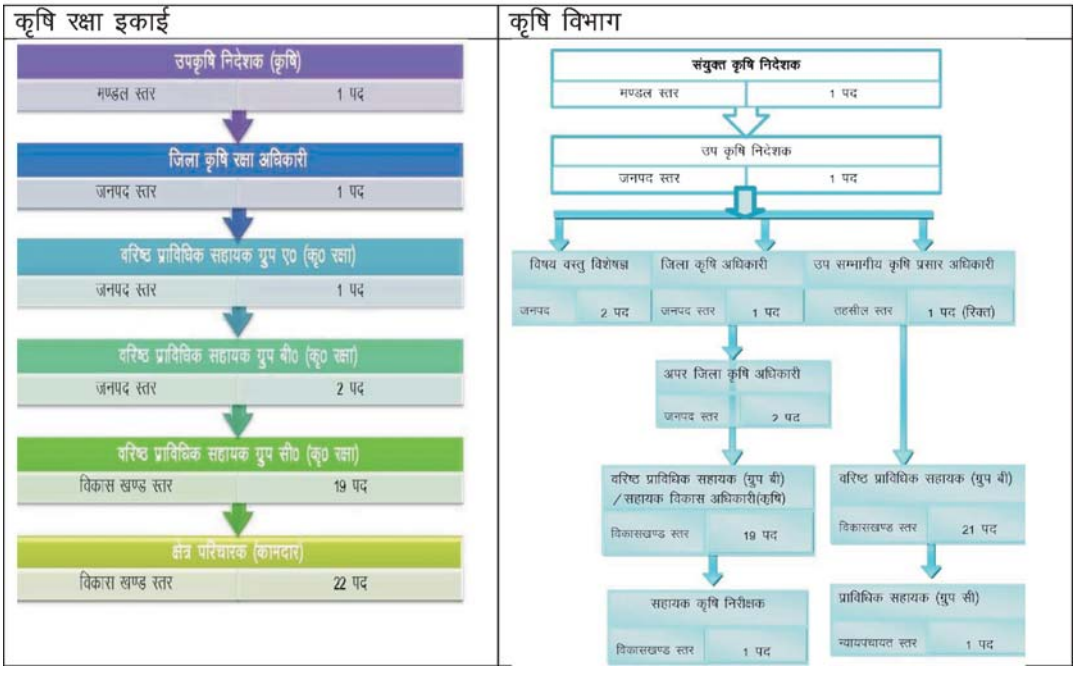
Report of Workshop

Date: 28 सितम्बर, 2012 **Department:** कृषि विभाग

No. of Participants: 19

Facilitator: श्री अजय कुमार सिंह **Co-facilitator:** अंजू पाण्डेय

1. विभागीय तंत्र की आरगैनोग्राम



2. कार्यभार / उत्तरदायित्व

कृषि रक्षा इकाई	कृषि विभाग
उपकृषि निदेशक (कृषि) • प्रदेश स्तर से दिये गये निर्देशों का अनुपालन • प्राप्त निर्देशों को जनपद स्तर तक लागू कराने का निर्देश। • दिये गये निर्देशों की मासिक समीक्षा • मण्डल स्तर पर रसायनों की व्यवस्था (तबादला आदि) जिला कृषि रक्षा अधिकारी • मण्डल स्तर से प्राप्त निर्देशों को विकासखण्ड स्तर तक निर्देश एवं अनुपालन कराना • दिये गये निर्देशों की समीक्षा • जनपद के अन्दर विभाग एवं प्राइवेट में रखें रसायनों की गुणवत्ता निर्धारित कराना। वरिष्ठ प्राविधिक सहायक ग्रुप ए0 (कृ0 रक्षा) • जिला कृषि रक्षा अधिकारी के निर्देशों को विकास खण्ड स्तर पर अनुपालन कराना। • जनपद की विभागीय निर्देशों एवं प्राइवेट कीटनाशी विक्रेताओं के रसायन की गुणवत्ता सुनिश्चित करना। वरिष्ठ प्राविधिक सहायक ग्रुप बी0 (कृ0 रक्षा) • जनपद में प्राप्त रसायनों का विकास खण्ड स्तर तक पहुँचना • जनपद अधिकारी से प्राप्त निर्देशों को विकासखण्ड स्तर तक पहुंचाना एवं उनसे प्राप्त सूचनाओं कों एकत्र करना। प्राविधिक सहायक ग्रुप सी0 (कृ0 रक्षा) • विकास खण्ड स्तर के किसानों की समस्याओं को दृष्टिगत रखते हुए रसायन की सलाह देना एवं उपलब्ध करवाना। • विकासखण्ड स्तर की फीट एवं न्यायाधियों की सर्वेक्षण कराना तथा जनपद स्तर पर पहुंचाना। क्षेत्र परिचारक (कामदार) • कृषि रक्षा रसायनों के भण्डार पर रखरखाव करना। • प्राविधिक सहायक ग्रुप सी के निर्देशों का पालन करना।	1.संयुक्त कृषि निदेशक • मण्डल में सम्मिलित जनपद के अधिकारियों का बैठक लेना। 2. उप कृषि निदेशक • जनपद स्तर के योजनाओं का संचालन एवं अपने से संबंधित अधीनस्थ कर्मचारियों का अनुश्रवण 3. विषय वस्तु विशेषज्ञ • जनपद स्तर अपने अधीनस्थों के साथ बैठक कर योजनाओं के विषय में पाक्षिक समीक्षा करना। 4. जिला कृषि अधिकारी • जनपद स्तर पर कृषि निवेश की व्यवस्था एवं अधीनस्थों के साथ बैठक कर समीक्षा। 5. उप सम्भागीय कृषि प्रसार अधिकारी • उपसम्भाग (तहसील) स्तर पर प्रसार कर्मियों को प्रशिक्षण देना एवं समीक्षा करना। 