

**Training Module**

**Urban Risk Reduction  
and Resilience**

# **Training Module on Urban Risk Reduction and Resilience**

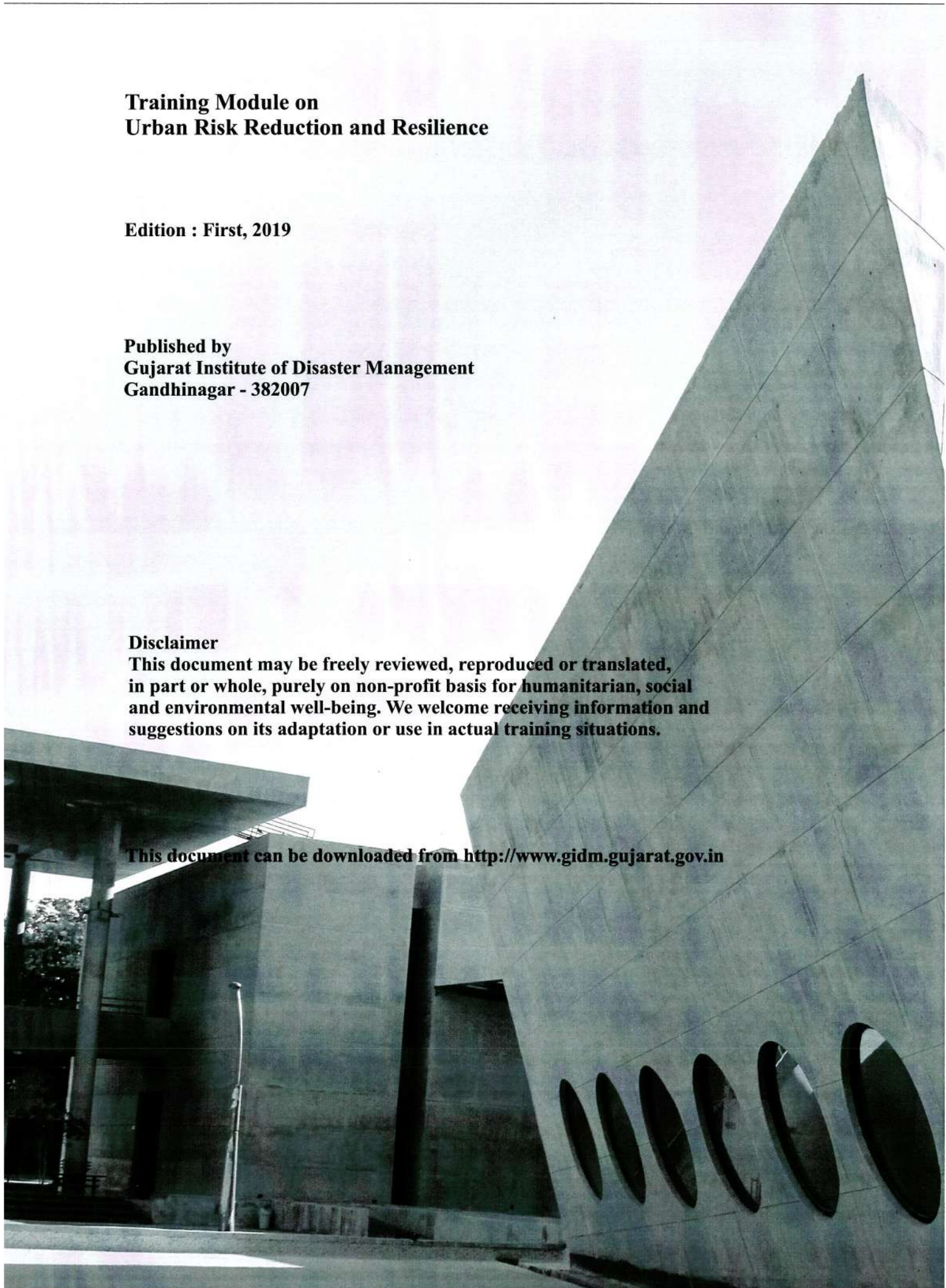
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## Message



Urban Conglomerations are complex Socio-Technical Systems, made up of communities, institutions, the built environment, the natural environment or ecosystem, infrastructure (such as transport, communications, water, sewerage and power), services (such as healthcare, education, police and waste collection) and economic and social activities. Practical interventions to reduce urban risks and vulnerabilities that focus on just one aspect of the system may bring benefits, but their overall impact will be limited without addressing other aspects as well. As cities continue to grow, exposure of lives, livelihoods and economic, social and environmental assets are set to increase exponentially. The local level is the frontline of addressing disaster risk and is where significant gains can be made through concerted efforts.

The Sendai Framework for Disaster Risk Reduction (SFDRR) has substantially expanded the scope of DRR to include natural hazards as well as human-made and all related environmental, technological and biological hazards and risks. It has advocated an all-of-society and whole-of-government approach for DRR. The 2030 Agenda for Sustainable Development includes 17 Sustainable Development Goals (SDGs) that now replace the Millennium Development Goals. At least eight of the goals and their targets have elements of DRR and building resilience embedded within them. The Paris Agreement under the United Nations Framework on Climate Change has recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage. The Paris Agreement has undertaken to enhance “understanding, action and support” in eight areas of DRR.

I appreciate the efforts of GIDM team especially Shri Nisarg Dave, Shri Shailendra Rai and Dr. Repaul Kanji for coming up with the module of Urban Risk Reduction & Resilience. I hope this module will benefit trainees, students, researchers and professionals working in the area of Urban Risk Reduction & Resilience. GIDM & UD&UHD has invested valuable time in preparing module. GIDM will organize a series of Capacity Building programmes based on this module. GIDM will engage in partnership with government institutions, academia, NGOs, CBOs etc. to scale up in order to create critical mass of people to address urban disaster risks and mitigate impacts. I am sure concerted efforts in this direction would help in building Disaster Resilient Urban Societies.

**(P.K. Taneja)**

**Director General**

**Gujarat Institute of Disaster Management**

Gandhinagar

March, 2019



## Acknowledgement



The development of the Training Module on “Urban Risk reduction & Resilience” has taken place under the Terms of Reference signed between Urban Development and Housing Department and GIDM.

GIDM is a premier institute of Government of Gujarat working in the field of disaster risk management. The institute, among other responsibilities of capacity building, has been entrusted with the duty of module development and capacity building of Urban Development & Urban Housing Department officials in the field of disaster risk management

The draft of the module was prepared after several consultations with the team of GIDM. Comments were exchanged and suggestions were duly incorporated in the revised version. I am happy to note that many valuable comments and suggestions were received during trainings and workshops. We gratefully acknowledge the efforts of GIDM team for development of this module. I acknowledge the efforts of Municipal Corporations, Town Planning and Valuation Department, Gujarat Urban Development Mission and other institutions of Urban Development & Housing Department for participating in trainings with full zeal. I also want to congratulate Urban Development & Housing Department team for smooth coordination and providing support to the GIDM team.

I sincerely extend our thanks to Shri P.K. Taneja, Director General, GIDM for leading the team and providing proper guidance for completion of module.

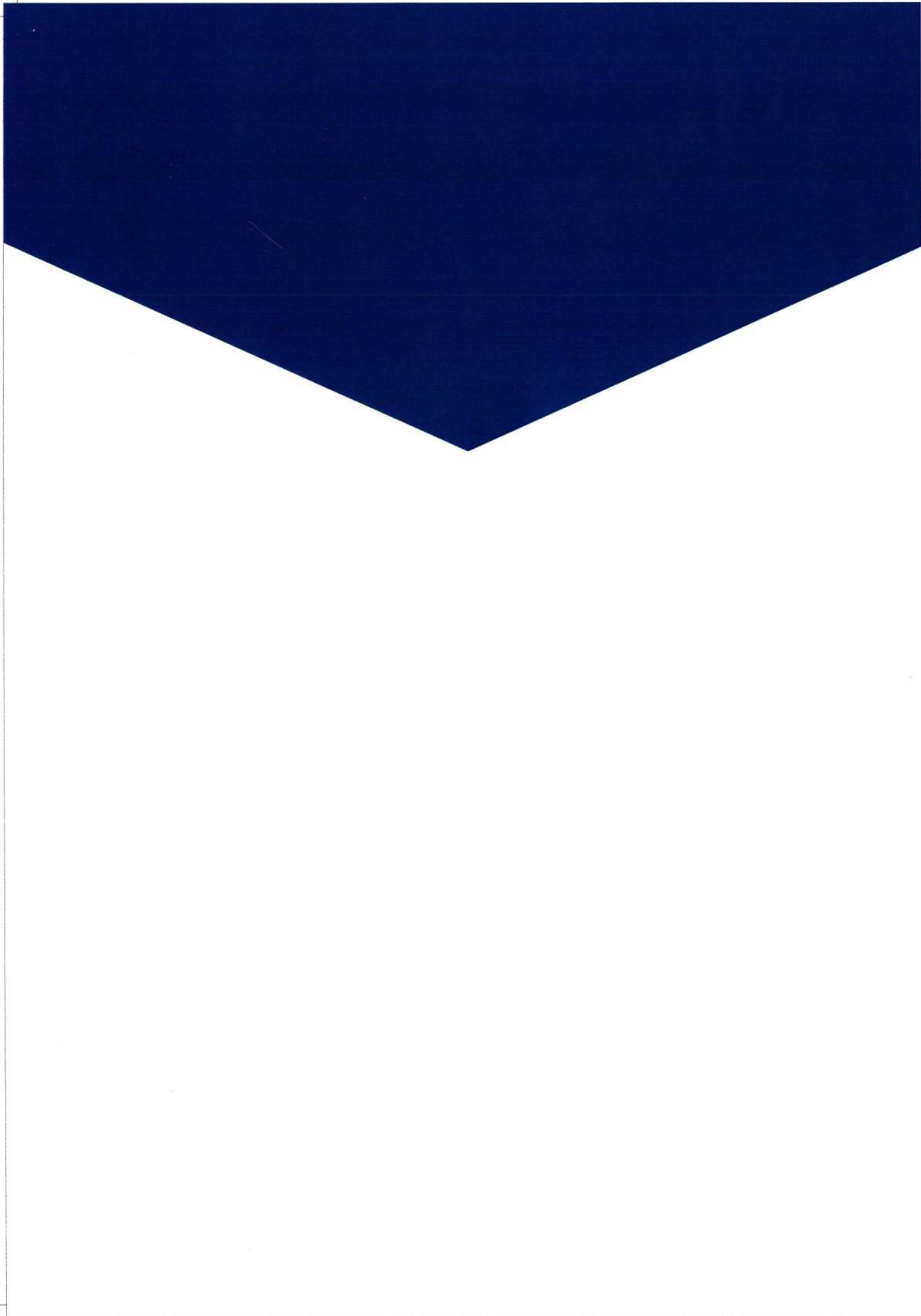
(Mukesh Puri)

