



Developing Disaster-Risk Resilience in Cities

Training Module for Urban Local
Bodies, including Contexts of Climate
Risk and Children's Resilience



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Foreword



The entire Asia-Pacific region is under the pace of expanding urban areas and newly coming up towns and cities, and high level of infrastructure growth to meet the changing needs of services and goods. Urban areas are also hubs for commercial activities besides floating populations. Due to high concentration of population and infrastructure, disasters often result into severe damages and losses, in urban areas. Environmental changes, in particular, the land-use changes, climate change and natural resource degradation, have emerged as major drivers of disaster risk in cities and towns. This calls for the “Culture of Safety and Prevention” to be integrated on all aspects of development, through effective planning and programmes, at all levels – national, sub-national and local levels.

Cities and towns, especially in the developing countries are sprawling fast and are hotspots of disaster damages and losses due to high concentration of people and infrastructure. Cities and towns are also the key determinants in achieving the Sustainable Development Goals and mitigation of climate change impacts. Risks of climate change and disasters have multiplied in India with urbanisation taking place at a faster rate.

Local level resilience, and therefore, local planning, and role of urban local bodies and capacity building of associated functionaries and stakeholders, is pivotal for enabling the urban resilience into development. There were several pilots and case studies on different aspects of urban disaster resilience in India. Drawing the lessons from these studies, this training manual on disaster risk resilience has been developed to support the capacity building activities. I am sure that the contents of this publication will be useful to trainers and professionals working on different aspects of urban governance, planning, research and training.

Manoj Kumar Bindal

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Background

Asia is among the most disaster prone regions in the world. The region is also home to half of the world's urban population. It constitutes one of the world's most rapidly urbanizing regions. Sixty-six out of the 100 fastest-growing urban areas are in Asia (Children in an Urban World, The State of the World's Children 2012, UNICEF). As disasters have been increasing, cities have become hotspots of disaster risks. Most cities in the developing world, including cities in this region, are located in areas where earthquakes, floods, landslides and other disasters are likely to happen. Over the last 10 years, climate related disasters have also increased by more than 40%, magnifying the risks that cities are already confronted with; particularly those associated with poverty, lack of basic services, slum formation, unplanned and unstable buildings, houses and infrastructures located in hazard prone areas, pollution and environmental degradation.

Clearly, it is imperative to build and strengthen the resilience of the urban populace, particularly the vulnerable groups, to reduce disaster risk. And as cities serve as economic hubs and provide a vast array of opportunities, it is equally important to address the resilience of urban systems such as water, food and energy. Lastly, the interaction of the populace with urban systems are defined and enabled or limited by institutions, i.e. authority, legal, regulatory, policy frameworks and processes. Reducing vulnerability to disasters and increasing resilience would necessitate reforms and innovations in critical institutions.

Mainstreaming of risk reduction within the urban planning and development process is non-negotiable since the emergence of risk is engrained in a city's very foundation. When populations migrate to a new location due to economic reasons and settle in unfamiliar atmosphere, their physical as well as social risk levels rise. Such settlements take place in areas not inhabited and are often in locations of high hazard exposure, such as river banks, transportation interchanges, mining or industrial hubs or other such centers of high turnover, high traffic and high risks. Removed from their traditional social safety nets, the urban settlers do not have much to fall back upon in times of crisis. This is particularly true for the urban poor, who live in marginal settlements and sub-standard housing, with limited infrastructure and



66/100

fastest-growing
urban areas are in
Asia

services, and with very little assets. Given the high population density in urban areas, including high concentrations of vulnerable people, increasing urban disaster risks are key concerns in discussions on the adverse impacts of climate change (Sluis and Aalst, 2006).

In its 2013 World Economic and Social Survey, the UN notes that as “urbanization is proceeding rapidly in developing countries, globalization and financialization are perpetuating inequalities, while exposing countries to greater risks of contagion from crises, and food and nutrition as well as energy security are threatened by competing demands on land and water, as well as environmental degradation.” Cities are growing naturally, through migration and through re-designation of rural and urban areas. Whichever the method, cities are growing faster than ever, and the larger a city, the faster it grows. Within this growth, insensitive or non-inclusive urban land-use planning, urban development and management, all lead to the creation of higher risk levels for some population groups.

In most Asian cities, these processes are based on a master planning approach that does not pay adequate attention to the urban poor. In addition, the informal sector does not include local people in the processes and depends on projection-based planning for unrealistic horizons instead of attempting to get close to real-time planning. Most of the world’s poor live in developing countries with rapidly growing populations, where poverty and population growth are reinforcing each other (Brown, 2001). Population pressure coupled with a host of other reasons is resulting in the growth of cities at an unprecedented pace. As there is lack of space to expand, cities are getting denser and are growing vertically. People are now building, living and working on lands that were earlier unoccupied because they were hazard prone, like steep slopes, low-lying lands, floodplains, river beds and drains. At the same time, human actions especially prevailing in the developed parts of the world over the last two centuries or so are now causing global warming and creating risks in an irreversible manner to all areas in general and in particular to mountain, riverine and coastal habitations. By its very nature of population concentration and developmental densities, urban areas give birth to risks. The informal nature of construction or density increases the risk of structures and infrastructures. Socially, the safety nets of closely-knit communities are lost, in fact, conflicts between unrelated communities increase. Similarly, there are evidence of environmental degradation, unhealthy living conditions and other factors accumulating risks, and more importantly, weakening resilience.

The Context

Local government officials and decision makers frequently deal with the impact of small- and medium-scale disasters—and less frequently with large-scale events—that arise from natural or man-made hazards. Climate change and extreme weather events are likely to increase the city's exposure to hazards and risk. Less obvious is the fact that regular development practices may also generate complex environmental change and contribute to increased risk, if they are not taken into account and acted upon.

In disasters, local governments are the first line of response, sometimes with wide-ranging responsibilities but insufficient capacities to deal with them. They are equally on the front line when it comes to anticipating, managing and reducing disaster risk, setting up or acting on early warning systems and establishing specific disaster/crisis management structures. In many cases, a review of mandates, responsibilities and resource allocations is needed to increase the capacity of local governments to respond to these challenges.

To understand that disasters are “not natural”, it is important to consider the elements of risk. Risk is a function of the shocks and stresses (drought, for example), the exposure of people and assets to the shocks and stresses (e.g. region is drought prone), the conditions of vulnerability of the exposed population or assets (e.g. poverty with no safety nets). These factors are not static and can be improved, depending on the institutional and individual capacity to cope and/or act to reduce risk. Societal and environmental development patterns can increase exposure and vulnerability and therefore increase risk.

Population pressure coupled with a host of other reasons is resulting in the growth of cities at an unprecedented pace.



Introduction to the Training Toolkit

Training Design and Training Plan

This training toolkit has been developed by Gorakhpur Environmental Action Group (GEAG) with technical and financial assistance of UNICEF. GEAG has extensive working experience on urban climate and disaster risk resilience. The aim of the toolkit is to provide a practical action guide to the city level stakeholders describing the various concepts, frameworks, methodologies and actions for building urban risk resilience.

This capacity building toolkit is designed primarily for local government leaders viz. Urban Local Bodies and policy makers to support public policy, decision making and organizations implementing disaster risk reduction and resilience activities in cities. It offers practical guidance to understand urban vulnerabilities and its key drivers, development-resilience linkages and take appropriate actions to minimize the disaster risks and losses. The toolkit caters to the need for better access to information, knowledge, capacities and tools to effectively deal with disaster risk and extreme climate events. It provides an overview of key strategies and actions needed to build resilience to disasters, as part of an overall strategy to achieve sustainable development. Each city and local government will determine how these actions apply to their own context and capacities.

The toolkit contains three modules for a five-day course with interactive learning activities, tools and case studies to support the overall capacity development framework.

MODULE 1 details the concepts of disasters, climate change and development and gives an introduction on disaster and climate risks and vulnerabilities in the urban areas, different concepts of resilience, principles and global frameworks and the practical approach of building urban resilience through the Disaster and Climate Resilience Framework.

MODULE 2 introduces the concept of resilient cities and the local level actions required to build resilient cities. It gives the principles of resilient urban governance useful at the ULB level.

MODULE 3 focusses on Women and Child-Centred Urban Resilience, the differential impacts of disasters and climate change on women and children and, the related resilience framework and the resilience actions and indicators for monitoring urban resilience at city/local government level.

Aim of the Training Module

The training module aims at building understanding on the concepts and frameworks for urban risk resilience and provide practical guidance to urban local governments and policy makers on actions needed to build resilience to disasters, specifically in the context of children's vulnerabilities, to achieve the overall goal of sustainable development.

Training Objectives

At the end of the training participants will be able to -

- Identify and analyze disaster hazards and risks in the city
- Enlist common challenges associated with climate change impacts and disaster risks in city environment, with specific examples for their own cities/departments
- Define the influence of climate change on disaster risk scenarios in different types of cities
- Describe the basic principles of resilient cities, roles of ULBs and its key sectors /departments, and contexts of climate risk framework and resilient development planning process
- Assess the specific vulnerabilities of urban poor women and children in disasters and develop child centric resilience framework
- Enumerate the need of disaster safe and climate resilient city systems by integrating concepts of adaptation, green growth strategies, resilient infrastructure, and concerns for children – especially urban poor children
- Analyze and delineate the pathways, approaches, process of resilience building in cities through development planning and actions
- Link Local, National and International Perspectives, specifically the objectives of Resilient Cities component according to the DRR Road Map of Bihar, in relation to resilient cities framework

Target Groups/Audience

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

- Primarily, the senior to middle level officials from the Urban Local Bodies
- However, the participants may include other relevant officials/professionals from following target groups as well, viz.,
- Officials from Department of Urban Development of concerned State/UT,
- Executives/professionals from other Government agencies/boards, programmes/schemes, including public sector undertakings,
- 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
- Faculty members/professionals from training, education and research institutes and other master trainers related to urban planning/development, environment, housing, disaster management, etc.
- Private Sector: Officials/professionals involved in water supply, sanitation, environmental-health, waste management, power, industries, communication, risk management, etc. in cities.

Contents and Structure of the Module

The training module on urban risk resilience offers a training tool along with course guidelines which will enable the participants to develop a holistic view of addressing urban resilience including needed efforts for mitigation and adaptation. The acquired capacities are expected to help participants for actions related to urban planning, preparedness, mitigation, response, rehabilitation and recovery. 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 Manual consists of three modules:

1. Disaster and climate resilient cities: demystifying context and pathways
2. Urban local authorities and resilient cities
3. Women and Child centric urban climate resilience: connecting to futuristic mileage

The details of Learning Units are as below:

Module 1:

Disaster and climate resilient cities: demystifying context and pathways

- LU (a)** Understanding Disasters: Key Concepts and Terminologies on the issues of disaster risk reduction, climate change and development
- LU (b)** Urban Growth, Disaster and Climate Vulnerability: – Global, Regional and Indian context
- LU (c)** Urban Disaster and Climate Resilience- Concepts and Operational Frameworks
- LU (d)** Policy Frameworks for Disaster Resilience

Module 2:

Urban local authorities and resilient cities

- LU (a)** Impacts of climate change and induced disasters on cities
- LU (b)** Building Resilient Cities – Key Frameworks
- LU (c)** Building Resilient Cities – Key Essentials
- LU (c)** Ward-level micro resilience planning

Module 3:

Women and Child centric urban climate resilience: connecting to futuristic mileage

- LU (a)** Impacts of climate change and disasters on children
- LU (b)** Child-centric Urban Resilience Framework
- LU (c)** Indicators for child-centred urban resilience
- LU (d)** Resilience-Governance Nexus

Tips to use the Training Module



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:

- **Question-Answer/Quiz Sessions:** These sessions have been included to evaluate understanding of concepts of urbanization, child vulnerability, peri-urbanization, ecosystem services, disasters, climate change and development.
- **Group discussions/work:** Group activity is included in each learning unit to facilitate mutual sharing and imparting knowledge for developing skills related to analysis, planning and formulating strategies.
- After each group work, a **presentation session** has to be included, to motivate the participants in knowledge grasping, participation and sharing.
- **Table-top/classroom exercises** to enhance ability of focused discussion in the group.
- **Field Visit** to be organized, to facilitate understanding of data collection, group reality and situation analysis.
- **Case studies** to provide live examples from the field so that knowledge could be connected with the ground reality.

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/regional language

Pre-requisite for the Trainer/Course Faculty

A team consisting of minimum 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	Interdisciplinary expert with knowledge on urban issues, climate change impacts, resilience, disaster risk reduction and green growth strategies, planning and governance, environment and developmental planning issues
Training 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.

Expected Benefits

- i. Capacity of the officials/professionals engaged in planning, designing, executing and/or governing various aspects of developmental planning and actions in cities and its sectors/departments and allied activities
- ii. The overall capacity of administration, academic institutions and non-governmental organizations improved in planning, coordination and strategy making for developmental activities in cities
- iii. Overall sensitization of officials of the Urban Local Bodies to understand climate and disaster resilience issues and their role in addressing these issues with more abilities.
- iv. Improved ability to collaborate with the each other both horizontally and vertically for achieving resilient-sustainable development at urban level.

Instructions for Module Use

- i. The module can be implemented local, project, municipality or state level (also at National or state/UT level with suitable modification utilizing its flexibility). For example, city administrators can take lead in organizing training programs for such heterogeneous group through coordinating with the line departments, academic institutes and other agencies. At national level, courses may be organized by concerned Ministries, Institutes/Universities and leading NGOs, whereas at state level the course may be organized by State Administrative Institute, Centre for Disaster Management, Climate Change Cell, etc.

- 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 programs at sub-national 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 3 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 programs.

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.

Pre Training Assessment

Context and description of the Session (0.5 hrs)	
The session shall consist of either written or oral question-answer/discussion round or under the perception level of the participants before at the entry level of the training course. This would be repeated at the end of the course (post training session) during valediction to understand the impact of the course by facilitation a comparison of entry and exit behavior of the participants. A film can also be shown to trigger the expression of participants prevailing knowledge and/or perception on aspects of climate change, disaster risks and child vulnerability, with example from city environments.	
Learning Objective	Methodology
• To compare the entry and exit behavior of the trainees. • To evaluate the knowledge and skills gained from the training. • To assess perceived competency of participants on disaster risks and climate resilient cities. • To carry out a formal internal evaluation methodology using questionnaires.	Question-answers Discussion Ice-breaking games Film Show
Guidance	
• Questionnaire based assessment of the participants' perception at the entry level (and also at the exit level) may be carried out. • The questions shall be identified/framed by the course director/coordination team looking into the course module's scope, participants profile and duties/background, and context of the film being screened. • It is advised that the course coordinator / trainers keep pre-developed notes as own tips and hints for delivering course session. • The resource person for this session is expected to have a broad knowledge of all aspects associated with urbanization, climate change – impacts and related disaster risk in cities, components of resilience framework for cities, urban and peri-urban ecosystems, women and child vulnerability, and the national and international framework for dealing with the subject, ideally a team of two or three resource persons drawn with background of urban development / environment studies or planning. Prior experience of disaster management and climate resilience should be desirable eligibility.	

MODULE 1

Disaster and climate resilient cities: demystifying context and pathways

1.1 Introduction

This module focuses on the conceptual understanding and inter-relation between disaster, development and climate change in the context of cities. Over the decades, with the increasing physical and financial losses due to increasing frequency of climate change induced disasters, the focus of planners and policy makers have shifted towards inclusion of disaster risk reduction in development practices.

There are four learning units under this module as below:

- LU (a)** Understanding Disasters: Key Concepts and Terminologies on the issues of disaster risk reduction, climate change and development
- LU (b)** Urban Growth, Disaster and Climate Vulnerability: – Global, Regional and Indian context
- LU (c)** Urban Disaster and Climate Resilience- Concepts and Operational Frameworks
- LU (d)** Policy Frameworks for Disaster Resilience

1.2 Learning Objectives

To enable understanding of disaster, its concepts, issues of disaster risk reduction, climate change and development
To understand urbanization, its causes and main effects on environment and ecosystems in terms of disaster and climate vulnerability

- To enumerate the impacts of unplanned urbanization, climate change and related disasters on children -
- National and international concepts and policies related to urban climate resilience.
- Urban climate resilience framework for building resilience and sustainable growth.
- To delineate main approaches to address sustainable and resilient urban development– role of planning, peri-urban ecosystem and green growth strategies.

1.3 Training Methodology and Duration

The first session will include theoretical mode of training. 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 training methodology will include:

- Lecture/Power Point Presentations
- Short films on urban disasters and climate change
- Perception check questionnaire (or Q&A)
- Case Study (based on films)
- Group exercises
- Experience sharing
- Discussion

1.4 Understanding Disasters: Key Concepts and Terminologies on the issues of disaster risk reduction, climate change and development

The Training 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 DRR.

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, 20073). More simply, any condition, material, process or event having the potential to cause harmful effect is understood as a hazard.