6. अपर जिला कृषि अधिकारी • जनपद में कृषि निवेश एवं उर्वरक की गुणवत्ता बनाएं रखना । 7. वरिष्ठ प्राविधिक सहायक (ग्रुप बी) /सहायक विकास अधिकारी(कृषि) • विकास खण्ड स्तर पर कृषि निवेश एवं उर्वरक व्यवस्था तथा समय–समय पर मेला एवं उर्वरक व्यवस्था तथा समय–समय पर मेला एवं गोष्ठी करके कृषकों को तकनीकी जानकारी प्राप्त कराना । • कृषि के अतिरिक्त राष्ट्रीय कायक्रमों की व्यवस्था कराना। 8. वरिष्ठ प्राविधिक सहायक (ग्रुप बी) • तहसील स्तर पर पाक्षिक बैठक में भाग लेना एवं अपने अधीनस्थ प्रसारकर्मियों के कार्य का अवलोकन। 9. सहायक कृषि निरीक्षक • विकास खण्ड स्तर पर कृषि निवेश की व्यवस्ता की जिम्मेदारी होती है। 10. प्राविधिक सहायक (ग्रुप सी) • न्याय पंचायत स्तर पर प्रसार कार्यकर्ता हैं। कृषि तकनीकी जानकारी कृषकों को देते हैं एवं समस्याओं का समाधान उपसम्भाग स्तर पर या जनपद स्तर पर या कृषि वैज्ञानिकों द्वारा भेजकर कराया जाता है।

3. विभागीय रिपोर्टिंग तंत्र

निर्देशों एवं सूचनाओं का प्रसरण में विभागीय आरगेनोग्राम के अनुसार क्रम में अनुसरण होता है।

4. **Resilience** में क्षेत्रीय सहयोग के तत्व

Impact of Flooding (1998/2008/10) (बाढ़ का प्रभाव)

- विकास खण्ड स्तर पर स्थित कृषि रक्षा गोदामों की दशा ठीक न होने के कारण कई जगह गोदामों में पानी भर जाता है जिससे रसायनों के क्षति होने की सम्भावना बढ़ जाती है।
- रास्ते अवरूद्ध होने के कारण कई जगह के कृषक अपनी समस्या कृषि रक्षा इकाई विभाग को नहीं दे पाते है जिससे वास्तविक कीट/रोग का पता नहीं चल पाता है।
- अधिक पानी लगने से कीट एवं रोग का प्रकोप बढ़ जाता है।
- जलजमाव के कारण कीट/रोग के नियंत्रण में कठिनाई आती है साथ ही जलजमाव के बाद अधिक मात्रा में कृषि रखा रसायनों की आवश्यकता बढ़ जाती है जो जल प्रदूषण का कारण बनता है।
- जलजमाव के कारण फसलों के विकास हेतु उर्वरकों का प्रयोग करने में काफी कठिनाई आती है।
- फसलों के एकत्र/भण्डारण करने में समस्या आती है।
- उत्पादित फसल सामग्री का रखरखाव की ''समय सीमा'' कम हो जाती है जिससे उत्पादन नष्ट होने का भय बना रहता है।
- उपभोक्ता तक उत्पादित सामग्री पहुंचाने में कठिनाई आती है।
- बाढ़ आने से फसल चक्र प्रभावित होता है।
- मृदा संरचना प्रभावित होती है, खराब हो जाती है अथवा सिल्ट अधिक बढ़ जाता है।
- विभागीय गोष्ठी, कृषक मेला, फसल प्रदर्शन में रूकावट आती है।