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Gandhinagar

March, 2019



## Abbreviations

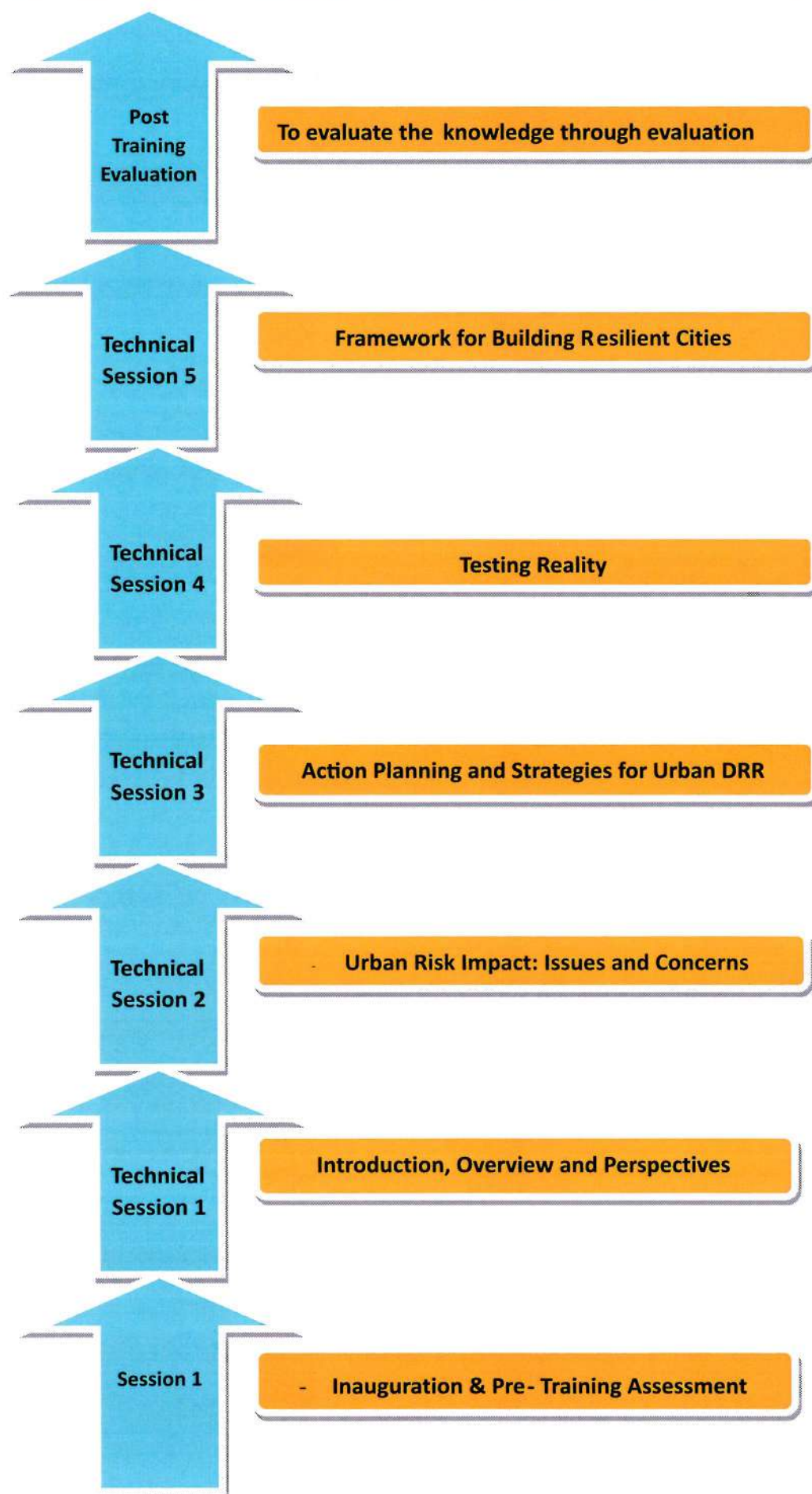
ATI	Administrative Training Institute
BMTPC	Building Materials & Technology Promotion Council
CBDM	Community-Based Disaster Management
CBOs	Community-Based Organisations
CDMP	City Disaster Management Plan
CDP	City Development Plan
COR	Commissioner of Relief
DM	Disaster Management
DRR	Disaster Risk Reduction
GIDM	Gujarat Institute of Disaster Management
GIS	Geographic Information System
GSDMA	Gujarat State Disaster Management Authority
HAZMAT	Hazardous Materials
HFA	Hyogo Framework for Action
HRVA	Hazard Risk and Vulnerability Assessment
HUDCO	Housing & Urban Development Corporation Ltd
ISDR	International Strategy for Disaster Reduction
JICA	Japan International Cooperation Agency
NBC	National Building Code
NDMA	National Disaster Management Authority
NIDM	National Institute of Disaster Management
NIUA	National Institute of Urban Affairs
SFDRR	Sendai Framework for Disaster Risk Reduction
TCPO	Town & Country Planning Organization
UDA	Urban Development Authority
UD & UHD	Urban Development & Urban Housing Department
ULB	Urban Local Body



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## Flowchart of the Training Module “Urban Risk Reduction & Resilience”



## About the Training Module

Training is an intrinsic part of the capacity building process. In disaster management, training assumes greater significance because of the nature of work during and after a disaster. Coping rapidly, scale and devastation of a disaster can overwhelm most people, compromising on the quality of response. Focused training and capacity building of the designated responder thus becomes imperative. On the other hand, disaster management transcends the realm of response and affects all the sections of the society. Therefore, disaster management training should also be imparted at all levels and to all sections of the society including the vulnerable community.

The training module on Urban Risk Reduction and Resilience focuses on various aspects of disaster risks in urban areas. Factors like concentration of population, economic activities, building activities and networks in urban areas result in aggravated risk from disasters and at times, these factors end up causing disasters as well. The training module aims to capture the specific issues in urban risks and their reduction measures. In the five day full-time programme, the trainees will be oriented towards the major facets of urban risks and their reduction. The training has been designed to be in an interactive mode with 60:40 lecture: activity orientation. This is to ensure that “learning by doing” method would help participants to implement the knowledge imparted in their respective areas of work. The module has been developed by the Gujarat Institute of Disaster Management (GIDM), with inputs from professionals working in this sector. GIDM is the premier institute entrusted with the responsibility of human resource development, capacity building, training, research and documentation in the field of Disaster Management.

### 1. Who shall use the Training Module?

It shall be used by trainers in the disaster management and/or urban development sectors for imparting training to the state and city level officials on urban risk mitigation. The module can also be used for self-study by urban development professionals, disaster management professionals, officials from the Urban Local Bodies (ULBs), Autonomous Bodies, NGOs etc. The following would be the expected target groups for the module:

- Urban Development and Urban Housing Development Department, Town Planning and Valuation Department, Departmental Training Institutes, Gujarat State Disaster Management Authority, Commissionerate of Relief.
- Professionals (Engineers, Architects, Planners, Administrators), from Urban Local Bodies (Municipal Corporations, Urban Development Authorities, Area Development Authorities, Municipalities etc)
- Elected representatives of Urban Local Bodies
- NGOs working on urban issues

## 2. How to use the Training Module?

The module has been prepared in a Self-Study Format to enable the reader to go through a step-by-step process of learning on urban risk reduction and resilience. The first chapter on module design brief gives the reader/trainer an overview of the entire process, including the aim and objectives of training, target participants' profile, session design, methodology, time allocation, training aids etc.

Thereafter, each session is explained in detail, along with the session plan, content to be covered, methodology to be followed and a trainers' note. The module retains a degree of flexibility in the sense that the trainer can innovate on the methodology or activities according to the profile and need of participants.

The trainer should also keep in mind the predominant urban development issues of the city/ cities that trainees hail/ work from and incorporate them into the sessions while keeping with the broad framework of the module.

## 3. Trainers' Guide

The training module has been designed keeping a participatory framework in mind. In addition to the knowledge and skill inputs explained in the technical sessions, the trainer may consider the following guidelines to make the programme interactive, comprehensive and interesting so that inputs are retained by trainees after the conclusion of the programme:

- After finalizing the participants' list, write a welcome note to the prospective participants about the location of the institute, how to reach the venue, reporting time for training, prevailing eather and type of clothing recommended and welcome to the institute.
- The participants should be asked to fill out An online registration form with details of name, address, contact numbers etc.
- While they wait for the programme to begin, a film about the institute/ organization can be shown to give them an idea of the institution they are training in.
- The participants list with contact details should be circulated after commencement of the training for any corrections before finalizing it.
- An ice-breaker session that involves all participants should be organized to initiate interaction.
- Energisers, especially in the post-lunch session should be organized (not more than 5 -10 min duration) every day.
- As far as possible, change the groups for group work every day to ensure better peer-to-peer interaction and sharing.

## Training Module Design Brief

### 1. Context/ Background

By 2050, the world's urban population is expected to nearly double, making urbanization one of the twenty-first century's most transformative trends (UNISDR). Populations, economic activities, social and cultural interactions, as well as environmental and humanitarian impacts, are increasingly concentrated in cities, and this poses massive sustainability challenges in terms of housing, infrastructure, basic services, food security, health, education, decent jobs, safety and natural resources, among others. A similar situation prevails in Gujarat, where about 42.6% of the population resides in urban areas, or 2.57 crore of the state's total population lives in the cities, (Census 2011). Among the urban areas too, the Major cities attract the maximum migrant population, thereby registering unprecedented growth. Excessive urbanization of major cities as witnessed in Gujarat has resulted in greatly increased vulnerability to major disasters, both natural and human-induced. Even natural hazards have different ramifications when they occur in urban areas due to high population density. Added to this is the threat of dangers like fires, building collapse etc; the vulnerability of urban areas acquires new dimensions.

A disaster brings with it destruction, devastation, along with loss of life, property, assets and livelihood. A successful disaster management system entails a proactive and coordinated administrative system on the one hand and an aware, informed and active community on the other. A proactive, efficient and coordinated administrative system can be brought about by a team of trained and committed personnel at all levels. The personnel involved in intervention during a disaster event have to draw upon the knowledge of best practices and intervention methods. Training of personnel from the Urban Local Bodies (ULBs) on the various manifestations of urban disasters will sensitise them to the specific needs and initiatives required.

### 2. Rationale for the course

The module is designed to provide a common platform of knowledge for urban development professionals and disaster management professionals. In most cases, disaster management professionals, involved with the holistic aspect, tend to overlook the specific aspects of urban risks and their mitigation. On the other hand, urban development professionals, without any sensitivity

towards the facets and perspectives of urban risks, try to formulate strategies or measures for urban development. As development becomes unsustainable if it does not aim for reducing risks from disaster, it becomes essential to provide the requisite knowledge and understanding on urban risks, the possible impacts, mitigation strategies and future trends to the participants.

### 3. Target Group

The training is targeted towards professionals involved in urban development and planning. This would involve senior and middle level officers from the Urban Development and Urban Housing Development Department in the states and associate organizations like the Town Planning Department, Urban Local Bodies (Municipalities, Municipal Corporations etc), Officials from the Revenue and Disaster Management Departments, etc.

Preferable Group Size: 25-30 participants.

### 4. Entry Behaviour

**Level of participants:** In service officers, in senior and middle level positions.

**Age Group:** Less than 55 years

**Educational Qualification:** Graduation, preferably with professional qualifications and/or experience

**Disaster Experience:** Desirable, but not mandatory

### 5. Key Constraints

The key constraints are presumed to be:

- Knowledge: Lack of awareness about the theoretical aspects of urban risk and prevention and preparedness aspects.
- Attitude: Attitudinal constraints towards training and learning may be a deterrent
- Time: As nodal administrative officers in an urban area, with nodal responsibilities, to be away for a lengthy training may be difficult.
- Field level experiences: not always positive, may take precedence over classroom training
- Transferable Nature of Job: may diminish the learning interest.

### 6. Objective of the programme

The overall objective of the programme is to impart adequate knowledge and skill to the trainees to deal with urban risks in their respective spheres of work and formulate strategies/ action plan suitable to prevent risks and build resilience.

### 7. Learning Objectives

At the end of the training, participants will be able to:

- i. Explain the approaches and methods for disaster management and their implementation in the context of urban risk management and sustainable development.

- ii. Describe the nature, extent of threat and significance of countermeasures required for urban risk reduction and resilience.
- iii. Identify the disaster management interventions required to deal with urban risks in order to achieve the goals of prevention, preparedness, response and mitigation.
- iv. Explain the need and nature of integration of urban risk concerns into the urban development process to achieve the goal of sustainable development.
- v. Describe the future strategies for disaster risk reduction in an urban context for a sustainable future.

## **8. Methodology**

The training will be conducted in an interactive mode with a judicious mixture of lectures, discussions, demonstrations, experience sharing, field visits, group work and case study analyses for understanding the major issues in urban risk reduction and resilience.

## **9. Teaching Aids**

Training will have to be conducted with the help of the following:

- A Compendium of Background Reading materials
- Handouts of presentations or additional material
- Scenarios for exercises
- Data Sharing: All the material to be given at the closure of the programme containing the presentations, group exercises, photographs, contact numbers of trainers and co-participants for subsequent updation and networking.

## **10. Training Materials and Equipments Required**

The training is designed to be classroom based, with field trips of half day or 1-day duration. The field trips would be followed by group exercises pertaining to the area visited and identifying the disaster risk issues therein. The training materials for classroom teaching like Computers, LCD projectors, Flip charts, markers etc would be required in the classroom. For the field trip, maps of the area to be distributed to participants for guidance and risk identification.

## **11. Seating Arrangements**

The seating arrangements should preferably be four or five circular tables to facilitate group work and allow the trainer to move around the class for interaction.