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. Vulnerability could be divided into four types, viz.

- Physical vulnerability,
- Environmental vulnerability,
- Socio-economic vulnerability, and
- 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, bio-productivity 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, 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.

Disaster

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

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 of likelihood that a particular shock or stress can become a disaster (by causing damage and losses) and may be expressed mathematically as a function of shocks or stresses, vulnerability, exposure and capacity. The amount refers to the quantification of the elements at risk (in another term – is expression of degree of exposure). Disaster Risk conglomerates around the dimensions of shocks and stresses, vulnerability, exposure and the capacity described as below:

- i. Shock (a sudden and potentially damaging phenomenon) or Stress (similar to a shock, but chronic in nature and can occur over a longer period of time);
- ii. Vulnerability (the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a shock or stress)
 - (a) Exposure (the presence of people, property, livelihoods, system or other elements in areas that can be impacted by various shocks and stresses)
 - (b) Capacity (the combination of all the strengths, attributes and resources available within a community, society or organization)

Understanding the risk formula

Type and Likelihood of Shocks and Stresses

Shock: a sudden and potentially damaging phenomenon

Stress: similar to a shock, but chronic in nature and can occur over a longer period of time.

Exposure:

the presence of people, property, livelihoods, system or other elements in areas that can be impacted by various shocks and stresses.

Vulnerability:

the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a shock or stress.

$$\text{Risk} = \frac{\text{Shocks or Stresses} \times \text{Exposure} \times \text{Vulnerability}}{\text{Capacity}}$$

Capacity:

the combination of all the strengths, attributes and resources available within a community, society or organization.

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.

Disaster Management

As per the 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:

- Prevention of danger or threat of any disaster;
- Mitigation or reduction of risk of any disaster or its severity or consequences;
- Capacity-building;
- Preparedness to deal with any disaster;
- Prompt response to any threatening disaster situation or disaster;
- Assessing the severity or magnitude of effects of any disaster; evacuation, rescue and relief;
- Rehabilitation and reconstruction;

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:

- Forecasting and disseminating warnings of potentially damaging phenomena or event.
- Developing and testing response (and emergency coordination) plans for both disaster warning and impact of such events.
- Assuring the rapid availability of appropriate material resources, transport, equipment and funds when and where needed.

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.

Capacity Building

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

- Identification of existing resources and resources to be acquired or created;
- Acquiring or creating resources;
- 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).

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).

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.

Climate Change

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

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).

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).

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'.

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.

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.).

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).

1.5 Urban Growth, Climate Vulnerability and Disasters: Global, Regional & Indian contexts

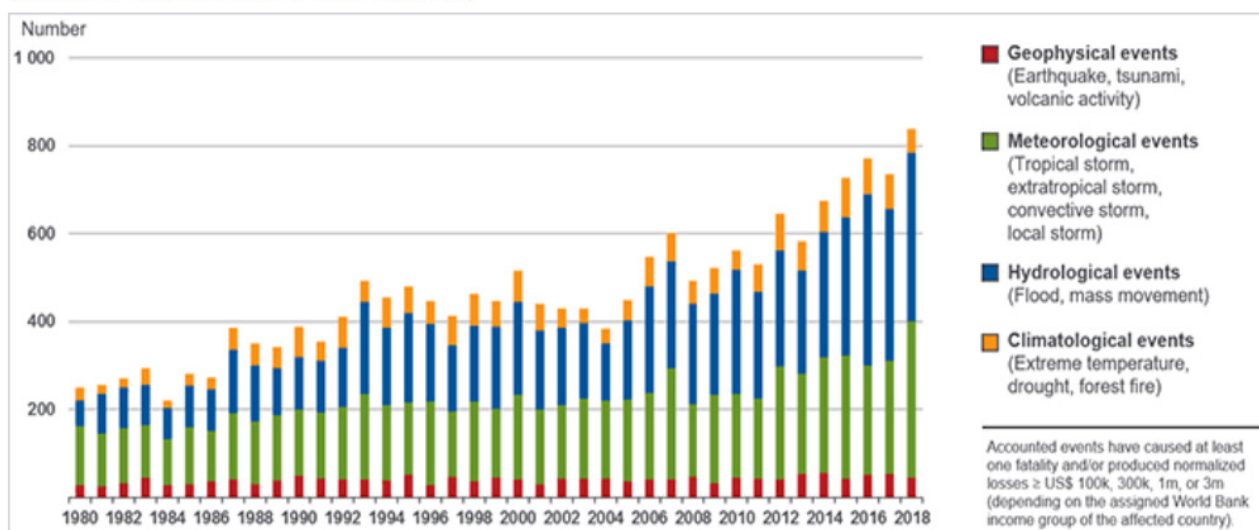
Cities inhabit more than half of world's population by now and this is expected to cross 70% by 2050 (World Urbanization Prospects, UN, 2014). The Asian cities are expected to see more than 60% of this increase and 46% of all urban population growth will occur in cities with fewer than 5 lakh inhabitants. This already has huge impact on environment, natural resources, city systems and people, and thereby increases the risks of disasters. Census data from 1901 to 2011 shows that the number of urban agglomeration/towns and cities has grown from 1827 in 1901 to 7935 in 2011 and the population residing in these urban areas has increased from 25.8 million in 1901 to 377 million in 2011, making 31.16% of the total population of the country at present. The figures are likely to increase in coming years intensifying the stress on city resources if not managed sustainably. The fast pace of migration from rural to urban areas, these being the major employment/ economic opportunity hubs, is also yielding into a range of problems related to access to basic services and deteriorating quality of life. As per the Census 2011, 65.5 million Indians are living in urban slums and the number is increasing rapidly. There is significant exchange of goods and services across borders between the ULB and the rural areas. Hence, any disruption to urban areas has potential to impact the rural population, and vice-versa. Thus, urban-rural linkage and peri-urban concerns are also important while dealing with urban disaster and climate risks.

With rapid and unplanned urbanisation and increasing poverty, the cities across the globe are grappling with the biggest development challenge of climate change. With continued global warming, the year 2016 was marked the third year in a row that set the record for the highest global temperatures. Without even doubling the CO₂ concentration, we have already halfway crossed the 2-degree mark. There is a common global consensus that climate change will increase the frequency of droughts, floods and severe weather events. Slow-onset climate change impacts can also undermine development gains and livelihood options (Unless we act now, UNICEF, 2015).

Evidences across the globe indicate that the overall losses from world-wide natural catastrophes in 2018 totalled \$160 billion dollars, according to Munich Re. There were 850 events that caused losses in 2018, compared with 740 events in the prior year. Insured losses from the 2018 events totalled \$80 billion, down from \$140 billion in 2017. Insured losses in 2018 were \$19 billion or 31 percent higher than the average of the prior ten years, 2008 to 2017. Natural catastrophes in 2018 caused 10,400 deaths, compared with 13,000 in 2017 and 60,000 in the ten years ending in 2017.

Figure 1: Total number of disasters and losses during 1980–2012

(Number of relevant events by peril)



Source: © 2019 Munich Re, Geo Risks Research, NatCatSERVICE. As of March 2019.

In India, climate change is now being increasingly linked to urban concerns as it is expected to exacerbate the risks in the infrastructure/resource deficit urban environments across the country. Socio-economic losses of climate change are already visible with large-scale losses of infrastructure and properties during disasters, widespread vector and water-borne diseases, loss of livelihoods and decreasing food security etc. Rapidly developing second- and third-tier cities are altogether more vulnerable to climate change impacts due to their limited infrastructural and institutional capacities, constrained finances and growing population.

The hydro-meteorological risks in the cities are expected to be amplified by climate change with more and more people exposed to the additional risks. These risks have different impacts on different sections of the society where some are able to afford mitigative, coping and resilience measures, while some are exposed to higher risks with little or no protective measures (Bhat, et al., 2013). A resilient and inclusive city approach is required for Indian cities where the infrastructure and the urban systems can withstand the stresses and extreme weather events and thereby reducing the vulnerabilities of men, women and children.

1.6 Urban Disaster and Climate Resilience- Concepts and Operational Frameworks

This section will deal with the concepts of resilience in the context of urban disasters and climate change. The section will also explain a few internationally recognised and accepted frameworks related to disaster and climate resilience in the urban contexts.

Definitions of resilience

“The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner”.

United Nations International Strategy for Disaster Reduction

“The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change”.

Intergovernmental Panel on Climate Change

“The capacity of a system to absorb disturbance and reorganize while undergoing change”. **The Resilience Alliance**

What is Resilience?

Resilience is the focus of a large and growing body of research. This work has sought to understand what the properties are that make a country, community or household resilient, to establish the principles and processes which strengthen resilience and to build the evidence for what projects and programmes really make people better able to withstand and recover from disasters. As a result of the research and its applications, the term resilience has acquired a range of definitions. Three widely cited examples are set out below.

What is Disaster Resilience?

Disaster resilience is the ability of individuals, communities, organisations and states to adapt to and recover from hazards, shocks or stresses without compromising long-term prospects for development (DFID). According to the Hyogo Framework for Action (UNISDR, 2005), disaster resilience is determined by the degree to which individuals, communities and public and private organisations are capable of organising themselves to learn from past disasters and reduce their risks to future ones, at international, regional, national and local levels.

What is a Disaster Resilient City?

A disaster resilient city:

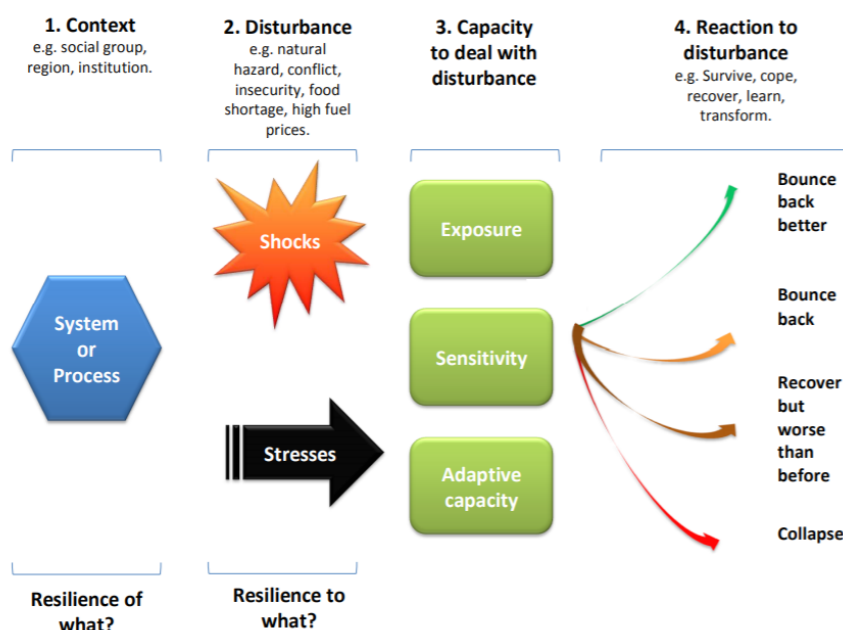
- Is one where disasters are minimised because the population lives in homes and neighbourhoods with organized services and infrastructure that adhere to sensible building codes; without informal settlements built on flood plains or steep slopes because no other land is available.
- Has an inclusive, competent and accountable local government that is concerned about sustainable urbanization and that commits the necessary resources to develop capacities to manage and organize itself before, during and after a natural hazard event.
- Is one where the local authorities and the population understand their risks and develop a shared, local information base on disaster losses, hazards and risks, including who is exposed and who is vulnerable.

- Is one where people are empowered to participate, decide and plan their city together with local authorities and value local and indigenous knowledge, capacities and resources.
- Has taken steps to anticipate and mitigate the impact of disasters, incorporating monitoring and early warning technologies to protect infrastructure, community assets and individuals, including their homes and possessions, cultural heritage, environmental and economic capital, and is able to minimize physical and social losses arising from extreme weather events, earthquakes or other natural or human-induced hazards.
- Is able to respond, implement immediate recovery strategies and quickly restore basic services to resume social, institutional and economic activity after such an event.
- Understands that most of the above is also central to building resilience to adverse environmental changes, including climate change, in addition to reducing greenhouse gas emissions.

Disaster Resilience Framework

Determining levels of resilience is an important part of understanding the concept. And most definitions of resilience share four common elements which can be used to do this: context; disturbance; capacity; and reaction. Together these elements form a resilience framework (see below) which can be used to examine different kinds of resilience (for example, of growth or of governance systems) and help determine the level of resilience that exists.

Figure 2: The four elements of a resilience framework



(Source: *How To Make Cities More Resilient – A Handbook For Local Government Leaders*, UNISDR)

The framework above is a simplified representation of the elements to be considered when examining resilience. Each element of the resilience framework is explored below with specific reference to disaster resilience:

Context

Resilience should always be clearly contextualised – allowing a coherent answer to the question 'resilience of what?' Resilience can be identified and strengthened in a social group, socio-economic or political system, environmental context or institution. Each of these systems will display greater or lesser resilience to natural or man-made

disasters. More work is needed to differentiate the significance of resilience for different social groups, resources and institutions across a range of different contexts.

Disturbance

Once the system or process of interest is determined, the next stage is to understand the disturbances faced, addressing the question 'resilience to what?' These disturbances usually take two forms:

- **Shocks** are sudden events that impact on the vulnerability of the system and its components. There are many different types of disaster-related shocks that can strike at different levels. These include disease outbreaks, weather-related and geophysical events including floods, high winds, landslides, droughts or earthquakes. There can also be conflict-related shocks such as outbreaks of fighting or violence, or shocks related to economic volatility.
- **Stresses** are long-term trends that undermine the potential of a given system or process and increase the vulnerability of actors within it. These can include natural resource degradation, loss of agricultural production, urbanisation, demographic changes, climate change, political instability and economic decline.

Capacity to deal with disturbance:

The ability of the system or process to deal with the shock or stress is based on the levels of exposure, the levels of sensitivity and adaptive capacities.

- Exposure to risk is an assessment of the magnitude and frequency of shocks or the degree of stress. For example, exposure to conflicts could be measured by the size and frequency of violent events caused by conflict or fragility, or the extent of political instability in other factors such as rule of law or human rights.
- Sensitivity is the degree to which a system will be affected by, or respond to, a given shock or stress. This can vary considerably for different actors within a system. For example, women accounted for up to 80% of those who died during the 2004 Indian Ocean tsunami, and death rates among women were almost four times higher than those among men in the 1991 Bangladesh cyclone. Limited mobility, skills set and social status exacerbated sensitivity to the shock.
- The adaptive capacities of actors – individuals, communities, regions, governments, organisations or institutions – are determined by their ability to adjust to a disturbance, moderate potential damage, take advantage of opportunities and cope with the consequences of a transformation. Adaptive capacities allow actors to anticipate, plan, react to, and learn from shocks or stresses.

Sensitivity and adaptive capacity are determined by the pool of assets and resources that can be mobilised in the face of shocks and stresses. Assets and resources can be social, human, technological, physical, economic, financial, environmental, natural, and political.

Whether a system or a process is resilient is a function of its sensitivity and adaptive capacity. The other side to this is vulnerability – the degree to which a system is susceptible to, or unable to cope with, the adverse effects of shocks and stresses.

Reaction to disturbance

In the best case, the reaction to a shock or stress might be a 'bounce back better' for the system or process concerned. In this case capacities are enhanced or sensitivities and exposures are reduced, leaving a system that is abler to deal with future shocks and stresses. An alternative reaction might be a 'bounce back' to a normal, pre-existing condition, or to 'recover, but worse than before' – the latter resulting in reduced capacities. In the worst-case

scenario, the system or process might not bounce back at all, but ‘collapse’, leading to a catastrophic reduction in capacity to cope in the future.

Urban Climate Resilience Framework

Urban Climate Change Resilience (UCCR) is the capacity of an individual, community or institution to dynamically and effectively respond to shifting climate impacts while continuing to function at an acceptable level. Putting it simply, it is the ability to survive and recover from the effects of climate change. Building resilience is a dynamic process which includes the ability to understand the potential impacts of climate change and to take appropriate actions before, during and after a particular consequence to minimize the negative impacts and maintain the ability to respond to changing conditions.