a. Causes of physical infrastructure damage (भौतिक सुविधाओं का नुकसान के कारण)
   i. Quality, (गुणवत्ता) – हॉ
   ii. design, (आकारकी) – हॉ
   iii. codes of construction, (निर्माण की वैधता) – हॉ
   iv. maintenance, (रख–रखाव) – हॉ
   v. lack of preparedness/prevention, (पूर्व तैयारी का अभाव) – नहीं
   vi. lack of prior information on arrival of flood (बाढ़ आने की पूर्व सूचना का अभाव) – हॉ
   vii. lack of redundancy & flexibility (अनुपूरक या वैकल्पिक व्यवस्था में कमी) – हॉ
   viii. lack of knowledge (ज्ञान का अभाव) – हॉ
   ix. lack of co-ordination between departments (विभिन्न विभागों के सहयोग में कमी) – हॉ
   x. Availability of Resources (Human & Kinds) (साधनों की उपलब्धता – मानव या अन्य) – हॉ

b. Changes in pattern & extent of damages in the projected climate scenario. (आगामी जलवायु परिदृश्य में होने वाले नुकसान की मात्रा एवं प्रतिरूप) – जलवायु परिवर्तन के कारण आपदाओं की गहनता एवं बारमबारताओं में वृद्धि होगी।

5. विभागीय विकास कार्यक्रम **How implemented programs can reduce the vulnerability (Action's needed)** (जोखिम को कैसे विकास कार्यक्रम न्यून कर सकता हैं)

- सर्वप्रभम भूमि संरक्षण अनुभाग से तलरूपता बनाये रखने के लिए समतलीकरण एवं मेड़बन्दी कार्य।
- रेनकट नियंत्रण हेतु वनीकरण एवं घास लगाने का कार्य भूमि संरक्षण अनुभाग द्वारा कराये जाता है।
- जल निकासी हेतु जल निकास नालियों की व्यवस्था
- कृषि निवेश (बीज, उर्वरक एवं दवाएं) का अनुदान पर व्यवस्था कराना।
- भूमि की उर्वरा शक्ति बढ़ाने हेतु जैविक एवं कार्बनिक खादों के निर्माण हेतु वर्मी एवं नाडेप कम्पोस्ट का निर्माण अनुदान पर व्यवस्था किया जाता है।
- दलहनी, तिलहनी एवं खरीफ तथा रबी फसलों का क्षेत्र की स्थिति अनुसार निःशुल्क प्रदर्शनों का आयोजन।
- दलहनी, तिलहनी एवं खरीफ तथा रबी फसलों में मिनीकिट प्रदर्शन का निःशुल्क आयोजन
- कृषि यंत्रों का अनुदान पर उपलब्ध कराया जाता है :
  - पम्पसेट पर अनुदान – 10000/– रू0
  - सीडड्रील पर अनुदान – 15000/– रू0
  - रोटावेटर पर अनुदान – 30000/– रू0
- चारा उत्पादन – सूखे/बाढ़ की स्थिति में हरा चारा उत्पादन निःशुल्क कराया जाता है।

कृषि विभाग द्वारा संचालित योजनाएं

- रा0 खा0 सु0 मिशन
- हरित कान्ति योजना
- आइसोपाम योजना
- कृषि तकनीकी प्रबन्ध अभिकरण (आत्मा)
- कृषि यंत्रीकरण
- मृदा स्वास्थ्य सुधार कार्यक्रम
- चारा उत्पादन योजना
- ढैंचा उत्पादन योजना

6- विशिष्ट नीति नवाचार सुझाव (Specific Innovation's)

कृषि निवेश समय से उपलब्ध कराया जाय। व्यवहारिक रूप से कराया जाय अर्थात केवलों कागजों में सही समय एवं दिनांक न हो।