## **12. Language of Instruction**

The medium of instruction will be English, Hindi and Gujarati

### 13. Content Design

#	Session Title	Session Objectives	Time	Methodology
<b>Inauguration</b>				
	Inauguration	<ul style="list-style-type: none"> <li>- Welcome participants</li> <li>- Introduce trainees and trainers</li> <li>- Overview of the training and GIDM</li> <li>- Lay down ground rules</li> <li>- Formal Inauguration</li> </ul>	40 Min	Interaction, Video
<b>Technical Session 1: Introduction, Overview and Perspectives</b>				
LU 1.1	Pre-Training Assessment	Pre-Test/ Icebreakers	40 min	Participatory Activities
LU 1.2	Hazard, Vulnerability & Risks: A Conceptual Approach to Disaster Risk Management	<ul style="list-style-type: none"> <li>- Explain the concepts of hazards, vulnerability, risk and resilience in the context of Disaster Management.</li> <li>- Describe the DM cycle and its stages.</li> <li>- Explain the impact of human actions on hazards and risks</li> </ul>	45 min	PPT and Discussion
LU 1.3	From DM to DRR: An Overview	<ul style="list-style-type: none"> <li>- Describe DM in the process of evolution</li> <li>- Explain Global paradigm shift</li> <li>- Explain Indian response to paradigm shift</li> <li>- Describe the change in orientation in DM system</li> <li>- Describe the DM Act</li> <li>- Describe the instruments of change in DM and Urban sectors</li> </ul>	30 Min	PPT and Discussion
LU 1.4	Identifying Risks & Vulnerabilities in the Urban Context	<ul style="list-style-type: none"> <li>- Identify the layers of vulnerability in an urban context</li> <li>- Assess disaster risks in urban areas</li> <li>- Explain how disasters impact the socio-economic well-being of an urban area.</li> <li>- Describe the differential vulnerability within segments of urban population and assessment concerns</li> <li>- List the indicators for assessing risk</li> </ul>	60 min	PPT and Discussion

LU 1.5	Urban Disaster Risk : Perspectives & Approaches	<ul style="list-style-type: none"> <li>- Describe the global urban characteristics</li> <li>- Describe the characteristics of Gujarat urban scenario</li> <li>- Identify the types, causes and factors aggravating urban risks</li> <li>- Explain the characteristics of resilient cities.</li> </ul>	60 min	PPT and Discussion
<b>Technical Session 2 Urban Risk Impact: Issues and Concerns</b>				
LU 2.1	Urban Disaster Impact and Role of Urban Planning for Risk Mitigation	<ul style="list-style-type: none"> <li>- Discuss the impact of disasters in cities and need for risk sensitive urban planning.</li> <li>- Discuss the major issues for unsafe built urban form and space.</li> <li>- Discuss the initiatives taken for earthquake risk reduction by some cities.</li> <li>- Discuss the considerations in the Indian context for urban planning and building design for risk reduction.</li> </ul>	60 min	Case Study Analysis
LU 2.2	Environmental Impact on Urban Risks	<ul style="list-style-type: none"> <li>- Identify the relationship between urban environment and disaster risks</li> <li>- Discuss how urban environmental risk mitigation is important for sustainable development</li> <li>- Identify ways of addressing Environmental concerns in urban Development policies</li> </ul>	60 min	Lecture + buzz group activity
LU 2.3	Implications of Urban Transport in Disaster Risk Reduction	<ul style="list-style-type: none"> <li>- Discuss the circulation patterns in urban areas leading to risks</li> <li>- Explain the risk arising from multimodal transport system</li> <li>- Discuss the initiatives required for reducing transportation risk.</li> </ul>	40 min	Discussion/ Case Study
LU 2.4	Urban Health Issues for Disaster Risk Reduction	<ul style="list-style-type: none"> <li>- Discuss the urban health profile in Gujarat and its implications in a disaster situation.</li> <li>- Identify preparedness strategies for health emergencies w.r.t urban areas</li> <li>- Discuss basic mass casualty management measures for urban emergencies.</li> <li>- Discuss overall planning considerations for mass casualty management.</li> </ul>	60 min	Interactive presentation

LU 2.5	Climate Change and Urban Risks: Impact for Present and Future	<ul style="list-style-type: none"> <li>- Explain the relationship between climate change and disasters.</li> <li>- Describe the impact of climate change and its implications on the risk profile of cities</li> <li>- Explain the need for building climate-resilient cities</li> </ul>	60 min	Lecture and Discussion
<b>Technical Session 3: Action Planning and Strategies for Urban DRR</b>				
LU 3.1	Mainstreaming Disaster Risk Reduction in Urban Development Policies & Governance	<ul style="list-style-type: none"> <li>- Discuss the need for mainstreaming DRR into Development initiatives to enable safe development</li> <li>- Discuss various initiatives at the national and state levels for urban development and disaster risk reduction</li> <li>- Identify ways of mainstreaming DRR into urban development plans and programmes in their respective states.</li> </ul>	60 min	Panel Discussion
LU 3.2	Techno-legal Framework for Urban Risk Reduction	<ul style="list-style-type: none"> <li>- Describe the need for techno-legal backup for safe construction</li> <li>- Describe the techno-legal instruments available for safe urban development</li> <li>- Describe the recent initiatives and their implications on the urban risk scenario.</li> </ul>	45 min	Moderated Group Discussion
LU 3.3	Earthquake Risks: Mitigation Framework for Structural and Non-Structural Safety	<ul style="list-style-type: none"> <li>- Discuss earthquake risks to various types of structures</li> <li>- Discuss the methodology for assessment of risk to buildings</li> <li>- Explain the structural safety features that should be adopted for earthquake resistant buildings</li> <li>- Describe case studies of earthquake reconstruction where structural safety features were followed.</li> <li>- Describe the nonstructural risks in buildings of different usage.</li> <li>- Discuss the rationale for reducing risks from non-structural elements.</li> <li>- Describe the basic mitigation measures that can be taken for anchoring or bracing of risky elements in a building.</li> <li>- Discuss the need and basic elements of household preparedness planning.</li> </ul>	60 min	PPT + animations+ cases + discussions

LU 3.4	Urban Flooding	<ul style="list-style-type: none"> <li>- Describe characteristics of urban flooding</li> <li>- Discuss the anthropogenic causes of urban flooding</li> <li>- Discuss the relation between risk sensitive development and disaster safety.</li> <li>- Compare the lessons learnt through case studies of urban floods.</li> <li>- Identify few actions at the household level as a mitigation strategy</li> </ul>	75 min	PPT+ discussion + activity
LU 3.5	Urban Fires	<ul style="list-style-type: none"> <li>- Describe the causes and extent of fire risks in urban areas.</li> <li>- Explain the mitigation measures for reducing fire risks.</li> <li>- List the preparedness actions to be taken for urban fires.</li> <li>- Demonstrate the basic firefighting techniques for household fires.</li> </ul>	40 min + 40 min demonstration	PPT + demonstration of fire tenders
LU 3.6	Climate Change and Urban Risks	<ul style="list-style-type: none"> <li>- Explain the relationship between climate change and disasters</li> <li>- Describe the impact of climate change and its implication on the risk profile of cities</li> <li>- Explain the need for building climate-resilient cities</li> </ul>	60 min	PPT +discussion
<b>Technical Session 4: Testing Reality</b>				
LU 4.1	City Observation Study: Identifying Risks	<ul style="list-style-type: none"> <li>- Identify complex risks in urban setting</li> <li>- Identify the causal and aggravating factors for risks present in the study area</li> <li>- Describe people's perception of hazard and their efforts at mitigation</li> </ul>	4 hours (240 min)	The participants will be divided into groups and given specific study areas with an assessment framework
LU 4.2	Risk Assessment and Mitigation Strategies	<ul style="list-style-type: none"> <li>- Apply knowledge gained in ground</li> <li>- Develop analytical skills for problem solving</li> <li>- Prepare a mitigation strategy for study area</li> </ul>	3 hours (180 min)	After the visit, the group discusses the issues and comes out with a strategy which is then discussed in the plenary

<b>Technical Session 5: Framework for Building Resilient Cities</b>				
LU 5.1	Climate Change & Cities	<ul style="list-style-type: none"> <li>• Discuss the role of cities in addressing climate change in the local and global context.</li> <li>• To facilitate the sharing of best practices</li> <li>- To identify opportunities for mainstreaming climate change in the development agenda</li> <li>- Community participation for climate change adaptation and resilience</li> </ul>	60 min	Lecture + discussion
LU 5.2	Technology and Innovations for Urban Sustainability	<ul style="list-style-type: none"> <li>- Describe the characteristic features of Green buildings and need for such structures</li> <li>- Discuss the LEEDS and other systems for identifying green buildings</li> <li>- Describe Indian examples of Green buildings – GRIHA ratings</li> <li>- Discuss use of RS &amp; GIS technology in risk analysis in urban areas</li> </ul>	60 min	Lecture + discussion
LU 5.3	Framework for Resilient Cities	<ul style="list-style-type: none"> <li>- Discuss the need for developing urban resilience for long-term sustainability</li> <li>- Explain the facets of resilient urban systems</li> <li>- Describe the framework for enhancing urban resilience</li> </ul>	60 min	Panel Discussion
<b>Valedictory</b>				
	Valedictory (Post-Training Evaluation & Conclusion)	<ul style="list-style-type: none"> <li>- To assess the exit behavior of the participants at the end of the course.</li> <li>- To evaluate the knowledge and skills gained during the course.</li> <li>- To carry out formal internal evaluation</li> </ul>	60 min	Interaction

#### **14. Trainers/ Facilitators/ Resource Persons Required**

As urban risk reduction and resilience is a multi-disciplinary and cross-cutting issue in disaster management, it is difficult for one trainer to deliver all the sessions. It is therefore necessary to have experts from various fields especially in sessions on Climate resilient cities, green buildings, structural safety and fire risk mitigation. The coordinator's role would be to sum up the inputs given into outputs from trainees so that they get the best of the knowledge and skills available within and outside the organization.

#### **15. Expected Outcome**

1. Better understanding of the phenomena leading to urban risk in its right perspective for better response and preparedness planning.
2. Enhance knowledge and upgrade skills for planning and implementation of strategies for urban risk reduction at state and local levels.
3. Link the learning to disaster management activities to lead to efficient response even in the worst-case scenario.
4. Skill development of participants for conducting training sessions on urban risk reduction and resilience at the state and local levels.

#### **16. Evaluation & Validation**

The course is continually evaluated in terms of summing up of the day's inputs by the coordinator, discussing issues raised by participants and connecting the knowledge inputs with participants' own experiences. At the end of the course, a formal evaluation is carried out by participants based on content, objectives, utility and facilities provided in the programme. According to the feedback and coordinator's impressions, the future programmes are designed and conducted.

## Notes

## Technical Session 1

### 1. Introduction, Overview & Perspectives

The first Technical Session would provide the introduction to the course to the trainees, after assessing their entry behavior. The course, being interdisciplinary in nature, would use this session for providing an overview of both urban aspects and disaster management aspects, and the interface between the two. This session would be divided into five learning units providing an overview of the subject.

Learning Unit 1.1: Pre-Training Assessment

Learning Unit 1.2: Hazards, Vulnerability & Risk: A Conceptual Approach to Disaster Management

Learning Unit 1.3: From DM to DRR: An Overview

Learning Unit 1.4: Identifying Risks & Vulnerabilities in the Urban Context

Learning Unit 1.5: Urban Disasters: Perspectives & Approaches

The primary objectives of the module would be to:

- Assess entry behaviour of the participants through pre-training assessment.
- Communicate the ground rules to participants for smooth conduct of training.
- Explain the basic concepts of disaster management and the impact of human actions on the hazards and risks.
- Trace the evolution of the disaster management discipline from the post-disaster response to pre-disaster risk reduction.
- Identify the interface between urban areas and disaster risks and the various ramifications of a disaster in an urban area.
- Explain the perspectives of urban risks in a socio-economic context focusing on the differentials of vulnerability.

**2. Duration:** 275 mins, preferably completed on the first day of training.

### 3. Methodology

Since this session has a dual aim of introduction to the training and between trainees as well as providing an overview of the subject, the methodology will vary from lesson to lesson. A formal inauguration may be arranged, followed by informal ice-breakers and discussions. The technical sessions can be conducted subsequently, after a short break for tea etc. As it is the

first day, the technical session would have to be trainer driven, aimed towards facilitating discussions and interaction among the trainees. As far as technical sessions are concerned, they can be conducted in a lecture-cum-discussion mode on the first day. Film shows, if available can be shown to initiate discussion.

#### **4. Trainers' Note**

The trainer should bear in mind that the first day is crucial to set the tone for the entire programme. Therefore, the first day should be designed to acquaint the trainees of the programme and make them comfortable in the new surroundings. The following ideas can be considered:

1. Inaugural Session: can be either formal or informal. A formal inauguration would involve inviting high-level dignitaries/experts on the subject. The session would include a formal address from the dignitaries with brief introduction of the course and participants. In an informal inauguration, the trainer can start directly with a welcome speech followed by introduction of participants. The introduction session should be conducted innovatively with the aim of getting everyone to participate so that peer to peer interactions are facilitated. About 30- 40 minutes can be spent on the introduction session. Dividing participants into pairs and getting each to introduce their partners can be used as an ice-breaker.
2. After the ice-breaker, 10-15 minutes can be taken to lay down the ground rules of training. It is advisable that this process involves all participants for better ownership and implementation. This could include:
  - Objectives
  - Session timings
  - Lunch & Tea Breaks
  - Formation of Host Teams and their duties
  - Norms for interactions and discussions during sessions
  - Mobile phone etiquettes
  - Availability of facilities (telephone, internet etc)
  - Smoking rules/bans etc
  - Evening engagements (if any)

## Learning Unit 1.1: Pre-Training assessment

### 1. Context & Description

Participants from different organizations have different levels of understanding of disaster management and urban development concepts. Their orientation towards the subject depends on the nature of duties performed, so in most cases, the understanding of urban disaster risks varies widely across the spectrum. For example, for some trainees, the understanding of the urban risks may be limited to nuances of building construction, while an administrator at the municipal level may focus on instruments of governance like laws, regulations etc. This session is therefore aimed towards assessing the entry behavior of the participants and subsequently getting them on a similar platform so that the objectives of the course are met.