Box: Adaptation v/s Resilience

Resilience and adaptation are interlinked. Resilient systems are the stable, yet flexible foundations that people require in order to shift strategies and adapt as conditions change. The Climate Resilience Framework uses the concept of resilience rather than adaptation because:

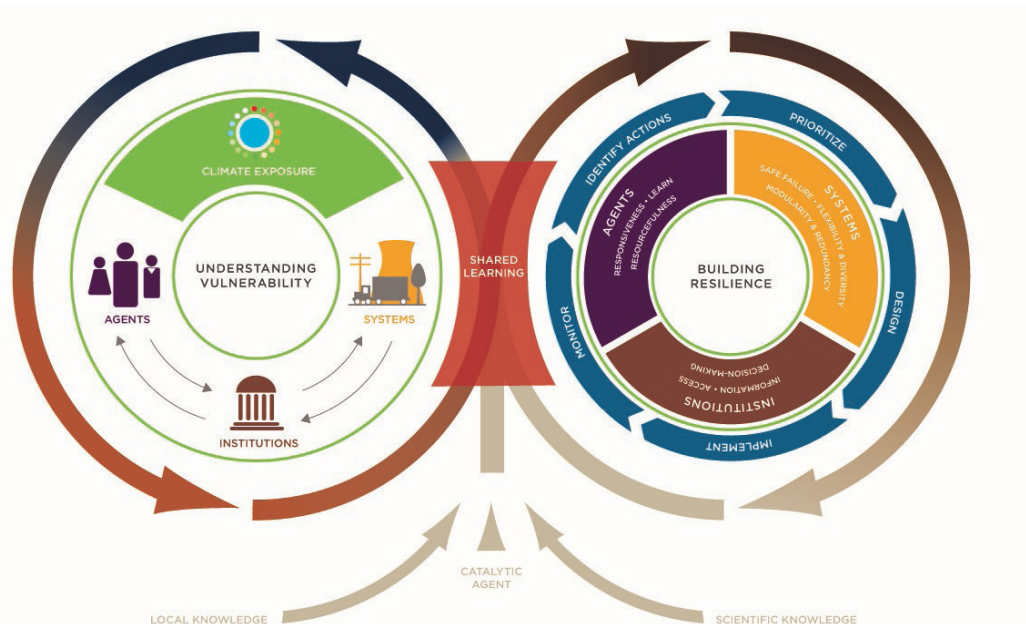
Adaptation is often taken to mean discrete actions, such as building flood-protection systems or mangrove restoration, developed to address specific vulnerabilities or problems.

Resilience is an ongoing process. Resilience recognizes that vulnerability and climate risk are constantly evolving, as our cities and communities—and the systems, agents and institutions within them—evolve and interact.

Source: MacChune and Reed, 2012

The Climate Resilience Framework (CRF) developed by ISET International is a conceptual planning approach to building resilience to climate change. The CRF is structured to build a broad understanding of urban resilience by describing the characteristics of urban systems, the agents (people and organisations) that depend on and manage those systems, institutions (laws, policies and cultural norms) that link systems and agents, and patterns of exposure to climate change. It operationalises these concepts through structured and iterative shared learning approaches that allow local planners to define these factors in their own context, in order to develop practical strategies for local action.

Figure 3: Climate Resilience Framework



Source: Moench, et al., 2011. Catalyzing Urban Climate Resilience

The left-hand loop of the framework helps in **understanding vulnerability** and clarifies factors that need to be included in the diagnosis of climate vulnerability. It structures the systematic analysis of vulnerability in ways that clearly identify the entry points for responding to vulnerability. The right-hand loop of the framework supports strategic planning to **build resilience** to climate change, prompting new and practical ways of thinking about the challenges of adapting to climate change.

The entry point into the resilience building process is at the bottom of the diagram, where arrows indicate inputs of local knowledge, scientific knowledge, and a 'catalytic agent' that initiates the process. This agent is intended to be a broad-based, high-capacity organisation that can provide training and methodological support to other organisations that will directly engage local communities.

The CRF is implemented through Shared Learning Dialogues (the center element, in red, in Figure). Shared Learning Dialogues draw from participatory engagement and research techniques. Throughout the CRF planning process, the focus is on capacity building and on utilizing pre-existing skills and knowledge. Consequently, the Framework can be implemented within existing development or disaster risk reduction mandates. The process, and the individual components within the process, is iterative, allowing time to build the understanding and relationships required to successfully engage in this work.

Key Components of CRF and their characteristics

Systems comprise elements and linkages: ecosystems, infrastructure, knowledge
Key characteristics: flexibility and diversity, modularity and redundancy, safe failure

Agents (individuals, organizations, groups): their behavior, socio-economic position, authority, marginalization, etc.
Key capacities: Responsiveness and (re-) organization, resourcefulness and planning, capacity to learn

Institutions: the rules or practices that guide how agents interact with each other and with systems
Key factors: access (rights/entitlements); decision-making; information

1.7 Policy Frameworks for Disaster Resilience

Disaster loss is on the rise with grave consequences for the survival, dignity and livelihood of individuals, particularly the poor, and hard-won development gains. Disaster risk is increasingly of global concern and its impact and actions in one region can have an impact on risks in another, and vice versa. This, compounded by increasing vulnerabilities related to changing demographic, technological and socio-economic conditions, unplanned urbanization, development within high-risk zones, under-development, environmental degradation, climate variability, climate change, geological hazards, competition for scarce resources, and the impact of

Figure 4: The Sendai Framework



epidemics, points to a future where disasters could increasingly threaten the world's economy, and its population and the sustainable development of developing countries.

There is now international acknowledgement that efforts to reduce disaster risks must be systematically integrated into policies, plans and programmes for sustainable development and poverty reduction, and supported through bilateral, regional and international cooperation, including partnerships. Sustainable development, poverty reduction, good governance and disaster risk reduction are mutually supportive objectives, and in order to meet the challenges ahead, accelerated efforts must be made to build the necessary capacities at the community and national levels to manage and reduce risk. Such an approach is to be recognized as an important element for the achievement of internationally agreed sustainable development goals. The importance of promoting disaster risk reduction efforts on the international and regional levels as well as the national and local levels has been recognized in the past few years in a number of key multilateral frameworks and declarations as explained below:

Sendai Framework for Disaster Risk Reduction 2015-2030

The Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030 was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015.

The Sendai Framework is the successor instrument to the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters. The HFA was conceived to give further impetus to the global work under the International Framework for Action for the International Decade for Natural Disaster Reduction of 1989, and the Yokohama Strategy for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action, adopted in 1994 and the International Strategy for Disaster Reduction of 1999. The Sendai Framework is built on elements which ensure continuity with the work done by States and other stakeholders under the HFA and introduces a number of innovations as called for during the consultations and negotiations.

SFDRR Goal

Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience.

Sendai Framework Innovations

1. A shift from disaster loss to disaster risk from disaster management to disaster risk management, from “what to do?” to “how to do?”
2. Focus on people-centered preventive approach to DRR
3. Primary responsibility of States for DRR and shared responsibility for DRR with stakeholders
4. Broader scope which includes risk of slow-onset disasters and man-made and bio hazards

Expected Outcomes

The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

Seven Targets

To support the assessment of global progress in achieving the outcome and goal of the present Framework, seven global targets have been agreed. These targets will be measured at the global level and will be complemented by work to develop appropriate indicators. National targets and indicators will contribute to the achievement of the outcome and goal of the present Framework.

The seven global targets are:

- a. Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015
- b. Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015
- c. Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030
- d. Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030
- e. Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020
- f. Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030
- g. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

Priorities for action

Taking into account the experience gained through the implementation of the Hyogo Framework for Action, and in pursuance of the expected outcome and goal, there is a need for focused action within and across sectors by States at local, national, regional and global levels in the following four priority areas:

Priority 1: Understanding disaster risk

Priority 2: Strengthening disaster risk governance to manage disaster risk.

Priority 3: Investing in disaster risk reduction for resilience

Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

Suggested reading: https://www.unisdr.org/files/43291_sendaiframeworkfordrren.pdf

National Policy on Disaster Management

The National Policy on Disaster Management¹ was formulated in India in 2009, post to the Disaster Management Act which came into existence in 2005. The Policy envisions to build a safe and disaster resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response.

National Disaster Management Authority, India

The Government of India, in recognition of the importance of Disaster Management as a national priority, set up a High-Powered Committee (HPC) in August 1999 and a National Committee after the Gujarat earthquake, for making recommendations on the preparation of Disaster Management plans and suggesting effective mitigation mechanisms. The Tenth Five-Year Plan document also had, for the first time, a detailed chapter on Disaster Management. The Twelfth Finance Commission was also mandated to review the financial arrangements for Disaster Management.

1 Suggested reading: <https://ndma.gov.in/images/guidelines/national-dm-policy2009.pdf>

On 23 December 2005, the Government of India enacted the Disaster Management Act, which envisaged the creation of National Disaster Management Authority (NDMA)², headed by the Prime Minister, and State Disaster Management Authorities (SDMAs) headed by respective Chief Ministers, to spearhead and implement a holistic and integrated approach to Disaster Management in India.

The NDMA envisions to “build a safer and disaster resilient India by a holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation.”

National Disaster Management Plan, 2016

The National Disaster Management Plan (NDMP)³ provides a framework and direction to the government agencies for all phases of disaster management cycle. The NDMP is a “dynamic document” in the sense that it will be periodically improved keeping up with the emerging global best practices and knowledge base in disaster management. It is in accordance with the provisions of the Disaster Management Act, 2005, the guidance given in the National Policy on Disaster Management, 2009, the aims and objectives of the Sendai Framework for Disaster Risk Reduction, 2015-2030, the Sustainable Development Goals, 2015 and the Paris Climate Change Agreement, 2015.

Roadmap for DRR 2015- 2030, Government of Bihar

In the light of the SFDRR, the Government of Bihar in India formulated a Roadmap for DRR (2015-2030) for the state. The Roadmap adopts a clear distinction between ‘disaster risk reduction’ and ‘disaster management’ with focussed attention on disaster risk reduction through strategies and actions aimed at addressing the causal factors of disaster risk. This marks a conscious shift from focus on implementation of disaster response, relief and recovery measures only. Despite the shift in focus, management of residual risks has been duly accounted for in the Roadmap through actions for ‘preparedness for effective response and recovery’. This is in line with the Priority 4 of the Sendai Framework for Disaster Risk Reduction: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

The Bihar DRR Roadmap framework envisages a Resilient Bihar and encompasses five components:

1. Resilient Villages
2. Resilient Livelihoods
3. Resilient Critical infrastructure
4. Resilient Basic Services, and
5. Resilient Cities

The **Resilient Cities** component of the DRR Roadmap focusses on policy and practice level changes aiming for resilience in urban areas of Bihar. The Resilient Cities Programme broadly focus on:

- Disaster risks recognition, understanding and analysis;
- Disaster risk informed ward level development planning, using participatory, comprehensive and scientific risk analysis;
- Risk reduction actions based on this planning;
- Capacity building measures for risk analysis, risk-informed planning and risk reduction actions;
- Actions for targeted and planned communication for DRR.

² Suggested reading: <https://ndma.gov.in/en/policy.html>

³ Suggested reading: <https://mha.gov.in/sites/default/files/National%20Disaster%20Management%20Plan%20May%202016.pdf>

1.8 Resilience in Post 2015 Global Development Frameworks

The year 2015 was a landmark year for the United Nations and Global Development Agenda. The convergence of interests and global concerns for sustainable development, disaster risk reduction and climate change led to the formation of a new roadmap for a sustainable and safe world together: The Sendai framework for disaster risk reduction, The 2030 agenda for sustainable development and The Paris Climate Agreement. These agreements of global significance provide opportunities to build coherence across different but overlapping policy areas. "Resilience" features in all the three frameworks and agreements.

Table: Resilience across Post 2015 Development Frameworks

Framework	Description	Resilience
1.Sustainable Development Goals (SDGs)- The 2030 Agenda	SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. These 17 Goals build on the successes of the Millennium Development Goals, while including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities.	- Resilience features in two goals and eight targets, linked to poverty, built infrastructure and human settlements, agricultural production and vulnerability to climate extremes and disasters. - Resilience is regarded simultaneously as a quality to be built, developed and strengthened, as a tool to reduce the exposure of people and as a foundation for inclusive economic growth and prosperity
2.Sendai Framework for Disaster Risk Reduction (SFDRR)	The Sendai Framework is a 15-year, voluntary, non-binding agreement which aims at substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.	- Resilience is an integral part of SFDRR Goal, Targets and Priorities. The overarching goal is to strengthen resilience, seen as a task of disaster risk management, covering all its aspects and dimensions - SFDRR reiterates the commitment of countries to build resilience to the impacts of disasters with a renewed sense of urgency, within the context of sustainable development and poverty eradication, and to integrate this into policies, plans, programmes and budgets at all levels.
3.Paris Climate Agreement	The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. It aims to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.	- Features resilience as an integral component of climate change adaptation, linked to concepts of building adaptive capacity and reducing climate change vulnerability. - Building resilience is emphasized in relation to communities and livelihoods as well as social, economic and ecological systems and is further considered a global mechanism for reducing damage and loss associated with the impacts of climate change

For more information on Global Frameworks

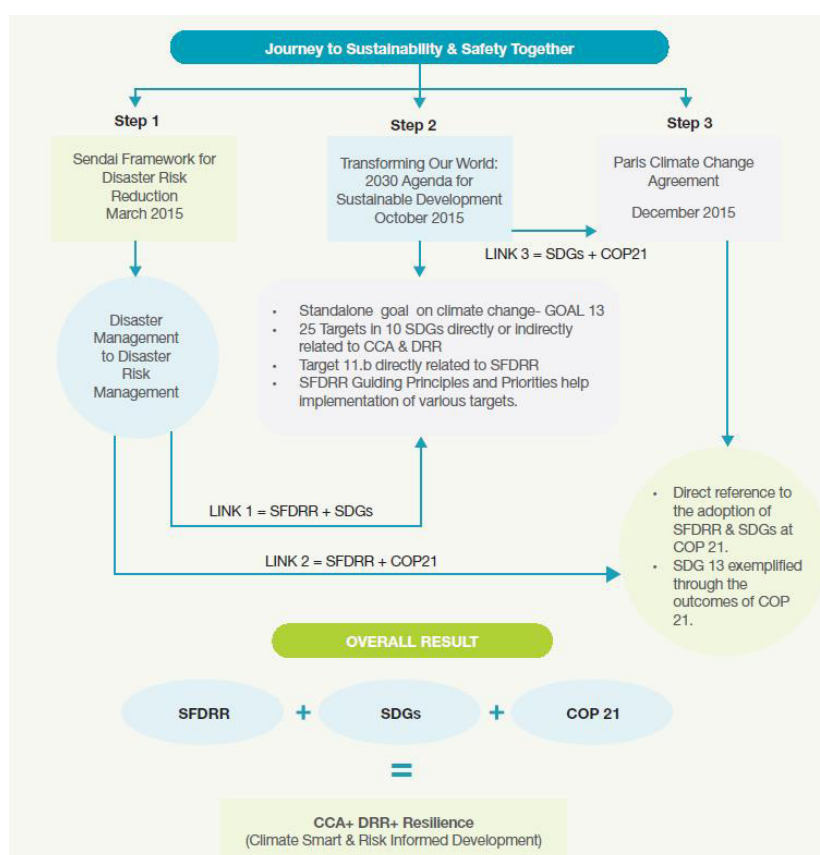
"What are the Sustainable Development Goals", United Nations Development Programme (UNDP), available at <www.undp.org/content/undp/en/home/sustainable-development-goals.html>

"Sendai Framework for Disaster Risk Reduction", United Nations Office for Disaster Risk Reduction (UNISDR), available at <www.unisdr.org/we/coordinate/sendai-framework>

"The Paris Agreement", United Nations Framework Convention on Climate Change (UNFCCC), available at <<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>>

(Source: Modified from *Building Resilience to Disasters in Asia and the Pacific through Coherent Responses to the Global Development Frameworks-A Briefing Note for Policy Makers*, 2017, United Nations Asia-Pacific Regional Coordination Mechanism; Peters and Tanner, 2016; Authors)

The frameworks articulate how building resilience is important to achieve global change in a variety of sectors, context and scales. The different contributions of these frameworks taken together will have huge potential to comprehensive resilience as building resilience requires actions that span across development, climate change and disaster risk reduction. DRR must be an integral part of local development. In fact, a holistic framework for DRR and Resilience for sustainable development will be more useful as it will simultaneously address the needs of many stakeholders and competing priorities.



(Source: Gupta, A.K., Singh, S., Katyal, S., Chopde, S., Wajih, S.A., Kumar, A., (2016). *Training Manual on Climate Resilient and Disaster Safe Development – Process Framework*, NIDM, New Delhi (India), GEAG, Gorakhpur (UP, India) and ISET, Colorado (USA), supported by CDKN, UK.

Box 2: Synergizing SDGs, Paris Climate Agreement and Sendai Framework for DRR

There is a growing global consensus that disaster risk reduction, climate change adaptation and sustainable development are linked to each other. Many evidences of linkages between the three agendas are observed while studying the Sendai Framework for Disaster Risk Reduction 2015–2030, Sustainable Development Goals 2030 and the Paris Climate Agreement 2015. All of them share a common aim of making the development sustainable. Commitment to the goals and their implementation must become a global priority. To ensure the achievement of SDGs, it is very important to consider current and future challenges caused by disasters and climate change.