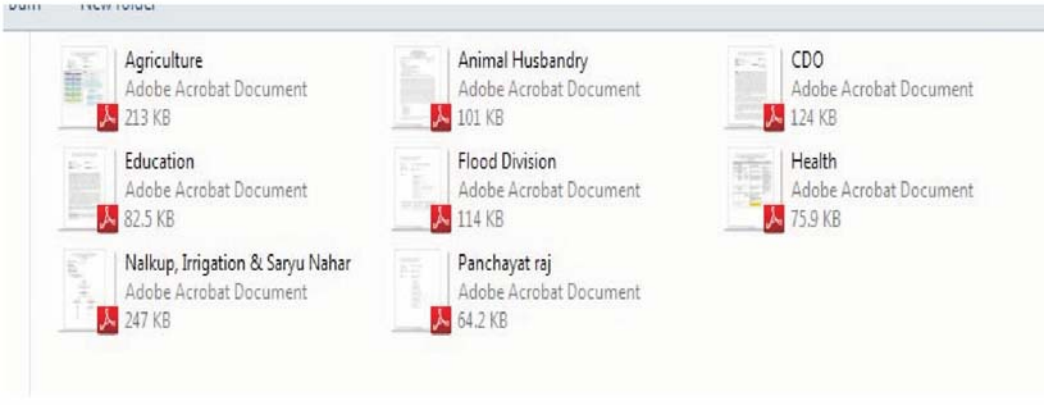
योजना में क्षेत्र का चयन स्थानीय परिस्थितियों को देखते हुए किया जाय। योजना के अंतर्गत बाढ़, सूखा ओले को सहन करने की क्षमता रखने वाली प्रजाति हो।

संबंधित विभागों, उपसम्भागों एवं जुड़े विभागों का आपसी तालमेल होना चाहिए।

7- Action Plan

- योजनाएं जलवायु परिवर्तन के प्रभाव को ध्यान में रख बनाई जानी चाहिए।
- आपदाओं के प्रभाव के देखते हुए क्षेत्रीय वितरण (उर्वरक एवं निवेश) क्षेत्र की आवश्यकतानुसार होना चाहिए।
- मृदा संरक्षण विभाग, कृषि विभाग एवं रक्षा इकाई विभाग का आपस में समन्वय होना चाहिए।

Facilitator: श्री अजय कुमार सिंह
Co-facilitator: अंजू पाण्डेय



The filled in format for the Department of Agriculture is given here as a case example. Such exercises have been done through the Shared Learning Dialogue with all the relevant Departments/Agency at District Level.

Annexure 5

Characteristics of Resilience Illustrated by *Jamie Stroud*

Systems: Redundancy & Modularity: During a power failure, it is imperative to have a back up power supply that is not dependent on the grid. Food, health, communications, automatic teller machines (ATMs) and many other systems are dependent on a constant supply of power. Traditionally, petrol or diesel generators are used as backup devices. Here we show a much more sustainable option—solar panels and batteries on top of a roof. The point of view comes from a dimly lit home that is without power, and we see that an electric pole has fallen. The family with the solar panel below is able to stay cool in the summer's heat, and maintain their usual set of daily activities in the household.

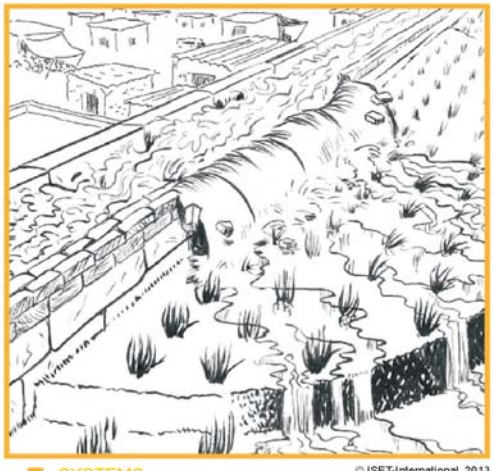
Systems: Safe Failure: The concept of safe failure recognizes that no system is ever perfect or "fail safe". It also recognizes that climate change is very hard to predict, and the severity of weather can quickly increase and overwhelm systems. We show a waterway here overwhelmed by water pressure. The waterway has been designed to break on the side that is facing agriculture—away from residences and industry where the loss of assets can be devastating, and where flash flooding can be devastating to the population. In this illustration, the waterway has been designed to fail safely.

Systems: Flexibility & Diversity: When designing a resilient community, it's important to build systems that are flexible and diverse. For example, the cyclist on the left is unable to pass because the one road is blocked. The rider on the left, however, is able to take alternate routes.