### 2. Session objectives

- To assess the expectations of the participants from this course
- To assess the entry behavior of participants
- To make a comparative analysis of the course objectives and participants' expectations.

### 3. Duration- 40 minutes

### 4. Methodology

- Expectation Exercise and Discussion
- Q & A Session

### 5. Trainers' Note

The session can be divided into two parts viz. the expectation and the entry behavior. In order to find out participants' expectations from the course, the trainer may distribute sheets of paper for participants to write down the most important expectation. These may then be collected and pasted/pinned to the walls/boards or collated in a composite chart. At the end of the training, a similar exercise can be conducted to see how much of the expectations were met.

In order to find out the entry behavior of the participants, a Question & Answer Session can be organized. The coordinator can ask simple questions on the subject, give each trainee 2-5 minutes to ponder and write down the answers and then proceed to discuss each with the group. If the group is too large, this exercise can be done in pairs.

## 6. Session Plan

No	Topic	Duration
1	Expectations & Objectives	15 mins
2.	Q & A	15 mins

## 7. Training/ Performance Aids

Colour paper handouts, Flip charts, Markers, Tag-boards to pin the handouts (walls and scotch tape will suffice if there are no tag-boards).

## Learning Unit 1.2: Hazard, Vulnerability & Risk: A Conceptual approach to Disaster Management

### 1. Context/ Background

This would be the first technical session of the training programme. It will broadly cover the basic concepts used in disaster management discourse. The session will aim to introduce the participants from the urban development field to the concepts and the phases of activities in disaster management and also provide a comprehensive recapitulation for the trainees from the disaster management field. The aim would also be to underscore the impact of human actions on disaster risks of an area and to explain the need for risk-sensitive development.

### 2. Description of the session<sup>1</sup>

Disasters form an intrinsic part of the passage of civilization. While nature has been unrestrained in showering her bounties to humankind, her fury has wrought devastation and destruction. Over millennia, civilizations and societies have learned to cope with the various disasters and vulnerabilities that struck them. With the evolution of society especially in post- Industrial Revolution era, the magnitude and impact of disasters increased exponentially.

**Disaster** is an actual or imminent event, whether natural or otherwise occurring in any part of the State which causes, or threatens to cause all or any of the following:

- 1) widespread loss or damage to property, both immovable and movable; or
- 2) widespread loss of human life or injury or illness to human beings; or
- 3) damage or degradation of environment;

and any of the effects specified in the (1) to (3) above is such as to be beyond the capacity of the affected community to cope up with using its own resources and which disrupts the normal functioning of the community. Disasters are the result of a combination of exposure to hazards, the vulnerability of the affected community and their capacity to cope with the disaster. A disaster is, therefore, the function of hazard, vulnerability, and capacity.

**Hazard** is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental

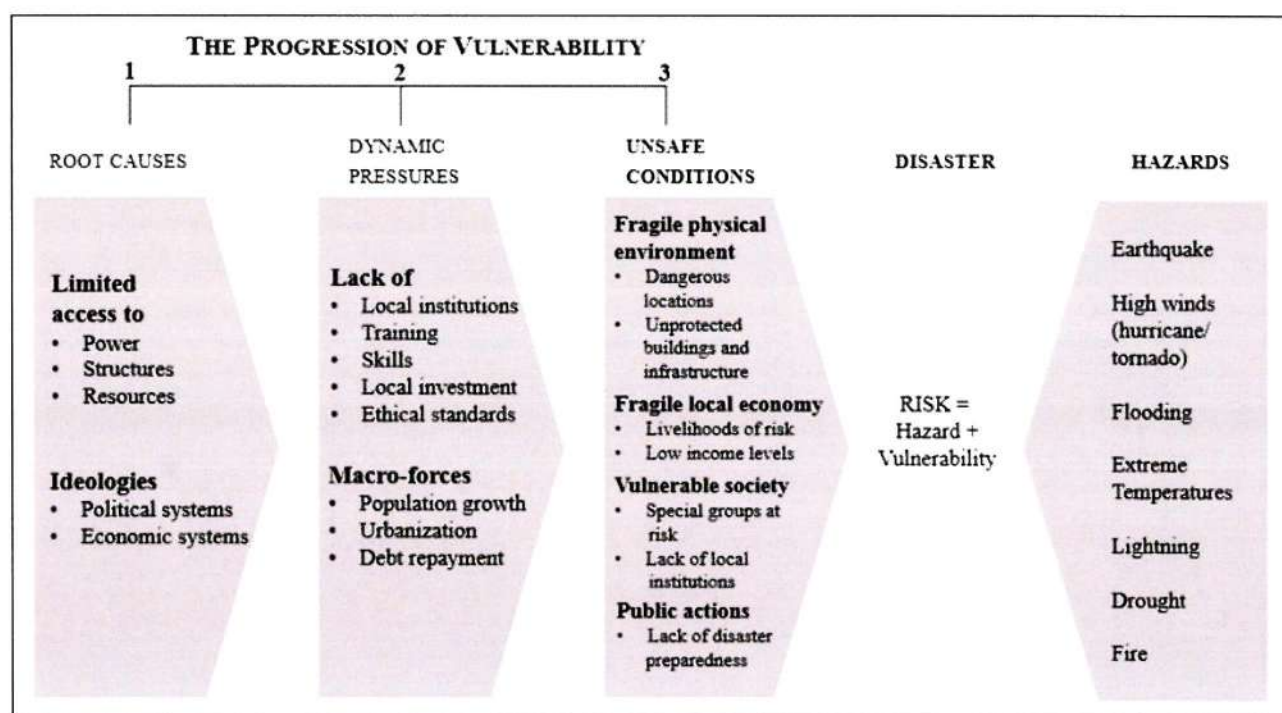
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<sup>1</sup> All the definitions and explanations follow the Gujarat State DM Act 2003 or UNISDR definitions (in case of not defined in DM Act 2003) [found at www.unisdr.org](http://www.unisdr.org)

degradation. Hazards arise from a variety of geological, meteorological, hydrological, oceanic, biological, and technological sources, sometimes acting in combination. Therefore, hazards are classified generically as geological, hydro-meteorological or technological. Hazards aggravated by degrading environment due to human actions are termed socio-natural hazards. Each hazard is characterized by its location, intensity or magnitude, frequency and probability. Biological hazards are also defined by their infectiousness or toxicity, or other characteristics of the pathogen such as dose-response, incubation period, case fatality rate and estimation of the pathogen for transmission.

**Exposure** is the situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas. Measures of exposure can include the number of people or types of assets in an area. These can be combined with the specific vulnerability and capacity of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest.

**Vulnerability** is the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards. Vulnerability is the human dimension of disasters and is the result of the range of economic, social, cultural, institutional, political and psychological factors that shape people's lives and the environment that they live in. Many of the underlying drivers of vulnerability, including poorly managed urban development, are increasing, resulting in vulnerability increasing in many countries and regions of the world.



**Capacity** is the combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience. Like vulnerability, capacity has physical, social, economic or environmental connotations and may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership, and management.

**Resilience** is the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.

**Disaster risk** is, therefore, the potential disaster losses, in lives, health status, livelihoods, assets, and services, which could occur to a particular community or a society over some specified future time period. The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster is disaster risk management. **Disaster Risk Reduction (DRR)** is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development. Disaster risk reduction strategies and policies define goals and objectives across different timescales and with concrete targets, indicators and time frames. In line with the Sendai Framework for Disaster Risk Reduction 2015-2030, these should be aimed at preventing the creation of disaster risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience.

### **Landless squatters in Dhaka**

Dhaka, the capital of Bangladesh, is situated in the flood plain of a major river, the Buriganga, a tributary of an even larger river, the Meghna (see Figure 6.2). To the north-west is a large zone of lowlying, flood-prone land in the vicinity of Nagor Konda. Here, squatter settlements grew rapidly in the 1980s as they did in many areas around the capital (Shaker 1987). This area had been densely settled, particularly since 1970, mostly by poor landless families from the south and east of the country (Rashid 1977).

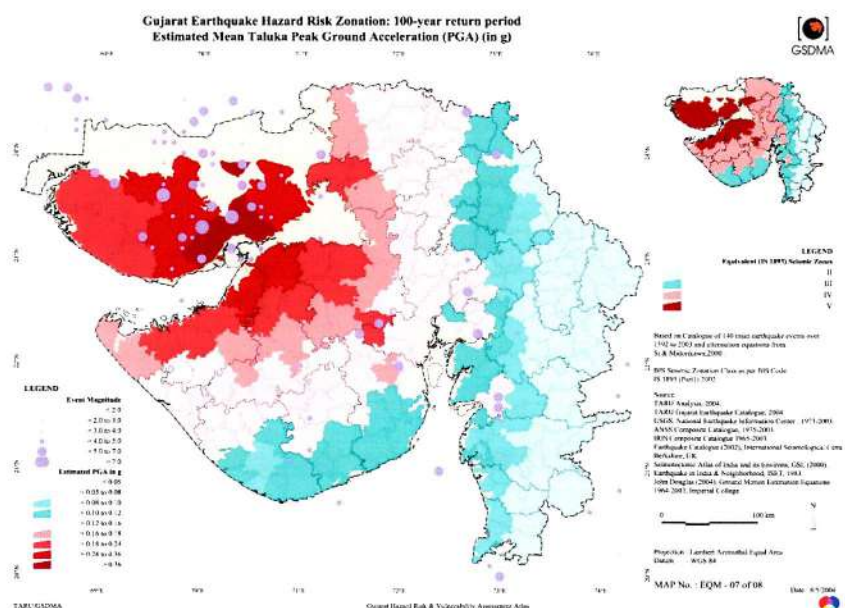
The former landless people who inhabit this depression are there because of its proximity to Dhaka's vegetable market. Already the chain of explanation of their vulnerability can be seen at work: rural people who are landless have few alternatives, and many seek the economic opportunity provided by the urban vegetable market. But this means living in an unsafe location. As newcomers, and extremely poor, the squatters in these low-lying areas had no access to the structures of power that control marketing. They also had insecure title to land in the depression, and therefore no access to credit to allow them to increase their productivity and compete with better-established market gardeners (A. Ali 1987). This situation meant that they had to grow rice rather than vegetables on their land, and thus the poor were forced into low-income pursuits. On the eve of the massive floods of August 1988 (see Chapter 6), this relatively powerless group with few assets was living in an economically marginal situation close to the city, on low-lying land prone to flooding. Their children were frequently malnourished and chronically ill. This is precisely how the dynamic pressures arising out of landlessness and economic marginalisation are channelled into a particular form of vulnerability: a lack of resistance to diarrhoeal disease and hunger following the flooding in 1988. Factors involving power, access, location, livelihood and biology come together to create a particular situation of unsafe conditions and enhanced vulnerability. These social, economic and political causes constitute one side of the pressure model. The other – the floods themselves during August 1988 – constitutes the trigger event whose impact on vulnerable people created the disaster (Source- Wisner et al, 2003).

## 1. Hazard Risk Vulnerability Assessment (HRVA) of Gujarat

### Earthquake

As per Indian Seismic Zone Map, Gujarat region lies in three zones- Zone III, IV and V. Kachchh region (about 300km x 300km) lies in zone V where earthquakes of magnitude 8 can be expected. A belt of about 60-70km width around this zone covering areas of North Saurashtra and areas bordering Eastern part of Kachchh lie in zone IV where intensity VIII

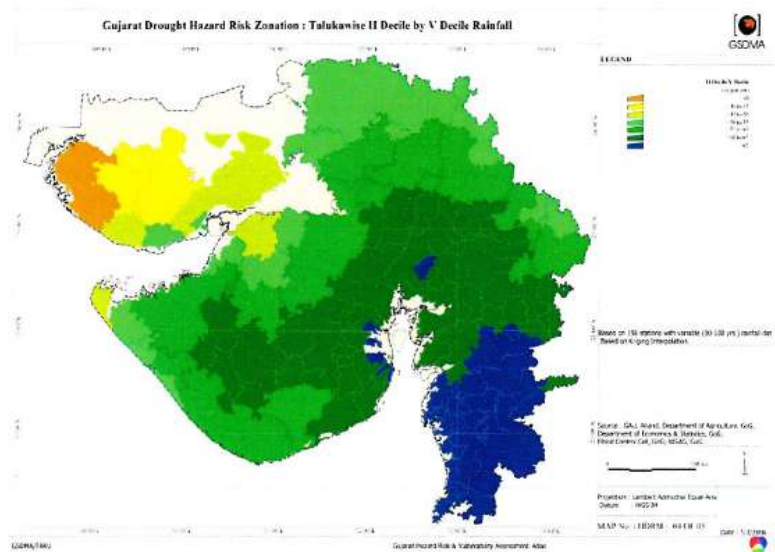
can be expected mainly due to earthquakes in Kachchh and some local earthquakes along North Kathiawar Fault in Northern Saurashtra. The rest of Gujarat lies in zone III where intensity VII earthquakes can be expected due to moderate local earthquakes or strong Kachchh earthquakes.