MODULE 2

Role of Urban Local Bodies in Urban Risk Resilience

2.1 Introduction

Urban local bodies play a pivotal role in the planning and development of urban areas. The municipalities in India are confronted with a number of challenges, such as issues of bringing efficiency in the conduct of business, ensuring effective participation by the weaker sections of the population in local governance, improving financial condition, ensuring transparency in the planning and implementation of projects, and so on. All these requirements are also coupled with serious development related challenges confronting the cities of the 21st century. On the one hand, cities have to gear up for the rising demands of urbanization and, on the other hand, cities need to deal with the challenges of environmental degradation, air pollution, climate change and increasing frequency of climate induced events and disasters.

There are three learning units under this module as below:

LU (a) Impacts of climate change and induced disasters on cities

LU (b) Building Resilient Cities – Key Frameworks

LU (c) Building Resilient Cities – Key Essentials

LU (c) Ward-level micro resilience planning

2.2 Learning Objectives

- To build understanding of ULBs on how climate and disaster impacts cities and urban areas
- To integrate climate and disaster resilience aspects in city planning and development strategies
- To comprehend the concepts of resilient urban governance
- To understand aspects of ward-level micro resilience planning

2.3 Training Methodology and Duration

The time duration in total delineated as 6 hours and hence, the Module will take 1 day in completing it.

The training methodology will include:

- | | | |
|-------------------------------------|---|----------------------|
| ■ Lecture/Power Point Presentations | ■ Best practices from different cities/ULBs | ■ Experience sharing |
| | ■ Group exercises | ■ Discussion |

2.4 Impacts of climate change and induced disasters on cities

This section highlights the major climate change drivers leading to disaster phenomena and their impacts on cities.

Temperature

- Cities' air and surface temperatures are higher as compared to surrounding rural areas. This phenomenon is termed as Urban Heat Island.
- As the climate change is expected to further raise the earth's average temperature, the problem of UHI will worsen.
- It will increase the energy demand for cooling (not limited to peak summers).

- For tropical country like India, summers are usually harsh, this can have serious implications for energy.
- It can also adversely affect human health and comfort due to rise in heat related morbidity and heat mortality cases.

2018 - fourth warmest year in continued warming trend, according to NASA, NOAA

Earth's global surface temperature in 2018 was the fourth warmest since 1880, according to independent analyses by NASA and the National Oceanic and Atmospheric Administration (NOAA). Global temperatures in 2018 were 1.5 degrees Fahrenheit (0.83 degrees Celsius) warmer than the 1951 to 1980 mean, according to scientists at NASA's Goddard Institute for Space Studies (GISS) in New York. Globally, 2018's temperatures rank behind those of 2016, 2017 and 2015. The past five years are, collectively, the warmest years in the modern record.

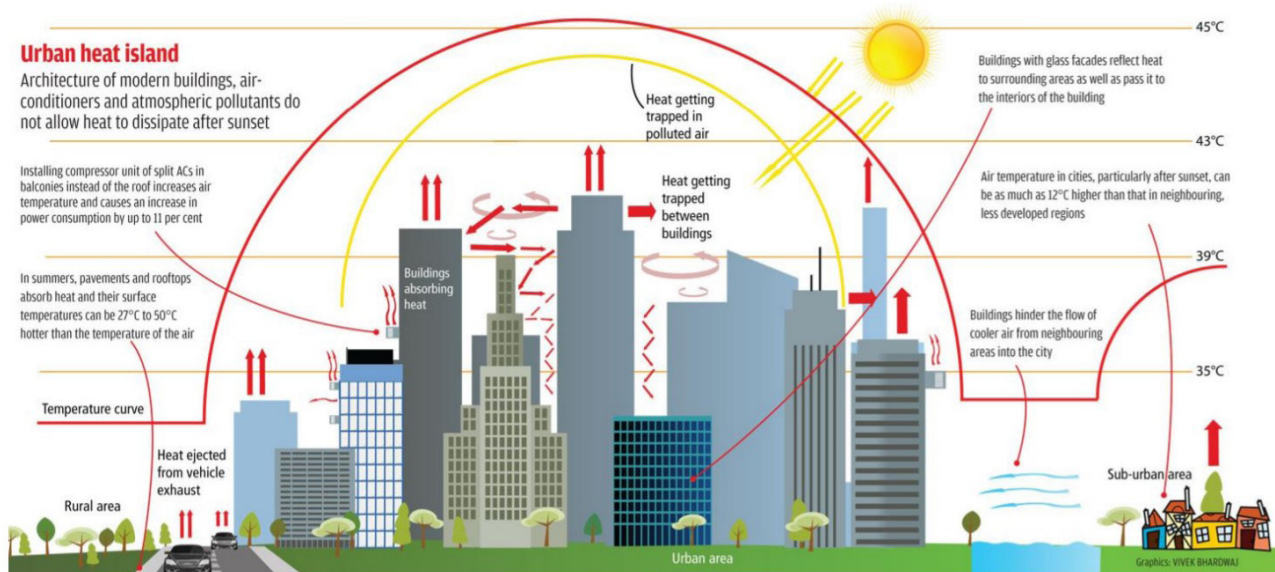


Figure 5: Urban Heat Island (<http://www.downtoearth.org.in/dtc/userfiles/images/20140731-47-1.jpg>)

Precipitation

- Extreme precipitation events (with heavy rainfalls) are expected in future which are likely to increase the risk of urban flooding in Indian cities.
- Sewerage and drainage systems in most Indian cities cannot cope with the amount of water during rains which often results in water logging and flooding in some cases.
- The impervious nature of urban structures, often aggravate the flooding by increasing the runoff.
- As cities are crowded with people, this increases the vulnerability to damage due to flooding especially in high exposure areas such as low lying areas, poor quality housing, settlements along the river banks, to mention a few.
- Thus, even moderate storms can create havoc in urban areas.
- Urban areas also tend to augment the thunderstorm activity by modifying the local air circulation patterns owing to UHI effects.
- Flooding damages the urban utilities such as transport systems (rail and road), electricity network and other critical infrastructure and services such as hospitals and schools.
- It affects health directly and indirectly. Direct health impacts could be through injuries, while indirect health impacts could be due to infections from contaminated water and food; and water and vector-borne diseases (such as dengue, encephalitis, malaria, chikungunya, jaundice).

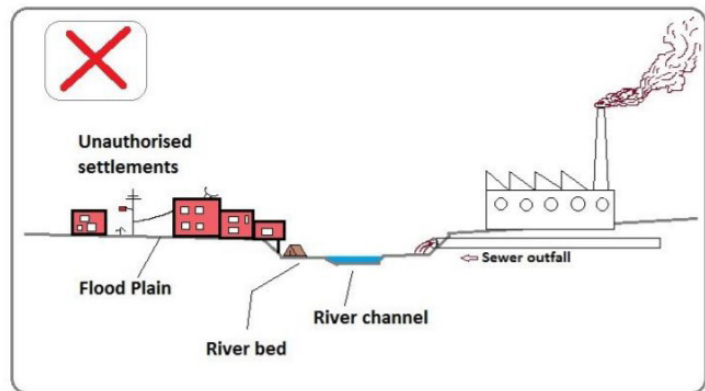
Urban flooding:

Flooding in urban areas is an emerging climate-induced disaster because of the following reasons:

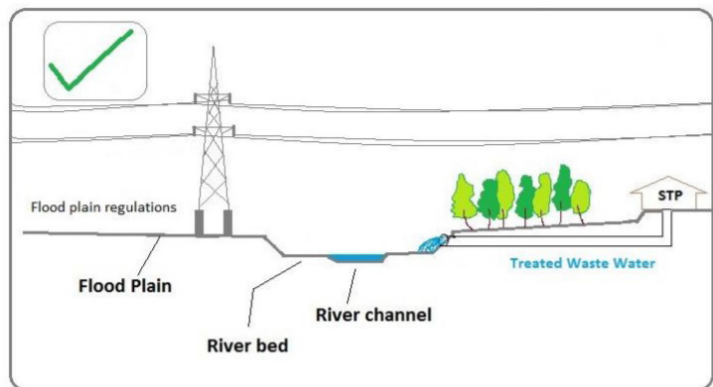
- Climate change is increasing the unpredictability of rainfall.
- Rapid urbanization in the country is leading to unplanned growth of urban areas
- Usurping of wetlands, water bodies and natural drains for construction of buildings
- Encroachment on flood plains and natural drainage has made the phenomenon of flooding more destructive in nature

Unauthorised settlements, key infrastructure, industries are come up close to river bed, on the flood plain. In the event of heavy or extreme rainfall, the river channel rises and claims the flood plain, leading to loss of life and property.

Floodplain of a river should be cautiously developed. Any vital infrastructure should be built on plinth or stilts. Vegetation should be promoted on the flood plain, if possible flood resistant in nature.



Scenario 1 – Development on flood plains



Scenario 2 – Expected development on flood plains

Urban Flood Risk in India

There has been an increasing trend of urban flood disasters in India over the past several years whereby major cities in India have been severely affected. The most notable amongst them are Uttarakhand in 2013, Chennai in 2015, Mumbai in 2017, and Kerala in 2018.

A special feature in India is that there is heavy rainfall during monsoons. There are other weather systems also that bring in a lot of rain. Storm surges can also affect coastal cities/ towns. Sudden release or failure to release water from dams can also have severe impact. In addition, the urban heat island effect has resulted in an increase in rainfall over urban areas. Global climate change is resulting in changed weather patterns and increased episodes of high intensity rainfall events occurring in shorter periods of time. Then the threat of sea-level rise is also looming large, threatening all the coastal cities. Cities/towns located on the coast, on river banks, upstream/ downstream of dams, inland cities and in hilly areas can all be affected.

Sectoral impacts of climate change and disasters in cities

Climate change impacts and disasters have sectoral impacts on cities, especially on the sectors responsible for provisioning of basic need services in the cities, such as, water supply, water source, sewerage system, sanitation, etc. Below is a table of few sectors getting impacted by climate and disasters.

Sectors	Probable impacts of climate change and disasters
Water Supply	• Variability in flow of water in perennial and non-perennial rivers will affect water availability. • Variability in rainfall will affect ground water recharge. • Reduction in water levels in tanks and dams will be seen due to rise in temperature and variability of precipitation. • Scarcity of water will rise over the time and geographically. • Water supply systems such as borewells, pumping stations, water treatment plants, will get affected due to floods • Springs and rivers will be more seasonal in nature due to variability of rainfall and rise in extreme rainfall events • Ground water table will fall rapidly in over exploited areas, as recharge of aquifers will reduce due to change in rainfall patterns (more extreme rainfall events leading to high run off).
Sewerage	• Infiltration of flood waters into sewers – creating pollution impacting health • Pollution of water downstream. • Due to high temperature & reduced water supply reduced flow may choke sewers and early decomposition may take place resulting in deposits in the network. • Open sewers may overflow due to heavy rains and threat of epidemic may increase
Sanitation	• Pits would get inundated from below due to flooding situations, polluting ground water and soil. • Open defecation would spread faecal matter during flooding causing serious health problems. • Silt load carried with flood water would settle in septic tanks and sometimes there would be backflow of sewage. This would indirectly contribute to water borne and vector borne diseases in flooded localities.

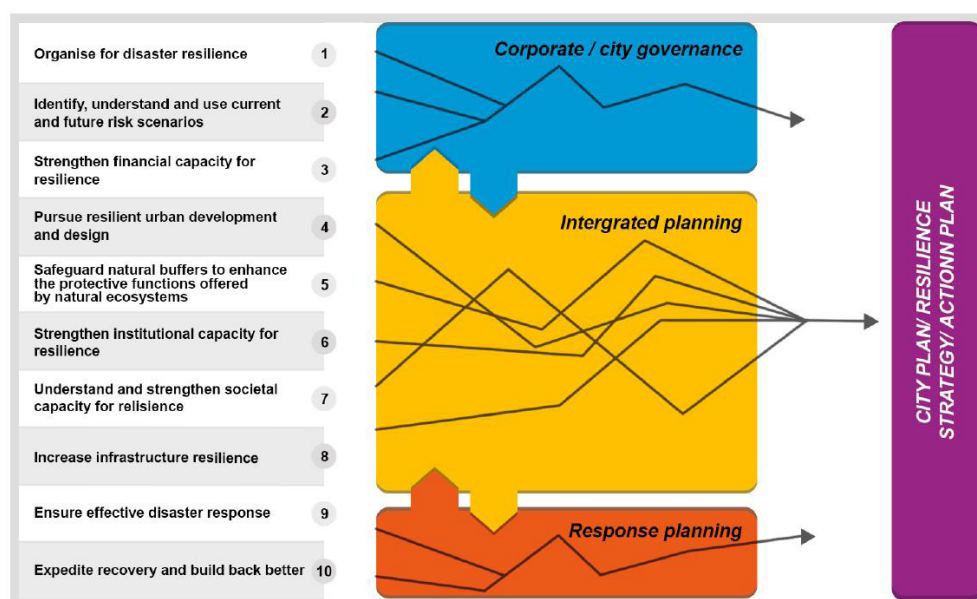
2.5 Building Resilient Cities – Key Frameworks

Building resilient cities embraces climate change adaptation, climate change mitigation and disaster risk management, while recognizing the complexity of rapidly growing urban areas and uncertainties associated with climate and disaster risks.

Making Cities Resilient Campaign (UNISDR)

Launched by UNISDR in May 2010, the “Making Cities Resilient: My City is Getting Ready Campaign” aims to “support sustainable urban development by promoting resilience activities and increasing local-level understanding of risk”. More than 3000 cities have joined the campaign by 2016 with a commitment to lead risk reduction strategies and activities on the basis of the new “Ten Essentials for Making Cities Resilient”. The New Ten Essentials have been formed developing on the previous 10 Essentials keeping in mind the alignment of essentials with the SFDRR priorities of action which emphasizes on minimizing the risks in the urban landscape. A transition towards the stage of implementation is being represented by the new essentials. SFDRR and the New Ten Essentials will pave the way new and enabling urban sector policies on resilience and will support the urban local governments to implement strategies in a time-bound manner (UNISDR, 2017).

Figure 6: UNISDR's Ten Essentials for Making Cities Resilient



Bihar Roadmap for DRR 2030

The Bihar Roadmap for DRR 2030 outlines a special component on Resilient Cities, given the context of increasing climate-induced disasters and the urgent need to build safe and resilient cities. The Roadmap envisages a resilient city as a dynamic and proactive social unit wherein all individuals, households and the community as a whole is capable to:

- **Assess** the disaster and climate change induced risks and access the early warning systems,
- **Address** disasters including 'climate change induced disasters' through risk informed development planning, which includes preparedness, response and mitigation actions,
- **Preserve** ecosystem thorough environmental impact assessment and
- **Recover** from disaster(s) through building back better.

Characteristics of resilient cities (Bihar DRR Roadmap 2030)

1. People are aware and recognize the risk/hazards and take appropriate action to prevent/mitigate disasters for a safe and secure environment.
2. Land zoning and urban planning is in sync with the ecosystem as well as with the natural drainage and geo-morphological patterns.
3. Communities practice safe behaviours like constructing safe houses, timely relocation to safe spaces, dispelling prevalent myth related to disaster, safe hygiene practices, promote preventive health, safe handling and storage of drinking water, acquire life skills, imbibe civic sense and practice community cooperation exercise sustainable livelihood choices, and life practices.
4. The city is able to meet small-scale disasters (L1) on its own.
5. Urban communities have timely access to early warning information and emergency services like evacuation, safe spaces, search and rescue as well as emergency health care and other essential services.
6. DRR is mainstreamed in ULB level plans by undertaking regular multi-hazard risk analysis.
7. Vibrant community institutions drive the process of risk analysis, risk communication, preparedness and risk reduction actions:
 - There are ward-level standing committees on DRR for supporting risk analysis and mainstreaming DRR in annual planning.

- There are ward-level Community Emergency Response Teams (CERT) comprising citizen council members, civil defence personnel, service providers and select community members for preparedness and response actions.
- 8. Risk analysis, planning, communication, preparedness and reduction measures are undertaken in an inclusive and participatory manner, accounting for differential needs and capacities of children, adolescents, elderly, women, men, PWD, and traditionally marginalized or minority groups and through appropriate use of technology such as GIS mapping, mobile applications etc.
- 9. Communities have easy access to pre-positioned essential items and life-saving equipment.
- 10. Continuity of basic services like health, education, nutrition, WASH, and housing and critical infrastructure like power, bridges, roads, and telecommunications is ensured in the city, with either no disruptions or rapid regaining of functionality in case of disruptions.
- 11. Communities can build back faster through risk transfer initiative such as insurance.