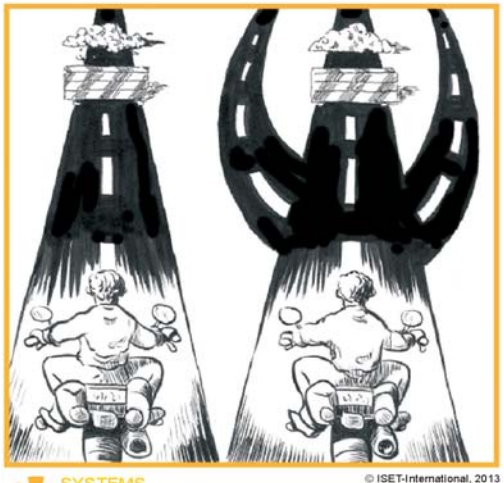
Agents: Capacity to Learn: There are many instances where populations are given the opportunity to learn from past experiences. After a flood, the man on the right has decided to rebuild his home on stilts, where the man on the left has failed to recognize that by rebuilding in the same location with the same construction plan as before he is, thus, putting his assets, again, in harm's way.

Institutions: Information: The ability to access accurate, accessible, and relevant information is one of the barriers for many communities regarding adaptation and becoming resilient. On the left we show a group of individuals who are able to enter a public library, access information, and share it with their community members. On the right we show stacks of books that are inaccessible to the public—with no one inside accessing information. On the right, valuable knowledge is locked and accessible only to a small population.

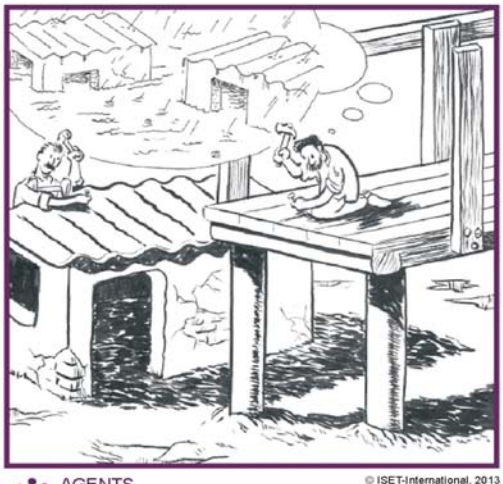
SYSTEMS
Redundancy & Modularity



SYSTEMS
Safe Failure



SYSTEMS
Flexibility & Diversity



AGENTS
Capacity to Learn

INSTITUTIONS
Information

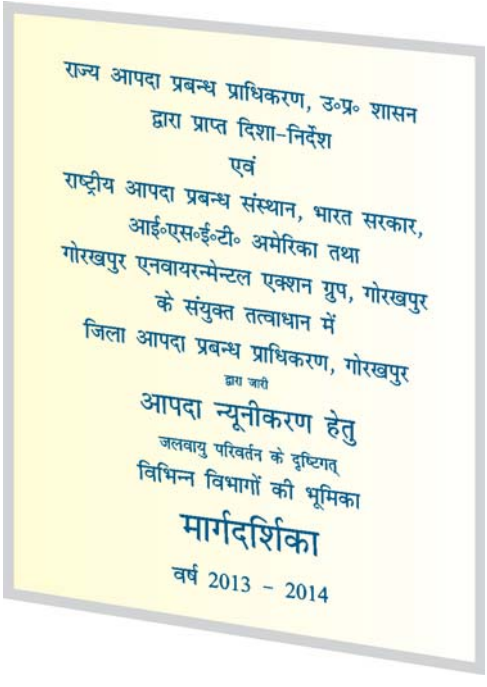
Project Launch Workshop. District Nodal Officer of DDMP at DDMA Gorakhpur, Officials of ISET, GEAG and NIDM Expert addressing and interacting with various Department heads and other relevant stakeholder.

Sectoral Workshops (with Departments)

Sharing Finding of Shared Learning Dialogues with DDMA

Young Researchers Training Programme On CCA-DRR and DDMP

State Level Workshop for Sharing Study Outcomes and Lessons. State Relief Commissioner addressing the Officials of various State Departments and other Stakeholders, NGOs, Institutes, etc.