The estimated mean taluka earthquake peak ground acceleration (PGA) zonation for a 100-year return period is presented in the figure 2.1. All of Kachchh, almost the entire coastline of northern Saurashtra that adjoins Kachchh and a small area in Patan district fall into the very severe intensity zone over a 100-year return period. The cities of Ahmedabad, Bharuch, Rajkot, and Bhavnagar fall into the severe intensity zone, while Bhuj and Jamnagar fall in the very severe intensity zone over this time frame.

## Drought

Daily temperature of the State ranges from a minimum 13°C to 27°C in January to 27°C to 41°C in the summer during May. The South-West winds mostly bring rain between June to September and approximately 90 to 95% of precipitation is registered in these three months. From the North-West areas to South Gujarat areas, the rainfall varies from 300 mm to 2000 mm per annum. Since 1900, the state has faced scarcity of water and food almost 30 times.



Gujarat is one the chronic drought prone state of India, with an average annual rainfall about only 700 mm with more than half of the Talukas of Gujarat receiving rainfall within the range of 200-400 mm.

Substantial portions of the State are arid to semiarid. With large parts of North Gujarat and Saurashtra having no source of alternate irrigation, groundwater exploitation is leading increased threats of droughts. Falling water tables have added stress on crops and water supplies.

## Cyclone

Gujarat falls in the region of tropical cyclone. With the longest coast line of 1600 km in the country, it is highly vulnerable to cyclone and its associated hazards such as floods, storm surges, etc. Most of the cyclones affecting the state are generated in the Arabian Sea. They move North-East and hit the coast particularly the Southern Kutch and Southern Saurashtra and the Western part of Gujarat.

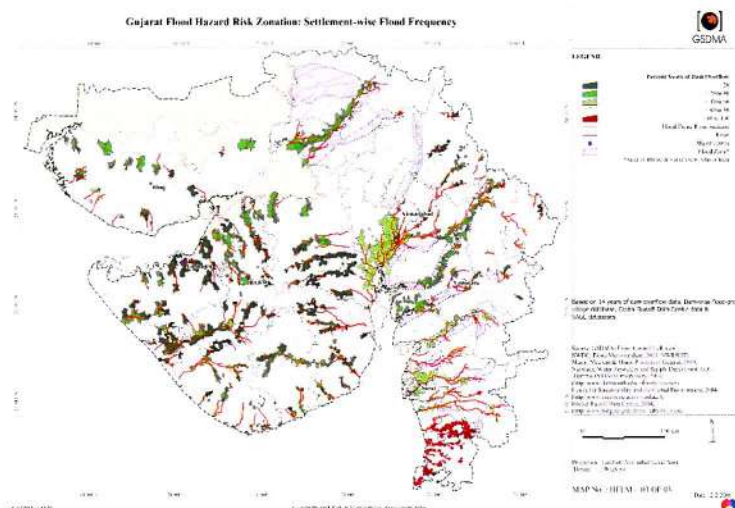
Two cyclonic storm seasons are experienced in Gujarat: May to June (advancing southwest monsoon) and September to November (retreating monsoon).

Over 120 cyclones originating in the Arabian Sea had passed through Gujarat over a period of 100 years. Figure 2.3 shows a maximum wind speed class of more than 55 m/sec along the Saurashtra coast, specifically in Porbandar, Jamnagar and Junagadh districts, which are exposed to high intensity cyclonic and storm impact. The 51 to 55 m/sec class extends further inland to cover much of Jamnagar,

part of Rajkot, Junagadh and Kutch districts. The 48 to 50 m/sec class extends to most of Rajkot, part of Amreli and Jamnagar districts including Jamnagar, Rajkot cities and parts of Kutch. The 45 to 47 m/sec class covers much of Saurashtra and all of Kutch. This is followed by the 40 to 44 m/sec class that gets its swathe from Kutch through northern Saurashtra all the way to the coast of Gulf of Khambhat and southern Gujarat. The rest of the State falls into the 34 to 39 m/sec class.

## Flood

The climatology of Gujarat is influenced by the Arabian Sea in the West and three hill ranges along its Eastern border. A long coastline makes parts of arid Saurashtra and Kutch occasionally experience very high rainfall. These occasional heavy rainstorms are responsible for most of the floods in the State. While the Northern part of the State is mostly arid and semi-arid, the Southern



part is humid to sub-humid. Extremes of climate, be it rainfall or temperatures are quite common in this region. All major rivers in the State pass through a wide stretch of the very flat terrain before reaching the sea. These flat lowlands of lower river basins are prone to flooding. Cities like Ahmedabad, Surat and Bharuch are located on the flat alluvial plains of large rivers.

Concentrated runoff resulted by heavy rainfall cause flash floods in the small river basin of Saurashtra and Kutch because of their fairly impervious catchments (rocky or black cotton soils) and steep sloping upper catchments.

The flood prone river sections were identified from settlement level analysis. Flood prone river sections in Saurashtra extend to the upper basins due to the presence of dams which have to resort to emergency discharge during heavy rainstorms. Even small valleys in Saurashtra are used for agriculture. Hence flooding in these zones impacts both residents and settlements.

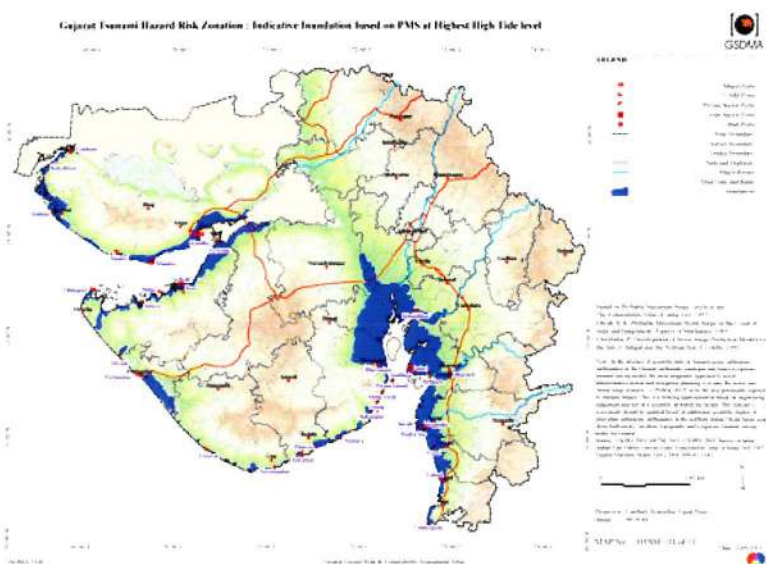
The majority of the area of Gujarat is flood prone, irrespective of the size of the catchment. The flood risk in Saurashtra is lower than that of the South Gujarat plains. The relatively flat plains in the lower basic areas with hilly catchments in upper parts of South Gujarat accentuate flood risks. Few villages in the North Gujarat are flood prone too.

## Tsunami & Storm Surge

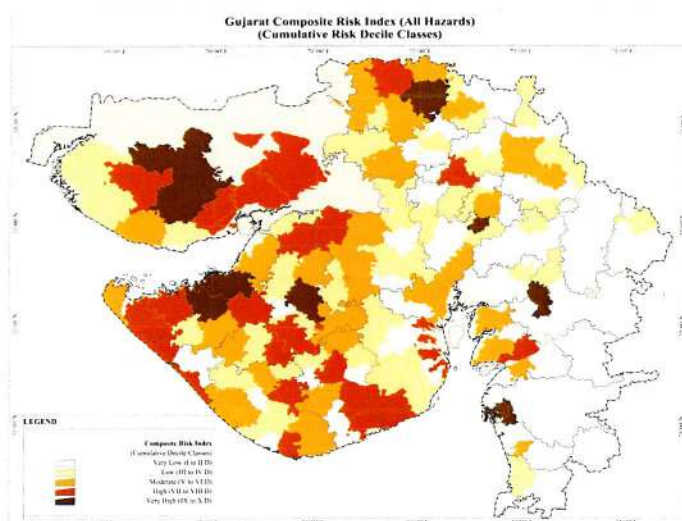
Gujarat is prone to tsunami risk due to its long coastline and probability of occurrence of near and offshore submarine earthquakes in the Arabian Sea. Makran Subduction Zone (MSZ) -South West of Karachi is an active fault area which may cause a high magnitude earthquake under the sea leading to a tsunami.

In past, Kandla coast was hit by a Tsunami of 12 mtrs height in 1945, due to an earthquake in the Makran fault line. Tsunami prone areas in the State include coastal villages of Kutch, Jamnagar, Rajkot, Porbandar, Bhavnagar, Anand, Ahmedabad, Bharuch, Surat, Navsari and Valsad districts.

Fire, Industrial & Chemical, Accidents, Heatwave, Epidemic, Stampede, etc. are also frequent in Gujarat.



## Composite Risk Index



An overall Composite Risk Index for all hazards on a taluka-wise basis has been estimated for prioritization of overall investments, disaster mitigation and related development interventions. The risk index has been computed by stratifying annualized risk estimates by two deciles classes to generate a five point scale (Very High, High, Moderate, Low and Very Low).

**The Disaster Management Cycle (DM Cycle)** identifies the activities to be undertaken before, during or after a disaster. Disaster management is a continued activity, which needs to be dealt with comprehensively. Thus the cycle consists of activities in the pre-disaster, during disaster and post-disaster phase.



**Prevention** means the measures to avoid the occurrence of a disaster. **Mitigation** aimed at reducing the impact or effect of disaster. **Preparedness** means state of readiness which enables stakeholders to mobilize, organize and provide relief to deal with an impending or actual disaster or the effect of a disaster. **Response** means measures taken during or immediate after a declaration of disaster to diminish, or alleviate any suffering, pain, injury or distress or hardship caused on account of the disaster. **Recovery** is the actions

taken by the community and all the government and the non-government agencies to reset the condition after disaster and minimise the vulnerability of the same kind of disaster in future. The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment defines the concept of “Build Back Better”.

#### 4. Learning objectives

At the end of the session, the participants will be able to:

- Explain the concepts of hazards, vulnerability, capacity, and risk in the context of disaster management.
- Describe the DM Cycle and its stages.
- Explain the impact of human actions on hazards and risks.

#### 5. Duration: 45 minutes

#### 6. Methodology

- Q & A/ Quiz on definitions
- Discussion

#### 7. Teaching/Performance aids:

Handout 1.2.1: Terminologies related to disaster management, as on ISDR website ([www.isdr.org](http://www.isdr.org))

Handout 1.2.2: Gujarat State DM Act 2003 (available on GIDM Website)

Handouts 1.2.3: Hazard, Risk, Vulnerability and Capacity Assessment - GSDMA

## 8. Trainers' Note & Session Plan

The first technical session should be conducted to provide a conceptual clarity about the subject. Rather than rote-learning of the concepts, the trainer should aim for an understanding of each of the concepts covered. The explanation should be buttressed with as much of pictorial and visual aids as possible. It is crucial that the trainees have clarity in understanding the concepts, as these will guide all subsequent discussions. The session can be divided into 2 broad sections. An indicative session plan is as follows:

Contents	Trainers' Note	Duration
Concepts of DM – Hazard, Vulnerability, Capacity, Risk, Risk Reduction Impact of Human Actions on Disaster Risk	Focus on the inter- relationship between the concepts HRVC of Gujarat	30 min
<b>The DM Cycle</b> Pre-disaster During Disaster Post-Disaster	Emphasize the Cycle as a comprehensive approach, then explain the concepts associated with each phase.	15 min

## Notes

## Learning Unit 1.3: From DM to DRR- An Overview

### 1. Background

This session will broadly cover the basics of disaster management and its process of evolution as a discipline. The aim of the session would be to provide participants an overview of the growth of disaster management as a discipline of discourse. It will basically trace the development of the subject from ancient to the modern, with emphasis on the paradigm shift in the 1990's. The aim is to trace the history of disaster management and link it to the issue of sustainable development.

### 2. Description of the Session

Coping with disasters has been a way of life with the human civilization. The Indus Valley Civilization, one of the greatest urban civilizations is thought to have been destroyed by a calamity. With the evolution of society especially in post- Industrial Revolution era, the magnitude and impact of disasters increased exponentially. Globally, between 2005-2015, over 700 thousand people have lost their lives, over 1.4 million have been injured and approximately 23 million have been made homeless as a result of disasters. 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. The total economic loss was more than \$1.3 trillion. In addition, between 2008 and 2012, 144 million people were displaced by disasters (UNISDR). This session aims at providing a general overview of the process and instruments of disaster management.