2.6: Building Resilient Cities – Key Essentials

Below are a set of key essential aspects that are vital to building resilient cities:

Provisioning of resilient basic services

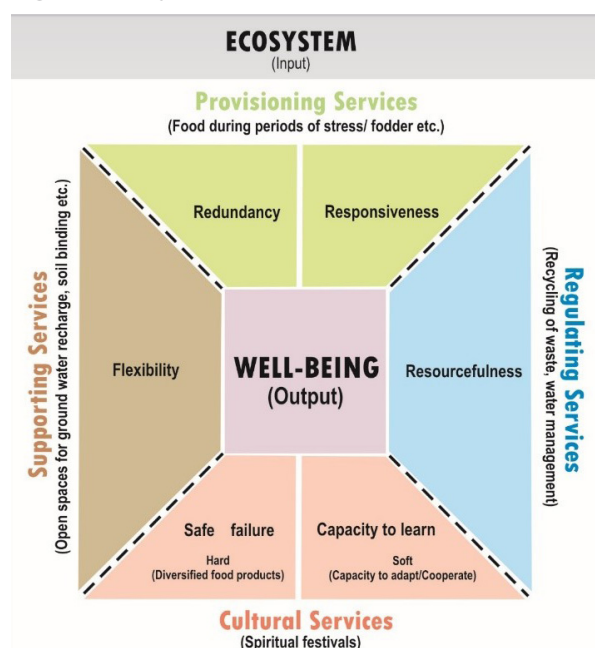
Basic services like water supply, sanitation, waste management, education, health, food supply, etc. are considered as the essential services which are critical for survival, sustenance of basic quality of life, protection and well-being of individuals and communities. Functional continuity and timely restoration of basic services in the aftermath of exposure to a hazard event forms the cornerstone of a resilient society. Ensuring this entails both structural and non-structural measures like building better from the start to withstand hazards through proper design and construction, retrofitting and rebuilding, a culture of maintenance, taking into account impact assessments, operational clarity, risk awareness/competence and culture of safety within staff.

Role of peri-urban ecosystem services in urban resilience

The Millennium Ecosystem Assessment focussed on 'ecosystem services' and their sustainable use to contribute to human well-being. Growing research on the importance of ecosystem services have shown scant regard for such concerns especially in a scenario of rapid urbanisation. Ecosystem services include provisioning services (food, water); regulating services (waste treatment, flood control); cultural services (recreational benefits); and habitat services (maintaining conditions for life).

Peri-urban areas are the transitional zones between a sprawling city and its rural surroundings, neither urban nor rural in its outlook and characteristics (Dutta, 2012; Prakash, 2012). There is a mix of agricultural and non-agricultural land-uses, flow of goods, services and resources between villages and urban centres and a heterogeneous social profile that is in a constant state of

Figure 7: Ecosystem Services



flux (Narain, 2010). The peri-urban is a fast-changing, semi-natural ecosystem which provides natural resources for growing cities while depending on the urban markets for sales and employment.

The relationship between ecosystems and cities are interlinked and is often a two-way process. Ecosystems provide a multitude of physical and environmental services to cities and their residents which also help in enhancing city's resilience. However, the cities, which are rapidly urbanising and experiencing unplanned development is leading to a threatening decline in ecosystems. This is impacting the resilience of several cities. The 'extractive' nature of urbanisation places a low premium on preserving the ecosystem, affecting not only the livelihoods of those directly dependent on it but also the city itself. Talking of peri—urbanisation, this is leading to usurpation of ecologically sensitive lands for housing and other construction activities. These change the face of agriculture, reduce open spaces and green zones, and enhance pressure on natural resources like water. These areas are marked by a lack of hygiene and sanitation infrastructure, industrial effluence, air pollution and inadequate provision of basic services. The peri-urban areas which provides ecosystem services to urban areas, are become the dumping grounds for urban solid waste, sewerage, etc., which is leading to environmental degradation, groundwater contamination and adversely impacting the livelihoods and the health of people residing in the peri-urban areas.

Environmental management of peri-urban areas is critical to the sustainability of urban and rural development as the ecological, economic and social functions performed by and in them impact on both the city and the countryside. Contemporary land acquisition policies in developing cities disregard social equity and environmental integrity, undermining a city's capacity to adapt to climate change and disaster risks and rendering the peri-urban areas and poorer populations very vulnerable. Environmental degradation, natural resource conflicts, health concerns and social injustice are particularly acute in the peri-urban areas that are excluded in formal planning processes.

Resilient Urban Governance

Urban local governments have critical roles and responsibilities in building resilience to climate change and related disasters. However, urban authorities need a supportive institutional, regulatory and financial framework for effective functioning (Save the Children, 2015). Local governments are responsible for the decisions and actions that determine the provisioning of services to their citizens. One of the most direct influences that local governments have on people's resilience, especially the urban poor including women and children, specifically, relates to environmental services, housing and shelter. This includes primarily, the provisions of water, sanitation, drainage, solid waste collection, public health and housing construction and improvement. These are also the sectors which have direct bearing on the health and well-being of people and directly linked to climate change and disaster related vulnerabilities. The vertical and horizontal coordination mechanisms between various levels of city governance – Urban Local Bodies (ULBs), Para-statal and State government play a vital role in establishing linkages with city development processes and providing resilient

Twelfth Schedule of the Constitution of India

- Urban planning, including town planning
- Regulation of land use and construction of buildings
- Planning for economic and social development
- Roads and bridges
- Water supply for domestic, industrial and commercial purposes
- Public health, sanitation conservancy and solid waste management
- Fire services
- Urban forestry, protection of environment and promotion of ecological aspects
- Safeguarding the interests of weaker sections of society, including the disabled and mentally retarded
- Slum improvement and upgrading
- Urban poverty alleviation
- Provision of urban amenities and facilities such as parks, gardens, playgrounds
- Promotion of cultural, educational, and aesthetic aspects
- Burials and burial grounds, cremations, cremation grounds, and electric crematoriums
- Cattle pounds; prevention of cruelty to animals
- Vital statistics including registration of births and deaths
- Public amenities including street lighting, parking lots, bus stops, and public conveniences
- Regulation of slaughter houses and tanneries

services and hence strengthening the enabling environment required for implementing such resilience measures (Wajih and Mani, 2016).

An important initiative of the Government of India to strengthen municipal governance was the enactment of the 74th CAA in 1992. Through this initiative, an attempt was being made to improve the performance ability of municipalities, so that they are able to discharge their duties efficiently. The 74th CAA introduced the Twelfth Schedule which lists the functions of the ULBs, covering planning, regulation and developmental aspects. The other important provisions specified in the Act include constitution of three types of municipalities, devolution of greater functional responsibilities and financial powers to municipalities, adequate representation of weaker sections and women, regular and fair conduct of municipal elections, and constitution of Wards Committees (WCs), District Planning Committees (DPCs), Metropolitan Planning Committees (MPCs) and State Finance Commissions (SFCs).

Table: Role of Municipal Governments in reducing risks and building resilience

Built Environment	Infrastructure	Services
• Setting and enforcing building codes • Land use regulations and property registration • Construction and maintenance of public buildings • Urban planning and zoning	• Piped water (including water treatment) • Sanitation • Drainage • Roads, bridges, pavements • Electricity • Solid waste disposal • Waste water treatment	• Fire protection • Public order, police, early warnings • Waste collection • Schools • Health care and public health services • Public transport and transport management • Social welfare • Emergency planning and response

(Source: Adapted from D. Dodman et al., *Understanding the Nature and Scale of Urban Risk in Low- and Middle-income Countries and Its Implications for Humanitarian Preparedness, Planning and Response* (London: IIED, 2013), <http://pubs.iied.org/pdfs/10624IIED.pdf>.)

Collective action is needed for building resilience of complex urban systems. Many different actors have important roles to play, including local and national government, civil society organisations, the private sector, community groups or associations and international funding agencies. In cities and towns, there are often more official and other agencies of various kinds than in the rural areas, and there is, accordingly, a more complex and diverse network of relationships between them. These bodies need to develop shared visions of the future and set priorities for action. Strategies and interventions in urban settings have to be planned in the context of the relationships (including power relationships) between the different actors involved. In addition, local and grassroots organisations and higher-level decision-making forums should be connected to one another. This can be challenging, especially where there is no tradition of community engagement. The decentralisation mechanisms such as the 74th CAA also calls for enhanced horizontal and vertical coordination among various departments which can be very useful in resilience building processes. However, this needs adequate policy and financial support from higher levels of government, which is often lacking.

Features of resilient urban governance

Deeper investigation and analysis are required to understand the extent to which good urban governance and climate and disaster resilient urban planning and development can be linked to deliver pro-poor resilience mechanisms for the most vulnerable populations. Governance arrangements must be able to address infrastructure, services and housing provisions for marginalised communities and in-migrant populations in the cities and therefore, must form a core component of any disaster resilience governance framework. Integrating climate change and disaster risk aspects into city development plans or by the ULBs in provisioning of services is influenced by levels of awareness and understanding of these risks and levels of motivation among elected representatives and government

departments. Access to resources is also significant particularly in those cities which have substantial financial autonomy. Accountability mechanisms in city planning and the participation of citizens in planning processes provide further indicators of the city's capacity to implement meaningful and pro-poor climate adaptation programmes.

Following are the features of resilient urban governance which will be helpful in building resilient cities:

Decentralization • Implementation of 74th CAA • Ward Autonomy	Accountability and Transparency • Reducing gap between service provider and end-user of services • Bi-lateral communication mechanisms • Quick and Real-time response by city governments to various problems	Community Participation and Inclusion • Involving citizens in municipal functions (setting priorities, budgeting provision, existing pressure on compliance on existing regulations) • Ward committee • Area Sabhas • Master Plan	Vertical and Horizontal Coordination • Vertical (national-state-city-ward-neighbourhood coordination and decentralization) • Horizontal (bottom-up endeavours and co-governance) • Intra-institutional, inter-sectorial and urban, peri-urban/rural coordination
Coherent Actions • Avoid duplication and fragmentation of roles between different institutions in control of resources, management of infrastructure and services currently constrain the urban governance system	Enforcement of Rules and Laws • Strict enforcement of rules and laws pertaining to increasing encroachment, illegal construction on green and open areas, informal settlements in river basin and low lying fragile areas	Capacity Building • Technical capacity building of ULBs for quality and efficiency of services • Integration of climate resilience components in the working agendas	Use of Science and Technology • Use of ICT Tools (GIS, E-Governance, Early Warning Systems, Wireless Communication) • Drainage planning on the basis of gradients, ward planning on the basis of climate threshold, mobile-based technology for monitoring etc.

(Source: Modified after Wajih and Mani, 2016)

Box: Local Governments' Powers and Responsibilities for DRR Actions

Actions:

- Action 1:** Developing a City Vision or Strategic Plan with Concepts of Resilience
- Action 2:** Establishing a Single Point of Coordination for DRR
- Action 3:** Undertaking Risk Analysis for Multiple Hazards
- Action 4:** Developing Financial Planning for Resilience
- Action 5:** Developing and Updating Urban Plans with Up-to-Date Risk Information
- Action 6:** Updating Building Codes and Standards and Enforcing their Use
- Action 7:** Protecting, Conserving, and Restoring Ecosystems for Resilience
- Action 8:** Developing a Critical Infrastructure Plan or Strategy for Resilience
- Action 9:** Strengthening Institutional Capacity for Resilience
- Action 10:** Identifying and Strengthening Societal Capacity for Resilience
- Action 11:** Developing a Disaster Management and/or Emergency Response Plan and Protocols
- Action 12:** Developing or Ensuring Connections to Early Warning Systems (EWS)
- Action 13:** Developing a Strategy for Post-Disaster Recovery and Reconstruction that Ensures Building Back Better (BBB)

Source: Local Government Powers for Disaster Risk Reduction: A study on Local-Level Authority and Capacity for Resilience, 2017, UNISDR, available at < www.unisdr.org/campaign/resilientcities/assets/documents/guidelines/LG%20Powers%20for%20DRR_2017_Final_20170531.pdf>

Policy Framework in India for supporting and financing urban resilience

To promote sustainable development amidst growing challenges of urbanization, the Government of India (GoI) has taken several steps in the past which are also the key entry points for building resilience in urban areas. The schemes like Integrated Development of Small & Medium Towns (IDSMT) and Urban Basic Services for the Poor (UBSP) focused on regulating migration to urban areas and upgrading the quality of life of urban poor respectively. Under Jawaharlal Nehru National Urban Renewal Mission (JnNURM) cities were identified as engines of India's economic growth and an integrated approach to urban development was adopted in the country. The mission aimed to develop economically productive, inclusive, responsive and efficient cities. Upgrading the infrastructure, provision of Basic Services to Urban Poor (BSUP) and a range of urban sector reforms were there in the mission to give more strength to Municipal Governance system in India in line with the 74th CAA. Several good practices of urban transformation across the country took place under the mission including innovative solid waste management in Rajkot, Mumbai, Delhi, Pune and Ahmedabad; 24X7 water supply initiatives in Nagpur, Hubli-Dharwad, Belgaum and Gulbarga; mobility solutions in Bhopal, Indore and Ahmedabad; several e-governance and financial reforms in Ahmedabad, Surat, Bengaluru and Hyderabad to name a few cities.

Several new schemes were launched by Government of India in 2015 including Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Housing for All (Urban) Scheme and the Smart Cities Mission. With these missions, the new thinking of recasting the urban landscape in India came into picture by making cities smart, sustainable, inclusive and livable while promoting the economic growth of the country (Ministry of Urban Development, Government of India, 2015). The mission AMRUT focussed on improving the lives of citizens through provision of basic services in a sustainable manner in 500 cities. Smart Cities is an urban renewal and retrofitting mission to develop 100 Smart Cities having citizen friendly and sustainable components. An analysis of AMRUT and SCM Guidelines shows that there are many objectives of these missions which will cater to the achievement of SDGs in India. For example, "Sustainable Environment" is a key feature of the SCM as mentioned in the guidelines. Issues related to urban basic services like clean water and sanitation, reduction, recycling and re-use of waste, inclusive city planning, physical and social infrastructure development, inclusive city planning and use of renewables etc. are key components of SCM which are aligned to SDG 11 of Safe, Inclusive and Resilient Cities.

Table: Entry points for mainstreaming resilience at various levels of government

National Level	Sub-national/State Level	City Level
- National Missions as part of National Action Plan on Climate Change, National Plan for Disaster Risk Reduction - Sectorial Policies (Water and Sanitation, Transport, Buildings, Energy, etc)	- State Agenda and Action Plan on Climate Change, District Disaster Management Plans - Sectorial Policies	- City Disaster Management Plan - City Sanitation Plan - City Development Plan - City Master Plan - City Mobility Plan - City Resilience Strategies

(Source: Modified from "Mainstreaming Urban Resilience Planning in India Cities: A Policy Perspective TERI, 2011) cited in NIUA

Despite these urban renewal and rejuvenation policies and programmes in place, a clear roadmap drafting the ways and means for translating the goals into on-ground actions for sustainable and resilient urban development is still missing. More linkages and alignment should be drawn to relevant SDGs for attainment of resilient cities.

2.7: Ward-level micro resilience planning

The 74th Constitutional Amendment Act provides the needed space for decentralized planning in the context of urban development. However, the implementation of the Act is at the discretion of state governments to amend and apply taking into account local context. Strikingly, there are capacity gaps in urban department at the state level to take up the needed planning. The scenario is further grim at further lower levels such as at the Urban Local Bodies (ULB) levels. Resultantly, there are not many examples of effective decentralized planning especially at the ULB levels that are especially developed using participatory bottom-up approach. Towards this, the micro level ward resilience planning provides several takeaways for the ULBs, government, urban planners, social scientists, donors and civil society organizations in terms of process of community involvement, government interface, sectoral planning, resource identification and execution of sector plans.

Key objectives of Ward-level micro resilience plan

1. To develop the understanding on various steps of developing climate resilient ward plan
2. To understand the planning process
3. To understand the process of implementation and monitoring of the plan
4. To leverage ideation on replication and scaling-up of ward level micro-resilience planning

With rapidly transforming complex urban systems and increasing frequency of magnitude of disasters due to climate change, it is of utmost importance to progress from a 'predict and prevent' approach to a more pro-active approach of building climate resilience through micro-level planning. Building resilient ward plans at the city level is a way to incorporate the concerns of urban vulnerabilities to climate change and disasters in decentralised planning. The process builds the resilience of various urban systems and diverse agents including the ward level functionaries and communities.

Principles of developing resilient ward plan

People's Participation: People's participation is the key to formulating a realistic and effective micro resilience ward plan. Hence, a bottom-up resilience planning approach should be adopted which ensures participation of people in the decision making processes, their contribution in the activities and hence their ownership in the long run.

Experiential Learning: Experiential learning is a process where knowledge is co-created through developing and promoting a shared vision and learning approach. The micro resilience ward plan should be developed on the basis of experiential learning generated through the implementation of pilot activities. This will help in getting a more realistic plan for implementation.

Entry Point Activities: Entry point activities are crucial in terms of building micro resilience plan in an urban setting. These activities should be carefully chosen and implemented to build effective rapport with the community as well as achieve quick success by solving some of the key problems related to climate change impacts.