GUIDELINE PAPER on Roles & Responsibilities of Various Departments in Disaster Management

दैनिक जागरण गोरखपुर, 26 जुलाई 2012

आपदा प्रबंधन पर बनेगी ठोस कार्ययोजना

आपदा जोखिम न्यूनीकरण को लेकर आयोजित बैठक में मौजूद राष्ट्रीय आपदा प्रबंध संस्थान के प्रो. अनिल गुप्ता व एडीएम जितेन्द्र कुमार। जागरण

संवाददाता, गोरखपुर: आपदा जोखिम न्यूनीकरण एवं जलवायु परिवर्तन को लेकर देश के लिए तैयार होने वाली परियोजना पर अमल शुरू हो गया। इसके लिए बुधवार को कलेक्ट्रेट सभागार में आयोजित बैठक में गोरखपुर जिले में जलवायु की स्थिति, संक्रामक बीमारियों के प्रभाव जैसी समस्याओं पर चर्चा हुई। परियोजना का आधार गोरखपुर जिले को माना गया है। बैठक में नगर निगम, सिंचाई, अग्निशमन, बिजली, पंचायती राज, कृषि, चिकित्सा समेत अन्य विभागों से कार्य योजना उपलब्ध कराने का निर्देश दिया गया।

बैठक में विशेषज्ञ के रूप में उपस्थित राष्ट्रीय आपदा प्रबंध संस्थान के प्रो. अनिल कुमार गुप्ता ने कहा कि यह अत्यंत महत्वपूर्ण है कि इस परियोजना के लिए देश के एक मात्र जिले गोरखपुर का चयन हुआ है। यहां बनने वाली कार्य योजना देश के बाकी जिलों में लागू होगी। ऐसे में इससे जुड़े सभी का दायित्व है कि इस कार्य में

बैठक

***गोरखपुर की तैयारी देश के लिए महत्वपूर्ण: प्रो. अनिल**

पूरी इमानदारी से प्रयास करें। कार्य योजना तैयार करने में किन-किन बातों पर ध्यान देना होगा, उन्होंने इसकी भी जानकारी दी। उन्होंने उम्मीद जाहिर कि तैयारी के लिए निर्धारित समयावधि 18 माह पर्याप्त होंगे।

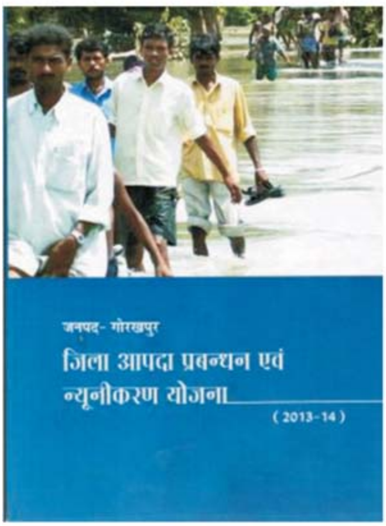
गोरखपुर इन्वायरमेंटल एक्शन ग्रुप के अध्यक्ष डा. शिराज वजीह ने जिले में जलवायु परिवर्तन की स्थिति रखी और आइसेट अमेरिका के प्रतिनिधि शशिकांत चोपड़ा ने परियोजना की रिपोर्ट प्रस्तुत की। बैठक की अध्यक्षता प्रभारी अधिकारी आपदा व अपर जिलाधिकारी वित्त-राजस्व जितेन्द्र कुमार ने की। संचालन आपदा प्रबंधन के परियोजना अधिकारी गौतम गुप्ता द्वारा किया गया।

क्या है आपदा प्रबंधन

आपदा प्रबंधन एक सतत प्रक्रिया है, जो विभिन्न विभागों के समन्वय व प्रयास से तैयार किया जाता है। बाढ़ बचाव, जल जमाव, अतिवृष्टि, सूखा, अग्निकांड, शीतलहर, ओलावृष्टि, संक्रामक बीमारियां आदि आपदा की श्रेणी में शामिल हैं। इसी से निपटने के लिए कार्य योजना तैयार की जानी है।

कार्य योजना इन पर होगी फोकस

- बाढ़ बचाव के लिए विभागों की मुस्तैदी अब 1 जुलाई से 15 सितंबर तक रखी जाए। पहले 15 जून से ड्यूटी लगती थी।
- मानसून के बदलाव के लिहाज से नहरों में पानी 15 जून तक भर लिया जाए।
- आपदा आई तो कौन विभाग क्या करेगा, यह तैयारी सतत जारी रखी जाए।
- शहरों में ड्रेनेज की गहराई स्थान के हिसाब से निर्धारित की जाए।



जनसंदेश टाइम्स गोरखपुर, बुधवार, 26 जुलाई, 2012

आपदा जोखिम न्यूनीकरण योजना में शामिल हुआ गोरखपुर

कलेक्ट्रेट सभागार में बैठक लेते एडीएम एफआर जितेन्द्र कुमार व अन्य।

अमर उजाला गोरखपुर | बृहस्पतिवार 26 जुलाई 2012

आपदा प्रबंधन का मॉडल बनेगा गोरखपुर

सिटी रिपोर्टर

सहारा गोरखपुर | बृहस्पतिवार • 26 जुलाई • 2012

आपदा जोखिम न्यूनीकरण की जिला योजना शीघ्र

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GEAG-NIDM-ISET project supported by CDKN-START
Salient features

Project title:

Towards Integrating Disaster Risk Reduction and Climate Change Adaptation: Understanding Flood risk and Resilience in eastern India.