Notwithstanding the continuous increase in the frequency and magnitude of disasters, the management remained reactive over the years. Disaster events continued to be considered as interruptions or aberration in the development process, to be managed through relief disbursement and reconstruction assistance. Globally, a paradigm shift in the approach to disaster management from relief and rehabilitation to prevention and mitigation and a holistic and comprehensive framework, took place when the United Nations observed the 1990s as the **International Decade for Natural Disaster Reduction (IDNDR)**. The objective of the IDNDR was to “reduce, through concerted international action, especially in developing countries, the loss of life, property damage and social and economic disruption caused by natural disasters.” In 1994 the Yokohama Strategy and Plan of Action for a Safer World was adopted at the World Conference on Natural Disasters. The strategy called for accelerated implementation of a Plan of Action based on evolving a global culture of prevention, an integrated approach to disaster reduction, unequivocal political commitment for vulnerability reduction, community participation, improved risk assessment, broader monitoring, and communication of forecasts and early warnings.

In 1999, the United Nations General Assembly Resolution adopted the **International Strategy for Disaster Reduction (ISDR)** and created the Secretariat of the ISDR (UNISDR). The International Strategy for Disaster Reduction (ISDR) is a multi-disciplinary and multi-stakeholder platform to enable societies to increase their resilience to natural, technological and environmental disasters and to reduce associated environmental, human and economic and social losses. A range of United Nations organizations and international partners participated in cooperation with Governments and civil society organizations. In adopting ISDR, the United Nations General Assembly (Res/54/219) endorsed the establishment of an institutional framework for its implementation consisting of the Inter-Agency Task Force on Disaster Reduction (IATF/DR) and the inter-agency secretariat (ISDR secretariat). The main functions of the secretariat are policy coordination, advocacy, and information management, at the international and regional levels, to ensure synergy between disaster reduction strategies and those in the socio-economic and humanitarian fields.

In 2003 and 2004, the UNISDR carried out a review of the Yokohama Strategy and Plan of Action for a Safer World. The review formed the basis of the **Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (HFA)** which was adopted by the World Conference on Disaster Reduction held in Jan. 2005 and subsequently endorsed by the General Assembly of the United Nations.

**The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR)** is the successor instrument to the HFA. It was adopted at the Third UN World Conference in Sendai, Japan, on March 18, 2015. 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. Many commentators have identified the most significant shifts as a strong emphasis on disaster risk management as opposed to disaster management, the definition of seven global targets, the reduction of disaster risk as an expected outcome, a goal focused on preventing new risk, reducing existing risk and strengthening resilience, as well as a set of guiding principles, including primary responsibility of states to prevent and reduce disaster risk, all-of-society and all-of-State institutions engagement. In addition, the scope of disaster risk reduction has been broadened significantly to focus on both natural and man-made hazards and related environmental, technological and biological hazards and risks. Health resilience is strongly promoted throughout.

The Sendai Framework for Disaster Risk Reduction 2015-2030 outlines seven clear targets and four priorities for action to prevent new and reduce existing disaster risks:

# Chart of the Sendai Framework for Disaster Risk Reduction 2015-2030

## Scope and purpose

The present framework will apply to the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks. It aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors.

## Expected outcome

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

## 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

## Targets

Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality between 2020-2030 compared to 2005-2015	Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared to 2005-2015	Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030	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	Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020	Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030	Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030
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## Priorities for Action

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

<b>Priority 1</b> Understanding disaster risk	<b>Priority 2</b> Strengthening disaster risk governance to manage disaster risk	<b>Priority 3</b> Investing in disaster risk reduction for resilience	<b>Priority 4</b> Enhancing disaster preparedness for effective response, and to «Build Back Better» in recovery, rehabilitation and reconstruction
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- 1) Understanding disaster risk;
- 2) Strengthening disaster risk governance to manage disaster risk;
- 3) Investing in disaster reduction for resilience and;
- 4) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

It aims to achieve 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 over the next 15 years. The chart for SFDRR is as under:

The state of Gujarat has been prone to disasters. These disasters have caused extensive damage to life and property and have adversely impacted economic development. Examples include the persistent droughts in the state and the devastating earthquake that hit Gujarat on January 26, 2001. While the state boast of a reasonably well-coordinated relief administration, proactive mitigation or risk reduction measures were conspicuous by their absence. After facing Bhuj Earthquake 2001, the focus shifted from a post-disaster reactive approach to a proactive risk reduction approach covering both pre and post-disaster phases. Today, the focus is on entire disaster management cycle with added emphasis on disaster risk reduction and preparedness. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process.

The Disaster Management Act 2003 was one of the most significant initiatives taken by the Government of Gujarat for putting in place an institutional system dedicated to disaster management. The Gujarat State Disaster Management Authority has been constituted for a more comprehensive and holistic management process. Subsequently, Gujarat Institute of Disaster Management (GIDM) has also been entrusted with the responsibility of human resource development, capacity building, training, research and documentation in the field of Disaster Management.

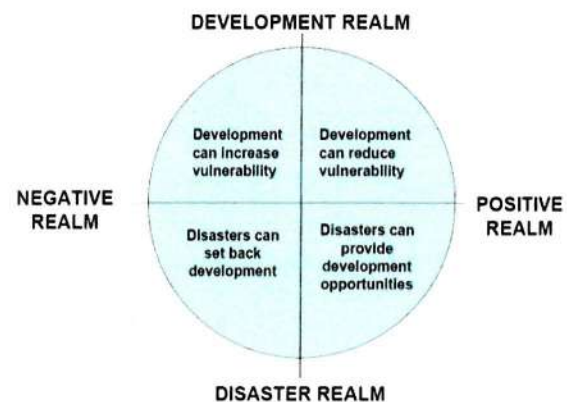
### **3. Disaster and Development**

Disasters and development are closely linked. Disasters can both destroy development initiatives and create development opportunities. Development schemes can both increase and decrease vulnerability.

In the traditional approach to disasters, the attitude was that the disasters, especially natural ones, were an act of god and as such were beyond human control; accepting death and damage to property was part of the costs. With such an attitude, most development plans were designed without consideration for the effect disasters would have on community plans and vice versa. When a disaster did occur, the response was directed at meeting emergency needs and cleaning up.

In the current approach, it has been realized that much more can and need to be done to reduce the severity of hazards and disasters. A growing body of knowledge on the relationships between disasters and development indicates four basic themes as follows:

- 1) Disasters set back development programming, destroying years of development initiatives.
- 2) Rebuilding after a disaster provides significant opportunities to initiate development programmes.
- 3) Development programmes can increase an area's susceptibility to disasters.
- 4) Development programmes can be designed to decrease the susceptibility to disasters and their negative consequences.



Thus, the policy makers cannot ignore the relationship between the disaster and development. Projects are thus being designed to include disaster recovery programmes and with long term development needs in mind. Disasters can significantly impede the effectiveness of development resource allocation.

#### 4. Learning objectives

At the end of the session, the participants will be able to:

- Describe the increasing trend of disasters globally and in India especially Gujarat
- Describe the evolution of Disaster Management concerns across the globe
- Describe the causes and process of the global paradigm shift and the relation between Disaster and Development
- Explain the Gujarat response to the paradigm shift
- Describe the change in orientation in DM system in India and Gujarat
- Explain the mandate, aim, and institutions brought about by the DM Act 2003 and 2005.

#### 5. Duration: 30 minutes

#### 6. Methodology

- PowerPoint Presentations
- Q & A sessions
- Discussion

## 7. Teaching/Performance Aids

Handout 1.2.1: Copy of the presentation

Handout 1.2.2: Disaster Management Act 2003

Handout 1.2.3: Disaster Management Act 2005

Handout 1.2.4: Sendai Framework for Disaster Risk Reduction (2015-2030)

## 8. Trainers' Note & session Plan

The session should be conducted to provide an overview to all participants about the evolution, of the subject, its role in the development and the changes brought about by the paradigm shift. Care should be taken not to overload the participants with too much of data, but explain the evolution process in a smooth discussion. The session can be divided into 3 broad sections and each broken down into smaller capsules. After each section, allow 5-10 min for discussion for better understanding and retention. An indicative session plan is as follows:

Contents	Trainers' Note	Duration
Disasters & the Trends Disasters by numbers and impact from 1900 onwards Trends of growth in numbers (emphasize on the increasing impact) Damage and losses due to disasters	In this section, aim for putting across the message that disasters transcend all societal mores, affects everybody and therefore needs everybody's participation. Focus on the disaster-development interface.	10 min
<b>The global agenda</b> IDNDR & Yokohama Strategy... ISDR, HFA and SFDRR Paradigm shift – cause and effect The Process – relief to mitigation to risk reduction Building resilience among communities	Focus on the gradual change in orientation, incidents that led to these changes. Ask trainees to name specific events during IDNDR they remember and compare the thinking then and now	20 min
<b>The Indian and Gujarat Experience of a Paradigm shift</b> The Initial Years (Famine Commission, Ministry of Agr, NDMA, GSDMA) The mega-disasters, learning lessons. Concept of Disaster and Development  DM Act 2003, 2005	Concentrate more on the Act while mentioning the circumstances leading to the Act formulation. Conclude by summarizing and connecting all sections	20 min + 10 min concluding the discussion.

**Note:** Being a long session, give a 5 min break before the next session participants to facilitate retention.

## **Learning Unit 1.4: Identifying Risks & Vulnerabilities in the Urban Context**

### **1. Background**

This session acts as the bridge between the themes of disaster management and urban development. It builds on the concepts of hazard, vulnerability, and risk and places it within the urban context. The aim is to acquaint participants with the concept of vulnerability among different sections of the population and how vulnerability differs among different sections of the community.

### **2. Description of the Session**

More than 50 % of the world's population now reside in urban areas, and this is projected to increase to 66 % by 2050. Urbanization and the complex characteristics of cities can present opportunities for sustainable development, while at the same time they have the potential to increase vulnerabilities and risk. Physical and spatial characteristics of urban areas, socio-economic vulnerability of their citizens, inadequacy of institutional capacities and environmental challenges are some of the risk drivers that thrive under the complex situation that cities are in.

The urban society is many-layered, with people from different sections of the society, with varying needs and vulnerabilities. Increasing urbanization is often mentioned as a cause of increasing economic impacts of disasters. The economic losses from disasters show continuous increase over the years for events of the same severity because of the high investment in the built environment often lost due to disasters. The socio-economic aspects of urban risks originate from those in the physical, built environment which accommodates them.

Rapid urbanization puts pressure on land and services, if not met with sustainable planning and land-use decisions. Often, this leads to incoming populations settling in hazard-prone areas, such as in coastal lowlands, in floodplains or on unstable and steep slopes.

Urban risks from a socio-economic perspective, therefore, deal with the various sections of the population and their respective risks. For example, a recently migrated household staying as squatters in a weak structure is vulnerable due to the poverty and economic vulnerability.

Likewise, a person employed in the informal sector lives with the risk of losing his livelihood – for a short-term or sometimes permanently, in case of any disaster

From an economic perspective, disasters impact both fixed capital investments and production flows. It follows therefore that a city having a concentration of both capital investments and production flows would be highly vulnerable to the impact of a disaster. This would also include indirect losses related to the cost of reconstruction and restart.

The social connotation of urban risk would include the differential vulnerabilities and coping capacities of different population segments. While it is generally accepted that poor are more vulnerable to

disasters due to their economic conditions, societal expectations and stereotypes aggravate vulnerabilities of segments like women, children, old people etc and those with severely compromised mobility. These multi-layered facets of risk need to be taken into account for aggregate risk assessment.

### 3. Learning objectives

At the end of the session, the participants will be able to:

- Identify the layers of vulnerability in an urban context
- Assess disaster risks in urban areas
- Explain how disasters impact the socio-economic well-being of an urban area.
- Describe the differential vulnerability within segments of urban population and assessment concerns
- Describe the coping mechanisms developed by the vulnerable population.

### 4. Duration: 60 min

### 5. Methodology

- PowerPoint Presentation (optional)
- Discussion
- Film (if available)

### 6. Teaching/Performance Aids

- 1.4.1 Copy of presentation
- 1.4.2 Flipchart/ markers

### 7. Trainers' Note & session Plan

The session should be taken up in a discussion mode so that trainees come out with their own ideas and experiences in understanding the different layers of vulnerability. A good way to begin the session would be to ask the participants to identify out various segments of the population residing in urban areas and list them out on a flipchart. Then ask the group to identify aspects of the vulnerability of each segment, the causes, and likely difficulties during a disaster. Draw out the social and economic aspects of vulnerability and focus on the differential vulnerability of urban social segments, concluding with a presentation on community-based disaster management in urban areas. An indicative session plan is as follows:

<b>Contents</b>	<b>Trainers' Note</b>	<b>Duration</b>
<b>The Urban Population</b>	This section should be dealt as a discussion to identify various segments of the urban population	15 min
<b>The Differential Vulnerability</b>	Identify the more vulnerable population segments and the underlying causes of their vulnerability. Could be done as a buzz group exercise	25 min
<b>Role of urban Community in risk mitigation</b>	A presentation covering all that was discussed would close the session.	20 min

### References

1. Progress on the Making Cities Sustainable and Resilient Action (Available on: <https://www.unisdr.org/we/inform/publications/58509>)
2. How to make cities more resilient: a handbook for local government leaders (Available on: <https://www.unisdr.org/we/inform/publications/54256>)
3. Book: The Vulnerability of Cities: Natural Disasters and Social Resilience by Mark Pelling

## Notes

## Learning Unit 1.5: Urban Disaster Risks: Perspectives & Approaches

### 1. Background

This session continues from the preceding to focus on the interface between the urban development and disaster management fields. The aim of the session would be looking at the urban scenario from a disaster risk perspective and identify the factors contributing to this risk.