Implementation of 74th CAA: The 74th CAA provides for the devolution of planning funds, functions and functionaries (including the technical expertise of various departments) to municipal corporations. The development of micro resilience ward plan and governance in urban areas can be decentralized through a bottom-up approach as outlined in this Amendment. This can be achieved by promoting community institutions, ward-level micro planning and implementation of activities that especially considers the priorities of local marginalized and poor communities,

with community-led monitoring of the process. Such a community-led process, which is based on people's priorities, needs, knowledge and capacities, will empower people to plan for and adapt to the impacts of climate change.

Facilitator: Micro resilience plan development is an iterative and intensive process, more so in the urban setting where it can be more challenging. It is important to have a core facilitator like an NGO who can lead the whole process and play the role of a facilitator among the different stakeholders involved in the process.

Engagement of government departments: For any micro resilience plan to be successful, it is imperative to have the engagement of government officials, decision makers and other stakeholders in the process right from the beginning. This will not only add credibility to the plan but will also help in further implementation and scaling up with the support of the government.

Dynamic Process: Resilience building is not a one-time process; rather it is a continuous process. Therefore, micro planning should be dynamic in nature that should be reviewed periodically and necessary amendments should be done based on the experiential learning. This is specifically important due to uncertainty in climate projections and the evolving nature of understanding of climate science and complex interactions between exposure, urban physical systems, institutions and change agents

In the development of climate and disaster resilient ward level, a series of five important steps are envisioned:

Note: The toolkit is designed for a community facing floods and waterlogging events in the past. It can be modified according to the risks present in a particular ward.

Process	Approach/Methodology	Data Collection	Outputs
Creating baseline on current vulnerabilities and impacts of climate change and induced disasters	- Quantitative and Qualitative Baseline Survey of the ward - Participatory Learning Action Tools (PLA) - Development of Household Survey Questionnaires - Field Testing and Investigation - Community Consultation	- Demographic characteristics - Social Status - Economic Status - Assets - Livelihood - Access to quality of services - Hazards - Prioritization of problems - Community perspective of development - Future intervention and their prioritization	- Development of initial rapport with communities - Data on nature and extent of current climate vulnerability and disaster risks
Climate threshold determination process	- Historical precipitation data analysis - PLA tools using recall methods	- Historical data of precipitation from meteorology department - Qualitative data from communities on past rainfall and waterlogging events	- Information on past events (depth, duration and area of waterlogging) - Assessment of future scenario of flooding/waterlogging which is prerequisite for proposing the climate resilient plan of an area

Process	Approach/Methodology	Data Collection	Outputs
Hazard mapping	• Orientation of communities on climate change and its impacts • Land-use survey to delineate ward boundary with the help of facilitator and communities • Participatory GIS and GPS for physical and social vulnerability mapping • PLA tools using recall methods for flood hazard assessment	• Qualitative and quantitative information on physical and social vulnerability • Google Images • Toposheets	• Interactive hazard maps to comprehend the physical climate risks and social vulnerability • Interactive hazard maps useful in mitigation aspects • Hazard maps useful in all stages of hazard management including preparedness, response, recovery with active participation of community
Vision scenario of ward	• Community consultation to understand local community's perspective on physical, social and economic development of ward • Community consultation to vision the supportive and unsupportive physical development conditions	Baseline information on Physical Structures: • River embankments • Basic amenities • Land development etc. Economic, political and social development aspects: • Employment opportunities • Social empowerment of weaker sections • Quality of life • Urban basic services	• Vision scenario 2030 for the ward for: Physical Structural Development, Economic Development, Political Development, Social Development • Identification of supportive and unsupportive physical conditions
Community institutions for building resilience	Facilitator supported community institutions building at three level: Neighborhood Committee, Thematic Committee, Ward Committee	Information from the baseline survey on local level actions required to address multiple challenges	• Empowered people to plan for and cope with the impacts of climate change • Implementation of prioritized activities by local communities which are also empowered to do so ensures sustainability of the resilience building process
Resilience building interventions	Combining the results of Baseline Survey, Hazard Mapping, Climate Threshold Analysis and Vision Scenario	All the above data sources	• Identification of core vulnerabilities and potential resilience building interventions • Assignment of responsibilities to specific committees
Monitoring of resilience	Development of a set of top priority indicators with communities and facilitation from an external agency (Bottom-up approach)	• Information from vulnerability assessment • Climate risks in the city	• Tracking progress on various resilience interventions and activities of community institutions • Record keeping • Behavioural change in communities through continuous learning by doing

Process	Approach/Methodology	Data Collection	Outputs
Success Pointers:			
Role of Municipal Corporation: Land use planning, service provisioning and maintenance should be transferred to Municipal Corporation. It will bring synergy between planning and maintenance functions of city.	Synergy between local knowledge and modern technologies: The integration of local community knowledge with modern technologies are not only effective in collecting data and information on risks but also helps to understand the intricacies of flood related problems at the local level and enhance the capacity of community to tackle with risks.	Decentralised planning: Ward committees function as catalyst for enhancing efficiency of systems and service delivery. Planning and maintenance of services and systems therefore should be decentralized and more representative.	Dynamic process: Building micro-resilience plan is an ongoing and dynamic process which requires iterations during the course as experiences
Resources “Developing Climate Resilient Ward Plan-A Guideline, Gorakhpur Environmental Action Group, 2014, Available at <https://geagindia.org/sites/default/files/2018-08/80.-GUIDELINE-ON-DEVELOPING-CLIMATE-RESILIENT-WARD-PLAN.pdf> “Process Document-Building Micro Resilience in Gorakhpur City”, Gorakhpur Environmental Action Group, 2014, Available at <https://geagindia.org/sites/default/files/2018-08/78.-Building-Micro-Resilience-Mahewa.pdf> - Mani, Nivedita and Shiraz A Wajih, “A participatory approach to micro-resilience planning by community institutions, The Case of Mahewa Ward in Gorakhpur, <i>Asian Cities Climate Resilience Working Paper Series</i>, 7: 2014, IIED, Available at <http://pubs.iied.org/pdfs/10656IIED.pdf> - Children Focused City Resilience Action Strategy for Patna Urban - https://geagindia.org/sites/default/files/2018-08/56.-Patna-CRS_Final-%282%29.pdf - Micro Resilience Ward Plan, Patna - https://geagindia.org/sites/default/files/2019-08/Micro%20Resilience%20Ward%20Plan-Patna.pdf			

Based on the above table, the participants can be given group exercise on understanding sectoral vulnerabilities and resilience planning as per Annexure-1.

Ward-level micro resilience planning in Patna Urban

The 'Resilient City Programme' of the Bihar DRR Roadmap focuses on policy and practice level changes aiming for resilience in urban areas of Bihar which broadly focuses on disaster risks recognition, understanding and analysis; disaster risk informed ward level development planning, using participatory, comprehensive and scientific risk analysis; risk reduction actions based on this planning; capacity building measures for risk analysis, risk-informed planning and risk reduction actions; and actions for targeted and planned communication for DRR. The Programme also emphasizes on the differential vulnerabilities of women and children which need to be taken into cognizance while developing resilience plans.

In line with this, GEAG with the support of UNICEF Bihar and in collaboration with the Patna Municipal Corporation developed a disaster-risk informed ward level micro resilience plan for Ward No. 48 in the city. The micro resilience plan adopted five steps as below:

1. Understanding climate-induced disaster risks
2. Understanding the impacts of various disasters in the light of urbanization and urban development
3. Hazard mapping
4. Sectoral vulnerabilities in the ward
5. Resilience actions and indicators

The micro resilience plan for Ward No. 48 in Patna can be accessed at: <https://geagindia.org/sites/default/files/2019-08/Micro%20Resilience%20Ward%20Plan-Patna.pdf>



MODULE 3

Urban risk resilience for Women and Children

3.1 Introduction

Children, especially the younger ones are not well-prepared to face deprivation and stress. With immature organs, rapid metabolisms and limited experience, they are more likely to get exposed to various risks than adults (Bartlett, 2008). While in every crisis children are the most vulnerable, but the urban children are at a higher risk where the concept of “*urban advantage*” (Bartlett, 2008; Van de Poel, et al., 2007) does not hold good for those living in poverty, with lack of education and life opportunities. Children may face the immediate impacts of climate change where access to basic facilities like clean water, sanitation, health and education will become difficult. Extreme weather events can destroy or disrupt the infrastructure critical to children’s well-being, including schools, health facilities and transport. They may have to face challenges where they have to cope up with higher levels of conflict and other types of pressures which will force them to leave schools early and do work too soon (Back and Cameron, 2008).

3.2 Learning Objectives

- To understand the impacts of climate change and disasters on children
- To understand the child-centered urban resilience framework
- To understand the concept of child-centered vulnerability assessment and developing resilience strategy
- To understand resilience-governance nexus in the context of child resilience.

3.3 Training Methodology and Duration

This module is intended to provide conceptual clarity about child vulnerability in a changing climate. The session should involve discussion and Q&A so that trainees can come out with their own ideas and experiences in understanding different climatic and disaster risk for children in urban areas & vulnerability of infrastructure to these risks. Approx. 4 hours should be allocated for this module. The training methodology will include:

- Lecture/power point presentation
- Group exercises
- Experience sharing
- Case study
- Discussion

3.4 Impacts of climate change and disasters on children

India, the largest democracy in the world is also home to the largest number of children in the world. As per Census 2011, 13.59 per cent (16.45 Cr) is in the age-group of 0-6 years and 30.76 per cent (37.24 Cr) is in the age-group of 0-14 years (Children in India, 2018-A Statistical Appraisal). An appalling fact is that more than 8 million children under 6 years of age live in slums (Save the Children, 2015). Cities and towns in India are increasingly becoming vulnerable to the effects of natural disasters and climate extremes.

Urban children living in poverty face multiple deprivations rendering them vulnerable in fast Indian urbanising cities. They are frequently exposed to physical hazards, such as polluted water; open sewer systems; inadequate public transport; lack of local safe play areas or cultural facilities; toxic local environments; and overcrowding (Wajih and Mani, 2016). The dangers severely restrict children’s independent mobility and opportunities for play and recreation while increasing their exposure to hazards, violence/crime, substance abuse, child labour and unintentional injuries.

The cumulative effect of such risks severely undermines the adaptive capacities of children to climate change and induced disasters. Understanding these risks is important, as policies that lessen pressures on resources, manage environmental threats and increase the welfare of the poorest members of society can simultaneously advance sustainable development goals, enhance adaptive capacity and reduce vulnerability to climate change and disaster risks.

Vulnerable Urban Children Groups	
Socio-economically weaker sections or disadvantaged group, SC/ST communities	Children with disabilities
Street/Homeless Children	Child Labour/Migrant/Trafficked Children
Children displaced by disasters	Children without family support or in institutions
Children living in fringe areas	Children living in slums

“Overall, more than 1.5 billion people have been affected by disasters in various ways, with women, children and people in vulnerable situations disproportionately affected”

(Sendai Framework for Disaster Risk Reduction, 2015).

Disasters directly affect the children by causing deaths, injuries, diseases and malnutrition and these conditions are exacerbated by secondary disasters and climate change (Lawler, 2011). The cases of trafficking, exploitation and other kinds of child abuse are also observed in the aftermath of disasters increasing the vulnerability of children (Kjaergaard, 2015). About 85 per cent of India's landmass is vulnerable to one or more multiple hazards and most of the cities are located on such terrains (Save the Children, 2015). Amidst rapid unplanned and haphazard urbanization, there is an immediate need for concerted actions to build the resilience of vulnerable urban children for their well-being, survival and proper development.

Children's Development vis-à-vis Climate Change and induced Disasters

In order to understand the different vulnerabilities of urban poor children in the context of climate change and induced disasters, we need to look at five main domains of children's development, which guide the overall growth, and development in children. These domains of children's development are – Health; Education; Water, Sanitation and Hygiene (WASH), Nutrition and Child Protection.



Health

Children's health is primarily determined by the socio-economic and physical conditions of the environment in which they live and are nurtured. Climate induced disasters alter the frequency, timing, intensity, and duration of weather events. In such situations, these children reside in the fragile fringes of the city and slums with poor basic facilities that get aggravated in times of extreme weather events, and their living environment becomes even more precarious. Climate change and disasters affect the growth and survival of disease-causing organisms related to water- and food-borne illnesses. These increase when outdoor temperature increases. Immediately following storms

or floods the incidence of water and food borne illnesses, such as gastroenteritis and infectious diarrhoea too escalates. High disease load in slums eventually manifests as under nutrition and stunting amongst young children. Extreme weather can result in the breakdown of sanitation and sewer systems, or inadequate means to cook food, increasing the likelihood of water- and food-borne illness. Children are especially susceptible to water- and food-borne illness due to their still developing immune systems. Health is closely inter-linked with livelihoods, income, nutrition, and water and sanitation facilities.

Appalling Facts

- Over 30 per cent of children below five years are underweight in urban Bihar, Madhya Pradesh and Karnataka (Chakrabarty, 2016).
- Between 2000 and 2009, 8.45 million children under 5 years of age were affected by disasters (UNICEF, India, cited in Save the Children, 2015).
- 59% of Indian children under 5 years of age have anaemia (NIUA, 2017).
- Diarrhoea alone kills one child every minute in India—more than 1000 children under 5 years of age die each day in India due to diarrhoea caused by lack of proper sanitation facilities (NIUA, 2017).

Education

Proper schooling and education is closely linked with the elusive triangle of its access, equity and quality for urban poor children. In the wake of changing weather patterns and disaster events, this is influenced by declining livelihood opportunities, migration, inaccessibility to schools, health, and disruption of social sector services (schools, anganwadis, health centres, water supply, sanitation system and social protection systems like Public Distribution System) etc. Climate induced disasters hit the poor communities who are then forced to discontinue their children's schooling. Displacement due to rural-urban migration leads to problem of identification, which also adversely impacts education and other child rights.

Appalling Facts

- 22.72 million urban children in the age group of 5–18 years are out of school. Out of this 9.1 per cent of urban children (8.97 million) in the 5–18 years age group used to attend school but have eventually dropped out, and 13.93 per cent (13.75 million) of children have never attended school (NIUA, 2016).
- 5.23 million children across India do not have access to drinking water facilities in schools (NIUA, 2016).

Water, Sanitation and Hygiene (WASH)

Unsafe water, poor sanitation and unhygienic conditions claim many lives each year. Poor urban areas where insufficient water supply and sanitation coverage combine with overcrowded conditions tend to maximize the possibility of faecal contamination. Open defecation in densely populated urban settlements is particularly alarming for public health. To top it all, the climate and disaster risks is often experienced through water. Climate-induced disasters severely affect the infrastructure and services related to drinking water, sanitation and hygiene. Floods inundate tube-wells, ponds and water bodies and contaminate the natural sources of fresh water thereby forcing affected communities to use unsafe water. Toilets are generally fragile and mostly unsuitable to withstand high flood or cyclone. It leaves people with no other option but to go for open defecation. Such crisis in safe water supply and sanitation service severely disrupts hygiene practices. Because of water contamination, public health situation often deteriorates, spreading water-borne diseases like diarrhoea, cholera, typhoid and hepatitis.

Appalling Facts

- 23 million children below the age of 14 in urban India are at risk from poor sanitation and 8 million children in urban areas are at risk from poor water supply – Ministry of Urban Development, Government of India, 2009 (NIUA, 2016).
- An estimated 1.8 million children die globally before the age of five from diarrhoea and half a million occur in India (Save the Children, 2015).

Nutrition

Though urban children are considered to have better nutritional status, several researches have evidenced that urban malnutrition is on the rise. Children, in their growth period are vulnerable and need proper food and nutrition for their overall development. Repeated incidences of acute diarrheal disease during childhood due to lack of appropriate sanitation and safe drinking water and hygiene in slums is one of the drivers of undernutrition, which is closely linked to exposure of slums to waterlogging and floods. Nutritional inadequacies results in the hampering of the development of their body. If this nutritional inadequacy persists for a longer period, it results in their improper growth manifested in the form of low weight, stunted height, low IQ, etc. Child malnutrition is the single biggest contributor to under-five mortality due to greater susceptibility to infections and slow recovery from illness. Droughts that lead to food shortages are likely to lead to malnutrition, affecting the health and development of urban poor children.

Appalling Fact

- A joint malnutrition dataset from UNICEF, World Bank and the World Health Organisation for the year 2016 indicates that the prevalence of severe wasting among children under the age of 5 was 4.6 percent, wasting-15.1 percent, stunting-38.7 percent, and underweight-29.4 per cent in India (Sevakari, 2016).