Duration: June 2012 – March 2014.

Implementing Agencies:

Gorakhpur Environmental Action Group (GEAG), National Institute of Disaster Management (NIDM) and Institute for Social and Environmental Transition (ISET-International, Colorado, USA); the project was implemented with DDMA, Gorakhpur.

Objectives and Scope:

The project focused on Gorakhpur district (Uttar Pradesh) and the leanings to foster replication in India -

- To understand the systemic factors within the flood prone Gorakhpur district of eastern Uttar Pradesh that contribute to resilience or exacerbate vulnerability;
- To 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 DRR and CCA practice;
- To engage and build capacity of scientists and young researchers from two key academic institutions promoting Disaster Risk Reduction and Climate Adaptation by seeking contributions to and sharing development of the knowledge; and,
- To document and disseminate the generated knowledge.

Outcomes/Outputs:

- Shared Learning Dialogues with various Departments in Gorakhpur District
- Focused capacity building workshops with MP PG Science College (Gorakhpur University) and B B Ambedkar (Central) University
- Recommendations for Climate-sensitive DDMP, Gorakhpur
- Policy brief
- National Policy Consultations
- Peer-reviewed article in a Journal

The project achieved more than planned. In addition, it brought out a revised and updated DDMP for Gorakhpur and Training Module for capacity development for replication in other Districts.

Research Investigators:

Dr. Shiraz A Wajih (PI), Dr. Anil K Gupta (Co-PI) and Dr. Marcus Moench (Co-PI); other Co-PIs: Shashikant Chopde (ISET), Dilip Singh (ISET), Ken MacClune (ISET) and, Chiang Kai Kim (ISET); Sreeja Nair (NIDM), Prof Vinod Sharma (IIPA); Prof. Sheo Shankar Verma (GEAG) and Monojeet Ghoshal (GEAG); Gautam Gupta (DDMA, Gorakhpur - position supported by the project).

Authors Profile

Dr. Anil K. Gupta

Dr. Anil K. Gupta, Head of Policy Planning Division and Head of Training Cell, joined the National Institute of Disaster Management in 2006 as Associate Professor. His areas are disaster management, climate-change adaptation and NRM, with focus on risk/vulnerability assessment, planning and management. He did his Post-Doctoral work at NEERI Nagpur (CSIR) and received Young Scientist Award in 1996. He is Fellow of Earth Scientists Society. He was Reader & Head of Department of Environment & NRM since 2003 and founder Director of Institute of Environment & Development Studies at Bundelkhand University. Earlier he worked at the Ambedkar Central University of Lucknow, Disaster Management Institute (Govt, of MR Bhopal), National Mineral Development Corporation, and CICON Environment Technologies. He has supervised several Ph.D. and PG research, has over 100 publications including 4 books, 6 training modules and 47 papers in refereed journals. He implemented several research/ coordinated projects supported by NORAD, World Bank, GIZ Germany, UNDP, UNEP CDKN, ICSSR, and MoEE focussing on drought, floods, climatic-risks, coastal hazards, DM planning, environmental knowledge and legislation. He has 23 experiences of research experience including 17 years teaching/training and 9 years administrative experience.

Sreeja S. Nair

Sreeja S. Nair is Assistant Professor at National Institute of Disaster Management since 2007. She is disaster management professional having more than 12 years of experience in the field. Her areas of research, documentation and training activities at NIDM include geoinformatics applications in disaster management, environmental law, disaster data and information management, ecosystem approach to disaster risk reduction and chemical disaster management. Ms. Nair published 15 papers in national and international journals, authored 7 training modules and editor of 3 books. She is the coordinator of Indo German Cooperation on Environmental Knowledge for Disaster Risk Management and co-principal investigator of ICSSR research project on drought vulnerability and mitigation analysis. She is also involved as a technical expert in the GIZ-European Union pilot project on integrating climate-change adaptation with disaster management planning process coastal Andhra & Tamil Nadu.