### 2. Description of the session

*“Urbanization holds out the bright promise of an unequaled future and the grave threat of unparalleled disaster.” - Wally N'Dow, Secretary General, Habitat II; quoted in United Nations Commission on Human Settlements, 1996.*

Disasters show significantly different impacts in urban areas primarily due to intense population concentration in cities and towns. The concentration of economic activities in urban centers leads to concentration of population which in turn results in a concentration of risks. Risks from natural hazards which arise due to the location of an urban area in a particular physiographical setting are aggravated due to problems in built form, spatial planning, networks, and systems, resulting in complex emergencies and disasters. Therefore, urban risk mitigation entails studying the entire system as a complex whole and as a network of networks supporting various systems.

Urban population has grown tremendously in the 19<sup>th</sup> and 20<sup>th</sup> centuries and shows no sign of abating in the near future. As generators of economic momentum, cities attract large numbers of people from the rural hinterland and in some cases, smaller urban centers. The developing world is at a greater risk because it is estimated that By 2030, it is expected that 85% of the world's population will be in developing countries, with 15% in LDCs. The poor among them are forced to settle down in the hazard-prone areas like those prone to water-logging, unstable slopes, unhygienic areas, thereby increasing their own vulnerabilities. On the other hand, unstable or badly constructed buildings, unplanned growth, inadequate and outdated infrastructure increase the disaster risk of “regular” urban areas. An urban area is characterized by its built-form, land use systems, socio-politico-economic features, all connected in a complex system of networks and risks. Due to this, a single disaster like earthquake may aggravate into fires (Kobe 1995), landslides, chemical leak etc. There is thus an urgent need for better preparedness, capacity building and clear-cut policy interventions for urban areas within a holistic DRR approach.

In Gujarat about 42.6% of the population resides in urban areas, or 2.57 crore of the state's total population lives in the cities, (Census 2011). In a state like Gujarat, where majority of the landmass is vulnerable to one or more hazards, it goes without saying that most cities also lie over hazardous terrain. Gujarat is vulnerable to all major natural hazards namely, drought, flood, cyclone, earthquake, tsunami etc. The State is also under constant threat of various human made hazards like that of industrial (chemical) hazards, transportation accidents, terror attacks, epidemic, road accidents, etc. (GSDMA) that claim lives, livelihood, and property.

In the Gujarat context, a rapidly growing urban population is a reality. The urban population is growing at a higher rate than the overall population. The state has the longest coast line of about 1,600 km in India. Almost entire State comes under Earthquake zone 3, 4 & 5. Major Rivers viz. Narmada, Tapi, Mahi, Sabarmati, etc poses the threat of flooding, Deserted Area like Kutch, Industrial Area – Hazira, Bharuch, Vapi, Dholera, etc. increasing the vulnerabilities.

Cities located in various climatic or geological zones are prone to hazards of varying nature. The challenge is to create resilient cities, based on the premise that disasters are a reality most cities have to face. A resilient city can bend due to a disaster, but will not break down entirely because the systems, people, and functions are integrated in a risk resilience format. This would involve both structural and non-structural measures to be taken in participation with all stake-holders for making a resilient city.

### 3. Learning objectives

At the end of the session, the participants will be able to:

- Describe the global urban characteristics
- Describe the characteristics of Indian and Gujarat urban scenario
- Identify the types, causes, and factors aggravating urban risks
- Explain the characteristics of resilient cities.

### 4. Duration: 60 min

### 5. Methodology

- PowerPoint Presentation
- Discussion

### 6. Teaching/Performance Aids

1.3.1 Handout of presentation

1.3.2 Relevant reading material

1.3.3. UN HABITAT: Urbanization: Facts and Figures (Available at:

<http://www.un.org/ga/Istanbul+5/bg10.htm>)

## 7. Trainers' Note & session Plan

The session will deal with the urban risks for the first time in the training. The trainer should focus on the relation between cities and its risks. The session can be divided into two broad sections focusing on the urban scenario and the urban risk scenario respectively, each divided into capsules for systematic learning. An indicative session plan is as follows:

Contents	Trainers' Note	Duration
<b>The Urban Context</b> Global urban population and density The growth of urban population Million-plus cities and its growing membership	A ppt is best suited with visuals of growth so that the dimensions of the problem are clear	10 min
<b>The Urban Context in India &amp; Gujarat</b> Urban population, density and growth Trend of urbanization Metropolitan growth and trends	This section should focus on the urban population growth and density in India & Gujarat, focus on the increasing growth of metros and stagnation of small towns, ask trainees to analyze causes and possible impacts on urban risk scenario	20 min (15 min ppt + 5 min discussion)
<b>Urban Risk Perspectives</b> Urban hazards and risks – types & features Urban centers in hazard-prone areas Features of a resilient city	This section is the most important and the trainer needs to draw from both the preceding sections to analyze this. Conclude with a discussion on the applicability of resilient cities concept.	30 min (20 ppt + 10 concluding discussion)

## Notes

## Technical Session 2: Urban Risk Impact: Issues & Concerns

### 1. Context

Having completed describing the close relationship between disaster risk reduction and urban development, this module focuses on the impact of disasters on urban areas, and the issues that need to be considered for formulating mitigation strategies. Urban risks are the product of varied issues, related to structures, people and networks combined in urban space. Urban risks are aggravated by physical, social and environmental concerns. Each of the issues taken up in this module impacts the urban hazard and vulnerability scenario significantly.

This module would be divided into 5 learning units, each dealing with a specific aspect of urban risk:

Learning Unit 2.1: Disaster Impact and Role of Urban Planning for Risk Mitigation

Learning Unit 2.2: Environmental Impact on Urban Risks

Learning Unit 2.3: Implications of Urban Transport in Disaster Risk Reduction

Learning Unit 2.4: Urban Health Issues for Disaster Risk Reduction

Learning Unit 2.5: Climate Change and Urban Risks: Impact for Present and Future

### 2. Objectives of the module would be to:

- Explain the impact of disasters on urban areas and the role of urban planning in risk mitigation.
- Examine the risks caused by the environmental factors
- Identify the health issues in urban disasters
- Identify ways of mainstreaming the issues into urban governance

**3. Duration:** 280 min. preferably completed in 1 day.

### 4. Methodology

The module deals with inter-disciplinary issues of urban risk, ranging from planning to health to transport. A knowledge-intensive module to be completed in a day, it should be conducted in a participatory, discussion mode. The primary aim of the entire module would be to provide comprehensive knowledge inputs to the participants, therefore the module would be trainer-driven, because varied inputs from various sectors have to be imparted in a concise capsule.

## 5. Trainers' Note

From the overview module, this one goes on to explain the technical aspects of urban risks, various related issues and concerns. The trainer should bear in mind that this module consists of varied topics and issues, therefore the inputs should be concise, focusing on the interface between the urban issue and the risk issue. The trainer should also keep in mind that trainees from specialized backgrounds would have more expertise/experience on a particular subject (for eg an engineer would know more about buildings and structures, a medical professional would be more aware of the health aspects). The trainer should be cautious so that other participants gain from the peer experience but not be neglected in favour of the person having more expertise

## **Learning Unit 2.1: Disaster Impact and Role of Urban Planning for Risk Mitigation**

### **1. Background**

The first session of this module would deal with disaster impacts in the city. From the more general overview, the course would get increasingly specific from this session onwards by sequentially following each aspect of risk and setting the context for identification of risk mitigation strategies. Devoted to the role of urban planning and design, this session underscores the need for risk sensitive urban planning.

### **2. Description of the Session**

Urban landscapes are characterized by its built form, land use, circulation patterns, social and economic systems, all connected in a complex network of people and organizations. Disaster risks form an integral part of this complex network. While a part of the risks accrues due to the location of the city in a hazard-prone area, a considerable part accrues out of the inherent vulnerabilities due to uncontrolled urbanization and planning, unsafe construction practices, vulnerabilities linked with livelihood and social stereotyping. Therefore, the first session in this module aims to look at the entire cityscape comprehensively and identify issues related with risk.

In Gujarat and most of India, the process of urbanization has been uncontrolled and ad hoc. Urban centres therefore are formed from a collection of different types of structures built within a network of circulation elements. The structures range from high-rise to mansions to shanties and tenements while the circulation ranges from lanes and by-lanes to avenues and highways. It naturally follows that the city offers shelter to the rich and the poor alike, each with different needs and vulnerabilities. The urban landscape therefore is a complex mix of varied structures and people.

Spatial planning and construction in urban areas need to be sensitive to disaster risks and ensure safer constructions. This presupposes strict disaster sensitive urban planning initiatives that incorporate risk reduction and disaster safety. A good way to begin would be to critically assess the risks to a locality and then plan for quick response facilities and further risk reduction. For individual buildings too, strict adherence to building bye-laws and structural safety features on the basis of risk assessment is required. The SFDRR gave emphasis to focus on tackling unplanned urbanization to address underlying disaster risk driver. The New Urban Agenda adopted in Oct. 2016 seeking to promote inclusivity to inhabit and produce safe, healthy, accessible, affordable, resilient and sustainable cities and human settlements to foster prosperity and quality of life for all.

### 3. Case study – Metro Manila

#### **Metro Manila –Risk Mitigation between Tremors and Typhoons**

Metropolitan Manila, which is composed of 13 cities and 4 municipalities, is the political, economic, and cultural center of the Philippines. The population of Metropolitan Manila is approximately 10 million at present. It has been developing and is now one of the most densely populated areas in Southeast Asia. Rapid population growth started in the 1970's, when the population was approximately 4 million. It increased to 6 million in the 1980s, 8 million in the 1990s and 10 million at present. The population has increased by 2.5 times in the last 30 years. Additionally, this rapid population growth is affecting the fringe areas of Metropolitan Manila, and the population is expected to grow to 25 million by the year 2015

Geographically, Metropolitan Manila is located in Luzon Island. Numerous earthquake generators, such as the Valley Fault System (VFS), Philippine Fault, Lubang Fault, Manila Trench, and Casiguran Fault, are located in and around it. Topographically, the Metropolitan Manila area is composed of coastal lowlands, a central plateau where the central district including Makati is located, as well as alluvial lowlands along the Marikina River and the Laguna Lake. In case of an earthquake, liquefaction in these lowland areas may cause damage to buildings and infrastructure. In addition, tsunami can also occur along the Manila Bay.

The Govt of Phillipines, with the assistance of JICA, has conducted an extensive study and prepared an Earthquake Impact Reduction Plan.

#### **Overall structure of the Plan**

##### **1) Assumption**

Based on the damage estimation by MMEIRS Study of the potential rupture of West Valley Fault, approximately 40% of the total number of residential buildings within Metropolitan Manila will collapse or be affected. This building collapse directly affects large numbers of people, since it is estimated to cause 34,000 deaths and 114,000 injuries. Moreover, additional 18,000 deaths are anticipated by the fire spreading after the earthquake event. This human loss, together with properties and economy losses of Metropolitan Manila will be a national crisis.

## **2) Vision**

“The earthquake impact reduction plan for Metropolitan Manila” prepared by the Metropolitan Manila Earthquake Impact Reduction Study anticipates the mitigation and reduction of the expected impact. The vision of this plan is to ultimately achieve “*A Safer Metropolitan Manila from Earthquake Impact*”

## **3) Goals, Objectives and Frameworks**

To attain this *vision*, six goals have been addressed as follows:

- 1) To develop a national system resistant to earthquake impact
- 2) To improve Metropolitan Manila’s urban structure resistant to earthquake
- 3) To enhance effective risk management system
- 4) To increase community resilience
- 5) To formulate reconstruction systems
- 6) To promote research and technology development for earthquake impact reduction measures.

These goals have 10 objectives, and the objectives are broken down into 34 frameworks. The frameworks represent main policies and strategies to achieve goals and objectives.