Child Protection

Disaster events and changing climate patterns impact the physical safety and protection of children. It also plays a role on children's psycho-social well-being. During disasters like floods and droughts, children experience emotional distress, including fear of being separated from their families, mounting tensions and pressures within households, a lack of emotional support at family level, and increased workloads. Floods can displace thousands of people, temporarily or for extended periods before houses and infrastructure, such as roads, power and communication links are rebuilt. Children, in particular, are highly vulnerable during population displacements. When a catastrophe occurs, parents or relatives can die and child protection systems become disrupted, increasing children's susceptibility to abuse, child labour, trafficking and exploitation.

Appalling Facts

- Out of the 128.5 million Indian children residing in urban areas, close to 7.8 million children under the age of 0-6 years still live in abject poverty and poor conditions in informal settlements (NIUA, 2016).
- 35 percent of India's street children are dealing with substance abuse (Save the Children, 2015).
- From 2012 to 2013, a 52.5 percent increase in crime against children in growing Indian cities was observed (Save the Children, 2015).
- There are 12.66 million child workers in India (NIUA, 2017).

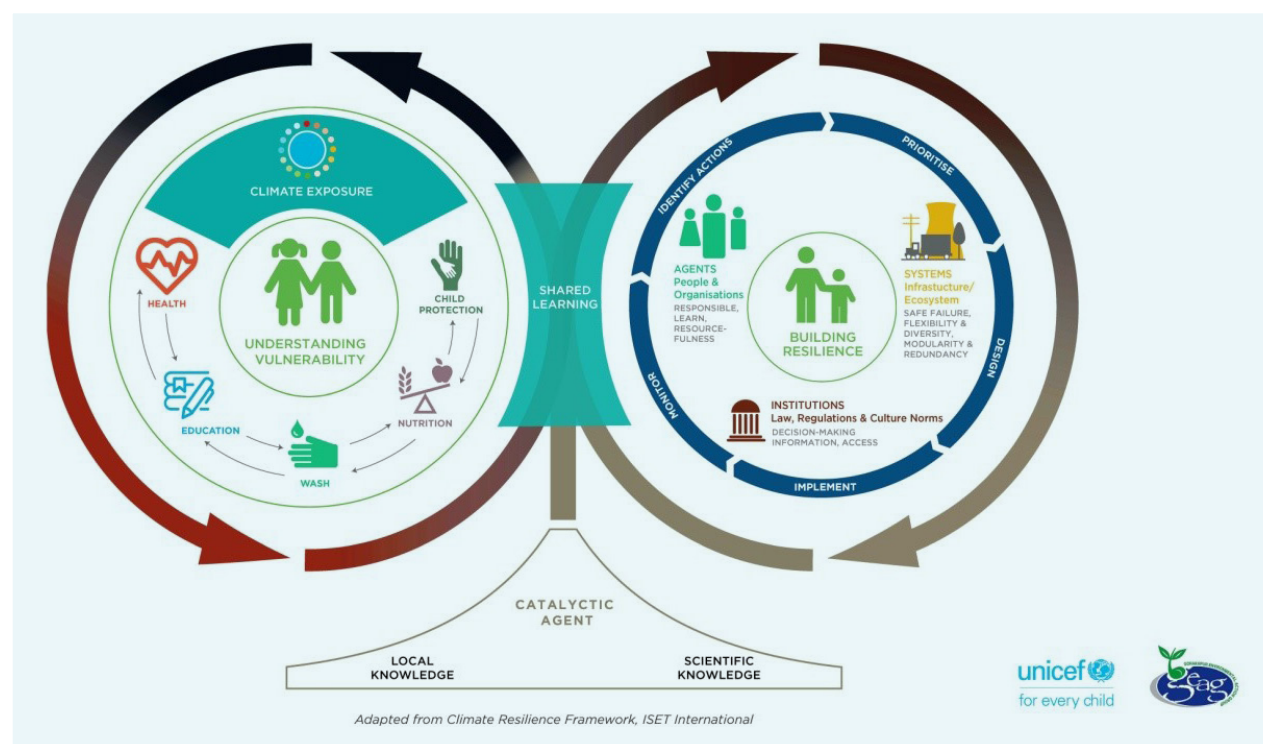
Based on the above information, a group exercise can be conducted with participants on identifying the impacts of urbanisation, climate change and disasters on the essential development parameters of children in their respective cities. Refer **Annexure-2**.

3.5 Child-centric Urban Resilience Framework

Children have the same right to survival, education, safety, clean water, health, sanitation, shelter and protection during and after disasters as they have before the disasters. Before it's too late we have the opportunity to inculcate the concept of 'Child-friendly resilient cities' in our current development process with the right governance structures and adequate investment for inclusive growth. The 'Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030' very clearly gives the message of this inclusive development where children and youth are identified as *"Agents of Change - Children and youth are agents of change and should be given the space and modalities to contribute to disaster risk reduction."* The 12 Sustainable Development Goals also directly or indirectly relate to the interests of children. We need to gradually expand our aims and objectives beyond school safety and education, keeping in mind the multi-dimensional vulnerability strongly emphasising on child rights and child participation.

With this backdrop, Gorakhpur Environmental Action Group (GEAG), developed the Child-centred urban climate resilience framework (CCUR). It is based on the existing internationally acclaimed CRF developed by ISET-International and the experiences of GEAG-UNICEF India project on "Building Climate Change and Disaster Resilience of Urban Children" in four Indian cities. The framework provides an integrated approach for understanding vulnerabilities of urban poor children, one on part, due to climate change and disaster impacts around their five key development parameters – Health, Education, Child Protection, Nutrition and WASH.

Figure 8: Child-centered urban resilience framework



Source: Wajih, Shiraz A., Singh, Bijay Kumar; Mani, Nivedita; Singh, Ajay Kumar; Srivastava, Archana; Singh, KK ; Prakash, Bijay; Pandey, Kailash; and Singh, Vijay; *Children Focused City Resilience Action Strategy for Patna Urban*, Gorakhpur Environmental Action Group, supported by United Nations Children's Fund, New Delhi, India, 2017

On the other hand, it focuses on the critical roles of Systems, Agents and Institutions across these five development parameters and the manner in which, with their own resilient characteristics, they can contribute in building resilience for children. It also incorporates the concept of shared learning as part of an iterative process in which the analysis feeds into planning, planning into actions, actions into learning, learning into further cycles of analysis and so on.

This iterative, shared action-learning cycle fosters building and maintaining resilience over time, in the face of rapidly evolving contexts and high levels of uncertainty.

To explain, the left circle helps in assessing vulnerabilities due to climate change exposure on five key development parameters – Health, Education, Child Protection, WASH and Nutrition. In addition, the causes of vulnerabilities across these five thematic areas are inter-linked and inter-dependent on each other. The right circle helps in understanding the key resilience mechanisms at three levels – Agents, Systems and Institutions, across the five development parameters of children. The Framework also suggests the key characteristics of Agents (Responsible, Ability to Learn, and Resourcefulness), Systems (Flexibility, Diversity, Modularity, Redundancy, Safe Failure) and Institutions (Decision-making, Information Access). It further guides that for resilience planning, it is important to *identify actions* across key thematic sectors, *prioritize actions*, *design* resilience options/solutions, *implement* and *monitor* them around a set of key indicators.

This framework guides efforts to build urban resilience that support children, youth, girls and boys. It integrates child and human rights into resilient urban development, enabling children to become agents of resilience.

Toolkit for Implementation of Child-Centred Urban Resilience Framework

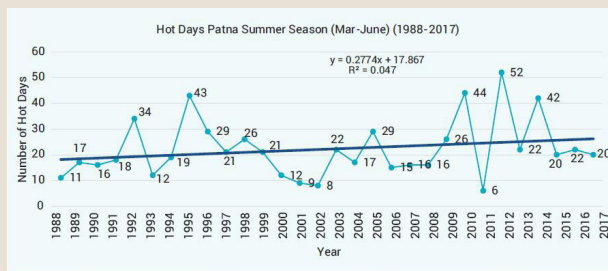
Tool: Developing Child-Centred City Resilience Action Strategy

Objectives:

- To understand the climate change and disaster vulnerabilities of children in the city
- To build resilience actions to address the vulnerabilities

Stakeholders: Children, Communities, City Officials–ULB, Para–statals, Research and Academic Institutions, NGOs and CSOs.

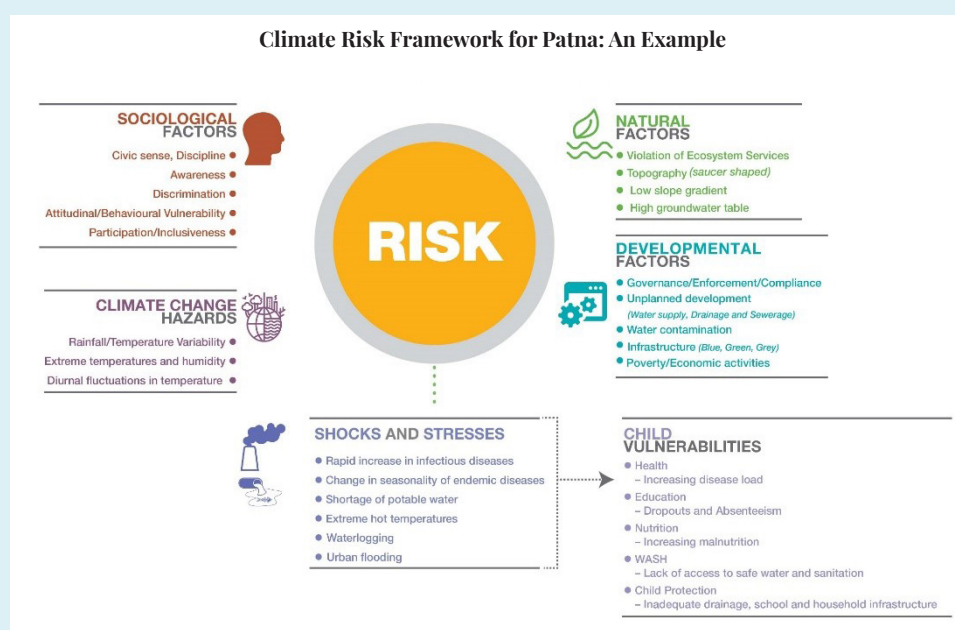
Process	Approach	Data/Resources Requirements	Outcomes
Hazard-Assessment	Historical and Future Climate Analysis	Information on past, present and future climate trends using climate models	- Characteristics of hazards such as—whether it is extreme precipitation or extreme high temperatures or low temperatures or both, which are of concern - Their trends and frequencies - Understanding thresholds of the concerned climatic parameter to assess how their frequencies are likely to change due to climate change



Future Climate Change Projections

- Annual maximum temperature is likely to increase by 1.82 °C by 2050.
- Annual minimum temperature is likely to increase by 1.95 °C by 2050.
- Annual mean maximum temperature is likely to rise by 1.75 °C by 2050 during post monsoon. Whereas in winter, this is likely to rise by 1.85 °C by 2050.
- Annual mean minimum temperature during post monsoon season is likely to increase by 2.85 °C by 2050.
- Hot days and warm night might increase.
- Mean annual rainfall is projected to increase by about 8-12 %.
- Mean monsoon rainfall is likely to increase by 70-90 mm by 2050.
- Most of the increases might occur in the monsoon period.
- Extreme rainfall events might increase by 10-25% by 2050.

Vulnerability Assessment	- Participatory workshops with all the city officials, ULBs, CSOs, NGOs, Research and Academic Institutions - Key Informant Interviews with city officials - SLDs and FGDs with communities, children, parents and teachers (user-friendly meetings and dialogic formats)	- Information to develop the casual loop diagrams - Checklist/questionnaires to analyse agents capacity/ constraints on resourcefulness, responsiveness and reorganization and associated institutions (Acts, norms for technical design and financing etc.).	- Understanding of spatial variation of children's vulnerabilities across the five development parameters as discussed in the CCUR and previous section - Understanding of institutional and (agents) capacity issues that influence vulnerability - Understanding of communities' and children's perception on vulnerabilities and thresholds of hazards - Understanding of vulnerable hotspots and conditions of urban basic services
Assessing Risks	Participatory mapping of shocks and stresses with all the stakeholders	Information to develop the "Risk Frame" which includes Natural Factors, Sociological Factors, Climate Change Hazards and Development Factors	Development of vulnerability "Risk Frame" of the city which is a useful resource to develop resilience actions



Source: Wajih, Shiraz A., Singh, Bijay Kumar; Mani, Nivedita; Singh, Ajay Kumar; Srivastava, Archana; Singh, KK; Prakash, Bijay; Pandey, Kailash; and Singh, Vijay; *Children Focused City Resilience Action Strategy for Patna Urban*, Gorakhpur Environmental Action Group, supported by United Nations Children's Fund, New Delhi, India, 2017.

Identifying Resilience Actions	Participatory workshops, SLDs and FGDs with key stakeholders	- Data/information on children's vulnerabilities as gathered in the previous steps - Information on Urban Systems and Development Deficit - Information on existing policies and programmes to find the entry points for building resilience	Children Focused City Resilience Action Strategy
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Sector Specific Reference: Child-Centred City Resilience Action Strategy

Sector	Children's Vulnerability	Development Deficit	Needed Actions	Policy/ Programmes	Institutions
Education	- Absenteeism due to extreme weather events (heat waves, cold waves and excessive rainfall) - Absenteeism due to seasonal illness - Lack of access to school due to waterlogging and flooding conditions - Drop out reasons - seasonal, labour oriented, livelihood loss, distressed migration - Behavioural problems - education is not a priority, especially for the girl child - Low enrollment, irregular return of girl child after challenging weather events	- Lack of separate, clean toilets for girls and boys in schools - Lack of drinking and hand wash water in schools - Construction of schools in flood plain areas/ inappropriate places such as below flyover (Adalatganj) - leading to inundation due to excessive rains - Lack of proper ventilation, safety escape routes and plans in case of fire and other disasters in schools - Lack of classrooms, open play areas, green spaces and infrastructural problems (fans and lights) leading to lack of interest among students - Ageing and dilapidated school building - seepage during rains - Inappropriate student teacher ratio - Lack of awareness on the importance of education among parents due to absence of regular counselling	POLICY/ENFORCEMENT: - School Safety Policy to be operationalized - Strict implementation of building bye-laws and penalty provisions - Considering resilient infrastructure under Sarva Shiksha Abhiyan norms - Education department to be part of DDMP/CDMP - Geo-tagging of urban schools - Coordination mechanism with traffic police department to prepare a "Traffic Plan" SCHOOL PROGRAMMES: - School Eco Clubs for taking up climate resilience initiatives - Formation and implementation of school disaster management, fire safety and evacuation plans with signage, mock drills governed by an active School Management Committee (SMC) Alternate school timings in extreme temperatures (summer and winter) - Children to develop school resilience plan; Regular mock drills on disasters - Regular health check-ups in government schools with the involvement of medical students/ interns. EDUCATION MANAGEMENT: - Climate change and urban resilience aspects to be included in the school curriculum - Formulation of "Child Parliament" in schools - Parent Teachers Meeting to be made compulsory in all the schools - Special programmes for mainstreaming of drop out children (crash courses)	- Sarva Shiksha Abhiyan Guidelines - School Safety Policy - DDMP - Chief Minister's School Safety Programme	- Education Department - Sarva Shiksha Abhiyan - Municipal Corporation - DDMA - Traffic Police Department - Health Department - Bihar Education Project Council (BEP)

Pointers for Implementation

- There are multiple agencies responsible for addressing climate and disaster related vulnerabilities and the inter-coordination between these agencies is crucial.
- Resilience actions developed should comply to manuals, guidelines and funding norms of governments
- A capacity building plan is required to develop the needed skills and foster flow of resources to various stakeholders (agents). It will enhance the "Responsiveness" in the given institutional requirement.
- A set of monitoring indicators is required across the development parameters relevant for CCUR (discussed in next section)

Knowledge Resources

- Gorakhpur Environmental Action Group (GEAG) Team, Promoting child-centred urban resilience: Concepts and methodology for practitioners, GEAG, Gorakhpur, Uttar Pradesh, India, December 2017, Available at <<https://geagindia.org/sites/default/files/2018-09/Methodology-Unicef.pdf>>
- Wajih, Shiraz A., Singh, Bijay Kumar; Mani, Nivedita; Singh, Ajay Kumar; Srivastava, Archana; Singh, KK ; Prakash, Bijay; Pandey, Kailash; and Singh, Vijay; Children Focused City Resilience Action Strategy for Patna Urban, Gorakhpur Environmental Action Group, supported by United Nations Children's Fund, New Delhi, India, 2017. Available at <https://geagindia.org/sites/default/files/2018-08/56.-Patna-CRS_Final-%282%29.pdf>
- Asian Development Bank (ADB), "Enabling Inclusive Cities-Toolkit for Inclusive Urban Development", ADB, Manila, Philippines, 2017.