Dr. Shiraz A. Wajih

Dr. Shiraz Wajih is a development professional, working as researcher, directing projects, trainer and facilitator since last 35 years. He is associated with Gorakhpur Environmental Action Group (www.geagindia.org) since its inception and is currently President of the organization. He is also Associate Professor in University College of Gorakhpur University. Dr. Wajih completed his MSc and then Ph.D. in Ecology. He has directed several projects related to issues like Sustainable Livelihoods, Natural Resource Management, Disaster Risk Reduction, Climate Change Adaptation and livelihood resilience etc supported by agencies like Unicef, Oxfam, Govt of India/UP, IDRC, DfID, CDKN, The Rockefeller Foundation etc. His specific interest areas are Participatory Planning, Vulnerability Analysis and Resilience Strategies, Policy influencing, Micro-planning, Training and Capacity Building, Action Research and Documentation. Dr. Wajih has worked as Consultant, providing services on issues like Planning, Capacity Building, Resilience Building processes, Monitoring and evaluation etc and has worked for agencies like Christian Aid, Canadian Power Consultant, Oxfam, GIZ (NIDM), Govt of India/UP etc. He has been part of National Team on evaluation of DRR programme in states of Uttarakhand and Uttar Pradesh. He has been a member of governing board of various organizations like Oxfam India, IYF, Sahyog, Voluntary Health Association of India etc. and he is currently an active board member of organizations like Society for Promotion of wasteland Development, Institute of Social and Environment Transition (ISET), USA, Gorakhpur Environmental Action Group, Member-Wildlife Board, Govt of UP etc

Shashikant Chopde

Shashikant Chopde is Post-Graduate in Civil Engineering with specialisation in Water Resources Management and a LEAD (Leadership in Environment and Development) Fellow. Mr. Chopde is having more than two decades of experience of working on issues of water management and more recently on Disaster Risk Management and Climate Risk Reduction. He is key team member of large-scale multi-country collaborative projects focusing on interface of climate change, urbanization and poverty in the region. He works with Institute for Social and Environmental Transition (ISET), a not-for-profit US based organization providing technical inputs on research and policy related to Climate Adaptation, Urban Climate Change Resilience, Disaster Risk Reduction, and Urban Water Management. Specifically, he is involved in Asian Cities Climate Change Resilience Network (ACCCRN) and CCA-DRR programmes supported by various agencies such as Rockefeller Foundation (RF) and CDKN. During his career he was associated with organizations such as VIKSAT and Winrock International India, and has worked on projects ranging from implementation, research and policy advocacy on the key themes.

Gautam Gupta

Gautam Gupta has rich experience in Community DRR Planning, Capacity Building and Resilience Building processes. He is associated with District Disaster Management Authority (DDMA), Gorakhpur since June 2010. At DDMA he has been involved in implementing the UNDP-GoI Urban Risk Reduction programme and CDKN-START project on incorporating climate concerns in DDMP, Gorakhpur. In addition, he is supporting State Disaster Management Authority, Uttar Pradesh as a Principal Trainer under the 13th Finance Commission Capacity Building Programme focusing on Community Based Disaster Risk Reduction - Gram Panchayat plan development. Prior to this position, in his work with Sphere India, he conducted research study "Education in Emergency" focusing on three disaster affected areas (Kosi Flood, Bihar; Aila Cyclone - Sundarban, West Bengal; and, Laila Cyclone - Guntur, Andhra Pradesh). Earlier, as a Humanitarian Program Manager with Poorvanchal Grameen Vikas Sansthan during Kosi Flood (2008) he managed various projects in partnership with Oxfam India, Christian Aid, Child Fund India and Catholic Relief Services on livelihood, reconstruction, HIV-AIDS, community capacity building, child protection etc.

Garima Aggarwal

Garima Aggarwal is presently perusing her Ph.D. research in the field of Disaster Management and holds Master's Degree in Geography (Delhi School of Economics, Delhi University) and Urban & Regional Planning (Centre for Environmental Planning & Technology, Ahmedabad). Her areas of interest are Hazard Risk & Analysis, Mainstreaming DRR, Sustainable Development and Disaster Mitigation Planning. She has worked with United National Development Programme for about a decade in the area of Disaster Management. During her tenure, she worked on several issues related to disaster management planning at community, district and state level, policy level issues, conceptualization of new proposals on disaster management and related subjects. She was involved in implementation of several national level programmes viz. GoI-UNDP Disaster Risk Management Programme, GoI-UNDP Disaster Risk Reduction Progrmame, Strengthening of Fire & Emergency Services in India and Upgradation of National Fire Service College etc.She has authored a book on "Industrial Relocation and Labour Issues in Delhi" and has published and developed multiple pieces of work on Disaster Management.

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