3.6 Indicators for child-centred urban resilience

Considering the post-2015 development frameworks and the relevant policies from India, a set of indicators has been developed for measuring child-centred urban resilience at city level. The suggested indicators focus on identified priority development parameters of urban children--Health, Education, WASH, Nutrition and Child Protection, as mentioned in the proposed Child-Centred Urban Climate Resilience Framework as presented in the preceding section. Only relevant indicators for CCUR are suggested out of seven SFDRR targets (Targets A to G), 17 SDG Goals and 17 categories of Smart City indicators. The Smart City Indicators relate to the status of urban planning,

urban development, ULB/ city economy and finances. All the indicators are related only to outcomes / results and hence investments for creating and maintaining resilient infrastructure and associated costs of human resources will additionally need to be monitored to assess relevance, effectiveness and efficiency of investments. Evaluating investments against outcomes/ results will support mid-course corrections, as needed.

Some alternative data collection mechanism, for example primary surveys, will need to be developed for indicators in non-bold font. In addition the potential data sources are shown in parenthesis. Finally, the SFDRR indicators need to be monitored at highest frequency (recommended annually) while SDG indicators at lowest (once every five to 10 years).

Table: Select indicators for monitoring at ULB/city level

High to low frequency of monitoring					
Development Parameter		SFDRR Indicator	Smart City Indicator (BIS)	SDG Indicator	Remarks
	Health	Target A: Deaths due to disaster (DDMA) Target B: Ill due to disaster (Department) Target D: Direct economic loss (no. of health facilities damaged) DDMA / Department Target D: Economic loss (no. of disruptions of basic services) DDMA/ Department	Air Quality (CPCB) Deaths due to Natural disasters (DDMA) Under-5 MR (NFHS/ Primary) No. of Physicians per 100,000 population (Medical Council of City/ District)	SDG 3: IMR (NFHS), Under-5 MR (NFHS) Death rate of Children in age 5 -14 years (Sample Registration System Survey) Access to health care and facilities (Primary)	Most of the data across all the three categories will need to be segregated at city/ ULB level All data pertaining to slums and homeless children is available only for age group 0-6 years. There is no data collection system for children of higher age groups, especially for slums and homeless
	Education	Target D: Direct economic loss (no. of school's facilities damaged) DDMA/ Department Target D: Economic loss (no. of disruptions of basic services) DDMA/ Department	Per cent school-aged girls enrolled in school (Annual U-DISE database/ Census) Per cent completing primary school (Annual U-DISE database/ Census) Per cent completing secondary school (Annual U-DISE database/ Census) Percent of school-aged population enrolled in schools (Annual U-DISE database)	SDG 4: Completing primary and secondary education (Annual U-DISE database/ Census) School drop-outs (Census) Access to technical and vocational training of Youths (primary)	
	Nutrition	Target C: Direct economic loss (primary)		SDG 2: Stunting, wasting and underweight children age 0-5 years (NFHS) Anaemic Women (NFHS) Sustainable and resilient agriculture practiced in urban and peri-urban areas (Primary)	

Development Parameter	WASH	Target D: Economic loss (no. of disruptions of basic services) DDMA/ Department Quality of Public Water Bodies (CPCB/ Primary) Effectiveness of Municipal Solid Waste Collection and Management (Primary/ ULB) Percent HH with access to potable water supply system (ULB/ Primary) Annual no of disruptions to water supply (Primary/ Department) Percent HH access to toilets, served by public sewage system (ULB/ Department/ Primary) Per cent wastewater collected, treated and safely disposed (ULB)	SDG 6: Access to water supply by condition of housing categorized by distance of source from HH by HH categorized into permanent/ semi-permanent/ etc.) (Census, MoUD survey, Primary Survey) Access to Sanitation (Census, MoUD survey, Primary Survey) SDG 15: Protection of forests and ecosystems (Primary)	Some data especially on disruptions will need to be segregated at ULB/ city level
	Child Protection	Target A: Deaths due to disaster (DDMA) Target A: Missing due to disaster (DDMA) Target B: Injured/ ill due to disaster Target B: Evacuated people (DDMA) Target B: No. of houses damaged (DDMA) GDP per capita GINI coefficient of income (CSO) City Unemployment rate (State Labour Bureau/ Census) Deaths due to natural disasters (DDMA) Percentage of slum population, homeless (Primary/ Census)	SDG 5: Violence and discrimination including trafficking and abuse (Primary) SDG 8: Employment and related human rights of parents and youths (Primary) SDG 10: Reduce inequality (income equality: (Central Statistical Organisation) SDG 11: Affordable housing (Census) Participation of community in Urban Planning (primary) MSW and air quality (MoUD and CPCB surveys) SDG 16: Violence, abuses, trafficking of children (Crime Records/ Primary)	All data will need to be segregated/ deduced at ULB/ city level

Note:

- Only **bold** font indicators denote data already being collected in formal system;
- Data sources are shown in parenthesis
- Department refers to relevant department at city/ ULB level

Some indicators in each of the three sets are cross-cutting across all the five development parameters of children. These indicators primarily relate to the issues of capacity and mainstreaming in policies and plans and governance. They will need qualitative assessment at city/ ULB level and presentation through narratives:

- SDG 13 Climate Action: It includes creating awareness, building adaptive capacity of key stakeholder groups and institutions, and integrating actions into policies and plans
- SDG 16 Peace, justice and strong institutions: Entails building peaceful and inclusive societies, effectiveness of governance institutions, and access to justice
- SFDRR Target E: Relates to development of resilient plans and integrating in policies and plans
- SFDRR Target G: Early Warning System
- Smart City indicators: Relates to capacity on planning and finances of ULB, governance and gender

Finally, periodicity of reporting on indicators under each set will need to be decided. The findings will need to be disseminated widely with all key stakeholders at city, state and national levels.

3.7 Resilience-Governance Nexus

Disaster and climate risks on vulnerable communities especially children is adding new challenges to the formal and informal institutions working in cities and also revealing new levels of uncertainty because of which the Resilience-Governance Nexus becomes complicated to comprehend. The first and foremost thing that the government and development agencies need to understand is that this nexus is directly related to addressing vulnerabilities of communities, most specifically that of children and eventually reducing urban poverty.

The State of Governance Report of Government of India, 2009 outlines three key realizations implicit in the governance approach. Firstly, it signals a conscious shift from technocratic and apolitical development paradigm to one which is dynamic and inherently political. Secondly, it recognizes that good governance is more than good government. It involves the articulation between the state (at all levels) and other stakeholders within the broader society. Thirdly, governance goes beyond the 'management' doctrine by attempting to address institutional issues.

Climate and disaster risks are posing threats to child on issues pertaining to survival, food security, health, as well as access to water and sanitation, education and protection as seen in the previous modules.

Based on GEAG's experiences, a Resilience-Governance Nexus framework was evolved that entails development planning and design, mitigation, efficient service delivery for adaptation with the synergy of scientific knowledge and local wisdom, recognising the important role of peri-urban-urban connect towards holistic urban resilient governance.

Developmental Planning and Design

One of the main aspects responsible for increasing vulnerability of children due to climate change and disaster impacts is the lack of effective mechanisms to develop the city and its infrastructure in a way that it mitigates the risks rather than exacerbating them. The situations like disruptions of drainage, shrinking flood buffering capacity of city, storm water-sewage mixing, unorganized development etc. are the issues related to planning and designing of the urban system and infrastructure. Flexibility and diversity, redundancy and modularity and possibilities of safe failures may be key criteria in designing and planning of urban systems and infrastructure. A forward looking design and locally appropriate development can lead to reduction of vulnerabilities while the ill planned and mal-designed development may cause mal-adaptation and enhanced problems. Therefore, governance related to designing, planning and development is crucial in terms of reducing climate change and disaster related vulnerabilities of urban poor children. The need of community and children's participation in developmental planning, decentralized

bottom up planning mechanisms, coordination amongst planners-service providers-users, scientific and informed planning, effective regulatory provisions, finances are only few of the governing principles recognized as crucial.

Hazard Mitigation

The environmental phenomena that affect the urban children are important in the context of urban resilience. Heat and cold waves, cloud bursts, increasing humidity, cyclones, temperature and rainfall variability (flood and droughts) are affecting the life of children in cities. Besides a resilient urban development which helps in mitigating the disaster and climate impacts, it is also important that mitigation measures are adopted to address the causes of such hazards and environmental factors.

Urban governance facilitating mangrove plantation and protection, maintenance of green spaces and water bodies, green energy, ecological and soil conservation, plantation and other such mitigation measures are important towards urban climate and disaster resilience and reducing vulnerabilities of children.

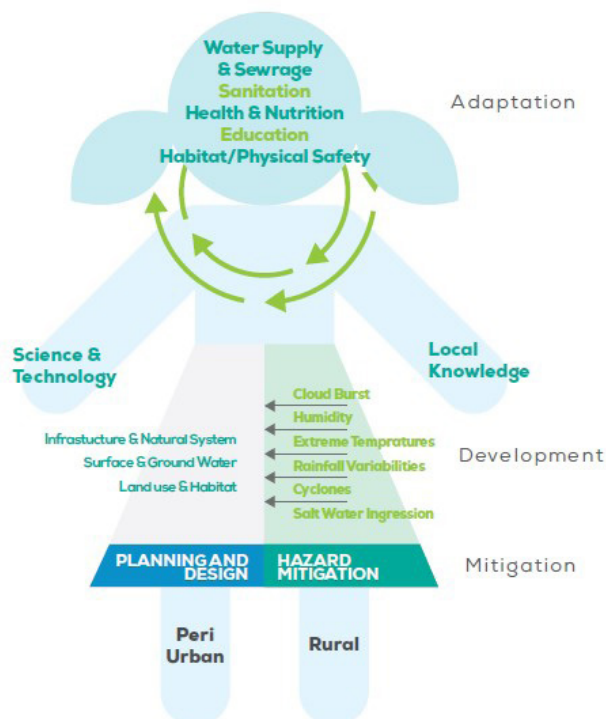
Adaptation Measures

Adaptation to adverse effects of climate change is vital in order to respond to impacts of climate changes that are happening. Poor and marginalized are the most affected due to such extreme weather events. Besides the mitigation measures it is important that the mechanisms are evolved for developing the resilience capacities of vulnerable population—children being one of such priority group. The efficiency of urban basic services helping the adaptive capacities of urban children need special attention on sectors like water supply and sewerage, sanitation, health and nutrition, education and housing and physical safety. Responsiveness, resourcefulness and capacity to learn are the key capacities of Agents to be developed in terms of efficient and effective governance of services.

Urban development and its governance have been largely conceptualized and operationalized in silos. This is being gradually recognized that urban and rural spheres are quite connected specifically in the context of life and livelihood of poor and vulnerable population. It has also been established that the rural-urban continuum is crucial especially for the secondary cities which are growing at a rapid space. Food, energy, labour, job, transport, health and several other such factors contributing to urban resilience are influenced by this rural-urban connect with peri-urban spaces playing an important role. The urban governance need to recognize this rural-peri urban–urban connect.

The Resilience–Governance Nexus

Addressing System Agent Institution



Source: Wajih, Shiraz A. and Nivedita Mani, *Study on Climate Change Resilience for Children and Urban Governance*, supported by United Nations Children's Fund, India, 2016.

Science and technology plays an important role in addressing climate change mitigation, adaptation and resilience. At the same time, the local traditional knowledge and people's wisdom have been also proved valuable and it is important that the synergy of the science and local knowledge is given due consideration in the governance procedure for resilience.

It is imperative that the different components of this resilient governance are mainstreamed at the institutional level towards evolving rules, provisions and allocating resources in the developmental policies and programmes related to mitigation, adaptation and resilience for urban poor children.

Box: Why Focus on Children while planning for resilience?

“Children and young women and men are critical agents of change and will find in the new Goals a platform to channel their infinite capacities for activism into the creation of a better world.” – Transforming our world: the 2030 Agenda for Sustainable Development

The vulnerabilities and individual needs of children and youth are not adequately taken into account by urban governance systems, municipal budgets and urban development plans. Advancing for child-friendly resilient cities will provide a wide range of development benefits. It is practical approach because:

- **Children represent over one third of the population:** Children constitute 39 per cent of the population in India. They deserve the best national attention, investment for their survival and development and right to be integrated in the planning and DRR process as they are likely to face more disasters than their parents.
- **Children are disproportionately affected by climate change and disasters:** Women and children are unequally affected by climate change and disasters as their pre-existing vulnerabilities might exacerbate. For sound resilient planning, it is imperative to consider the specific vulnerabilities of children and women
- **Larger developmental challenges can be monitored through children's vulnerabilities:** As children are often the first receiver of shocks and stresses, monitoring their health, education, nutrition, WASH and protection related parameters/indicators can provide useful insights for emerging vulnerabilities and avenues for dealing with such challenges in the larger population groups

The “**2030 Agenda for Sustainable Development**” is a ray of new hope by which many governments and non-government actors have begun to recognize children as capable agents of change for a safer and sustainable world. Cities may act as centres for increasing children's resilience where equal opportunities to children as stakeholders in the urban development process are provided and a healthy living environment is promoted with access to child friendly spaces.

Children across SFDRR, SDGs and Paris Climate Agreement

- The agreements clearly acknowledge children as vulnerable groups and strongly supports for reaching out to the most vulnerable children.
- The agreements voice strong support for ensuring safer schools through hard infrastructure solutions, emphasize on education continuity in the aftermath of disasters and CCA/DRR education in course curriculum.
- The agreements support promoting child participation in planning and decision making, assure access to information, protection in crisis, disaster and conflicts and protection against exploitation and abuse.

Conclusion and Summing-up, Post-training Assessment and Course Follow-up Recommendations

Participant's feedback on the program-design, contents, learning and resources, are important for the continuous improvement of the course and its delivery. Besides, it also generates new and innovative ideas and options for diversifying the courses for effective and objective course delivery. Feedback of the course faculty/coordinators on the course participants and overall conduct of the course will also be important at the end. A pre-developed feedback format shall be given to the participants for their entries before the valedictory session, which shall be later analyzed and be used in developing summary course-report.

Valedictory session is important which can be chaired by a senior member in the urban development department/ disaster management department or a senior academic faculty on related subject. Alternatively, the course Director shall preside the session. A brief course report following the welcome note will be followed by few brief feedback rounds from the participants and messages of long-term interaction and continuous learning on the subject. Valedictory session shall aim at generating the feeling that the training objectives shall be fulfilled by putting in-use of the lessons discussed in the course, and by initiating a process of effective risk management and response on a routine basis. A formal vote of thanks shall be given at the end to express gratitude towards the host institution, collaborators, resource persons, associates, team and all other whose contribution was important in making the course a success.

Annexure-1:**Group Exercise: Understanding sectoral vulnerabilities and resilience planning**

Activity: Sectoral Action Plan for Building Resilient City	Time: 1 hour for group work and ½ hour for discussion	Material: Printed worksheets for different groups
Objectives: • To enhance the capacity of participants to understand the linkage of key sectors to climate change and disaster risks • To integrate climate change and disaster resilience aspects in city planning and development strategies • To comprehend elements of developing city resilience strategy		
Instructions for Trainer: • Prior to the group exercise, the trainer should acquaint the participants with the concepts of sector specific impacts of climate change and what adaptation measures can be taken to deal with the impacts • A PowerPoint presentation may be used to show the impacts of climate change on different urban sectors • Use Annexure 1 to take a specific case of building resilience of urban water supply and storage infrastructure • Divide the participants in groups and hand over the worksheets to each group • After group discussion, each group of participants will fill the worksheets and hand it over to the resource person • Use these worksheets for subsequent activities and discussions in the summing-up session		

Worksheet

Solid Waste Management			
City	Actions	Institutions	Supporting Regulatory Frameworks/Policies
Medium Term			
Long Term			
Drainage and Sewerage			
Medium Term			
Long Term			
Drinking Water			
Medium Term			
Long Term			
Urban Planning			
Medium Term			
Long Term			
Housing/Buildings			
Medium Term			
Long Term			
Energy			
Medium Term			
Long Term			
Ecosystem Conservation and Flood Management			
Public Health			
Medium Term			
Long Term			

Annexure-2:**Identify the impacts of urbanization, climate change and disasters on the essential development parameters of children in your city: (Worksheet Exercise)**

Exposure due to projected change in climate	Consequences for children's socio-physical environments in cities	Implications for children's health	Implications for children's safety, protection, education, play and recreation, and social development
Warm spell/ heat waves			
Cold waves			
Heavy rainfall events/ Cyclonic events/Floods			
Drought			
Fire			
Earthquake			

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Nivedita Mani is a development professional and has been associated with development programmes since 14 years. She has extensive field experience on issues related to sustainable livelihoods, gender, ecosystems, waste management, water and sanitation and rural and urban climate change resilience. Her core areas of expertise are research, documentation and communications, and she has led various teams in this work. Nivedita has written several research papers and publications supported by agencies that include FAO, Oxfam, The Rockefeller Foundation, International Institute for Environment and Development (IIED), Climate Development Knowledge Network (CDKN), BORDA, and has edited a variety of newsletters and magazines.



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