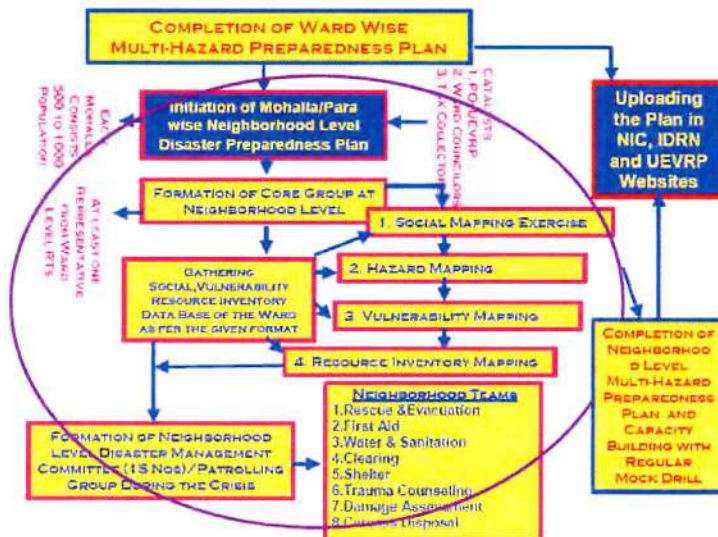
## **4) Frameworks and action Plans**

The frameworks contain 105 action plans. The action plans are prepared to put in practice the policies and strategies represented in the frameworks.

### **Priority action Plans**

Among the 105 identified action plans in the master plan, 40 of them are selected as high priority action plans.

The Indian scenario of cities and buildings reflect lack of Disaster Risk Reduction concerns in the planning and construction process. The biggest challenge is to make all structures, residential, social or economic safe from disaster risks. The Bhuj Earthquake of 2001 was an eye opener for the failure of buildings due to faulty construction practices. Inadequate spatial planning should take into account a disaster scenario, in terms of rescue, evacuation and reconstruction. Layout of roads, parking areas and other amenities need to be planned according to the risk conditions of the area. No development should be allowed that aggravates the risk of the area. The planning process should have a bottom-up approach wherein neighborhood and ward level plans collate to form a comprehensive city plan. Community involvement is an important aspect of the city planning process, to be completed alongside systematic capacity building processes of the stakeholders.



A framework of local level city planning, as developed by UNDP (see <http://www.disastermgmt.bih.nic.in/Reports/Ward%20Disaster%20Management%20Plan.pdf>) can be referred to.

#### 4. Learning objectives

At the end of the session, the participants will be able to:

- Discuss the impact of disasters in cities and need for risk sensitive urban planning.
- Discuss the major issues for unsafe built urban form and space
- Discuss the initiatives taken for earthquake risk reduction for Metro Manila, one of the most vulnerable urban centres in Asia.
- Discuss the considerations in the Indian context for urban planning and building design for risk reduction.

#### 5. Duration: 60 min

#### 6. Methodology

- Case Study Metro Manila
- Discussion
- Case Study of any Indian city

#### 7. Teaching/Performance aids

2.1.1 Handout of presentation

2.1.2 Case Study sheet

## 8. Trainers' Note & session Plan

Following from the earlier sessions, a lecture-discussion mode would be suitable for this session. While explaining the Metro Manila experience, the trainer should concurrently draw parallels with the prevailing Indian situation and the issues therein. The Indian urban risk scenario can be explained by a powerpoint presentation, or slide projection of photographs. An experience sheet can also be circulated among participants to identify issues in urban planning and construction. The trainer should conclude the session with a discussion on disaster management plans. An indicative session plan is as follows:

Contents	Trainers' Note	Duration
Disaster Impact on Urban Landscape - Estimated asset loss in cities during disasters due to faulty planning - Need for Risk Considerations in Urban Planning	Initiate discussion by pointing out the complexities of the urban fabric, in terms of space and structures, present examples of unsafe development	15 min
Metro Manila – Risk Mitigation between Tremors and Typhoons Vulnerability of Metro Manila Mitigation Plan	Describe the layers of vulnerability, the mitigation plan, organizations involved and main components of the plan	10 min
<b>Risk Sensitive Urban Planning</b>	Bring the focus to Indian urban planning scenario through case studies	15 min
City Disaster Management Plans Planning goals Components of a plan	This could either be a participatory exercise or a concluding ppt	20 min

## Notes

## Learning Unit 2.2: Environmental Impact on Urban Risks

### 1. Background

Environmental issues like waste management, pollution etc often become either sources of urban risk or factors that aggravate the existing risk profile. This session will attempt to interpret urban risks from an environmental perspective and identify the key issues for mitigation. In the process, it will also focus on the key message of multi-stakeholder participation for environmental risk mitigation. That urban risk mitigation is a cross-cutting issue overlapping many sectors and demanding multi-sectoral mitigation actions is emphasized in this session.

### 2. Description of the Session

“The neglect of our natural assets and environment has always led to crisis.” (The Second Administrative Reforms Commission, 2006). In addition to the most visible human dimensions, a disaster has huge environmental implications as well. “Environmental conditions may exacerbate the impact of a disaster, and vice versa, disasters have an impact on the environment. Deforestation, forest management practices, agriculture systems etc. can exacerbate the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting and ground/surface water contamination.” (<http://www.gdrc.org/uem/disasters/disenvi/index.html>).

The urban environment is especially vulnerable to various disaster risks because of extensive human interventions in the natural processes. Population and vehicular concentration, heavy construction load and destruction of the natural habitat in terms of environmental alterations like creation of waste dumps, filling of wetlands with waste, industrial or effluent contamination, etc. may cause land instability giving rise to risk of damage to buildings and structures even in the case of earthquakes. Human interventions like construction over and against the natural drainage systems, pollution and degradation of natural resources create or exacerbate the impact of disasters. As per the Centre for Science & Environment, a New Delhi based NGO; the ecological footprint of large urban areas generally exceeds its capability for sustainable growth. About 120,000 tonnes of garbage is generated everyday in Indian cities, creating an environmental concern. According to the data given by AMC, Ahmedabad generates 3,700-4000 tons of solid waste generated every day, out of which around 10 to 12% is plastic. Over time, these environmental implications assume the proportion of disasters. Environmental implications of high impact natural events are huge in terms of agricultural productivity, construction materials and natural resources. Disposal of destroyed buildings and its contents, damaged infrastructure may have significant impacts on the environment. Salination of agricultural land due to sea water ingress, loss of shelterbelt plantations due to cyclone or tsunami have adverse environmental impacts.

Activities like rampant groundwater extraction, leaching from garbage dumps, release of untreated industrial effluents into natural water sources destroy the urban ecosystem. An example of an urban environmental disaster was the “trash-slide” caused by heavy rains killing hundreds of poor people in Barangay Lupang Pangako, Payatas, Quezon City, Metro Manila, Philippines in July 2000.

### **The Philippines Trash Slide – Vulnerability of Poor?**

Weighed down by the heavy rains of two typhoons that hit the Philippines, a monstrous mountain of garbage collapsed Monday on a cluster of shanties outside Manila. As rescuers continued to sift through the tons of waste Tuesday, officials said hopes had dimmed for finding survivors. The accident claimed at least 85 lives in the small community known as Lupang Pangkao, or the Promised Land. At least 68 people - and possibly hundreds - remained missing Tuesday. The landfill collapse in the suburb of Quezon City occurred after five days of heavy rains from Typhoon Kirogi. The typhoon, which converged on the Philippines with Typhoon Kai-Tak, battered the country with severe flooding that left at least 44 dead.

As rescuers dug through the heaps of refuse Monday, they could hear voices calling for help. But overnight the pleas faded, leaving rescuers and relatives with little hope. “It’s almost impossible to get anybody alive at this time, after 24 hours,” Defense Secretary Orlando Mercado told CNN. The local civil defense office put the number missing at several hundred, but officials said that no one knew for sure how many people were buried. At least another 29 people were injured in the disaster. Approximately 800 people had been taken to emergency shelters. The rotting trash was strewn over Lupang Pangkao, covering an area about the size of four basketball courts and swamping at least 100 huts. Most of the nearly 60,000 people who reside in the community relied on the rubbish heap for their livelihoods, collecting plastic containers, bottles and other items to sell to junk shops. Residents recounted hearing a thunder-like burst just before the wall of garbage, looming over the town like a volcano, fell. The cascade of debris from the Payatas dumpsite then burst into flames, possibly after being ignited by fallen cable wires or stoves in the huts. Fire trucks - unable to reach the garbage-clogged area - were forced to park on a main road several blocks away. They pulled and twisted hoses through alleys to extinguish the blaze within hours. Rescuers dug into the rotting mess late into Monday night, but were hampered by the stench and a lack of equipment. Residents cried out against efforts to sift through the pile using bulldozer, fearing their loved ones would be crushed. Before the typhoon season began, officials had warned residents of the possible danger posed by the massive trash pile. But many refused to abandon their livelihoods. “They say that we are moving them out of their source of income,” Quezon City Mayor Mel Mathay told CNN. The city had planned to close the dump in December of last year, but plans were delayed when residents at a waste site in San Mateo, in nearby Rizal province, refused to allow metropolitan Manila’s trash to be dumped there. Danilo Casto, whose home was perched alongside the mountain of waste, said he felt the ground shift Monday morning before the accident. “I left the house because I needed to sell outside, so I left my wife and child,” he told CNN. “When I came back my house was gone and my wife and child are buried underneath.” DisasterRelief.org <http://www.reliefweb.int/rw/RWB.NSF/d>

### **3. Learning Objectives**

At the end of the session, the participants will be able to:

- Identify the relationship between urban environment and disaster risks
- Discuss how urban environmental risk reduction is important for sustainable development
- Identify ways of addressing environmental concerns in urban development practices.

#### 4. Duration: 60 min

#### 5. Methodology

- PowerPoint presentation
- Discussion
- Case Study
- Buzz Group Exercise

#### 6. Teaching/Performance Aids

2.2.1 Handout of presentation

2.2.2 Case Study sheet

2.2.3 Flipcharts/Exercise Sheets

#### 7. Trainers' Note & Session Plan

This session should draw on the intrinsic relationship between environment and disasters. While environmental issues cause/aggravate disasters, specific disaster events result in deteriorating environments. The key message to be sent in this session would be the role of individuals in decreasing the carbon footprint and contribute to environmental sustainability. The session can be divided into three major sections, as explained in the indicative session plan:

Contents	Trainers' Note	Duration
<b>Environment &amp; Disasters – The Intrinsic relationship</b> <ul style="list-style-type: none"><li>- Disasters cause environmental concerns</li><li>- Degraded environment affects disasters</li><li>- Urban environment</li></ul>	Use a ppt to consolidate thoughts and ideas and underscore the disaster-environment relationship	20 min
<b>An Environmental Disaster Case study</b> Philippines Trash Slide	Discuss the disaster from an environmental point of view	20 min
<b>Buzz group activity</b> Environmental Impact of Tsunami	Group activity	20 min

#### 8. Suggested Reference

1. Kotter, Theo: Prevention of Environmental Disasters by Spatial Planning and Land Management, <http://www.gdrc.org/uem/disasters/disenvi/koetter.pdf>
2. Ghosh, Archana (ed.) (2003): Urban Environment Management Local Government & Community Action published for Institute of Social Sciences & Friedrich Ebert Stiftung by Concept Publishing Company, New Delhi – 110059

# Notes

## **Learning Unit 2.3: Implications of Urban Transport in Disaster Risk Reduction**

### **1. Context/ Background**

This session would identify the specific issues related to urban transport and subsequent risks. The session will connect the transportation sector with the associated risks in urban areas. The focus would be two-fold viz the role of transportation sector on development and the transportation based disasters like accidents etc.

### **2. Description of the session**

Transportation is an inherent part of the urban scenario. While it is an integral part of the development process, it also generates risk in terms of accidents, vehicular pollution etc. A lifeline of the urban sector, the transportation system connects all the spatial elements in a city. The nodal role of transport system in moving people and goods between multiple origins and destinations in influencing urban productivity is well acknowledged. However, unplanned construction, excessive population concentration, vehicular congestion etc give rise to urban transportation risks.

Accidents form a significant part of the urban risk scenario. Indian cities are characterized by a variety of modes of transport, ranging from fast moving automobiles to slow moving animal or human powered vehicles. Increase in the number of vehicles in Indian cities has increased the demand for transport infrastructure, which mostly have not been able to match with the demand. This has caused traffic congestion and consequent parking problems in the city. Inadequacy of public transportation also results in vehicular congestion leading to pollution, loss of public space and compromised safety of both vehicle users and pedestrians.

The major issues in traffic and transportation are therefore:

- Vehicular and parking congestion
- Inadequate public transport system
- Accidents – Pedestrians, vehicle users
- Environmental implications – pollution
- Land consumption and landuse – loss of public space

### **3. Learning objectives**

At the end of the session, the participants will be able to:

- Discuss the role of urban transportation system in aggravating disaster risks.
- Describe the issues of urban transportation systems in the Indian context for mitigation
- Discuss the initiatives that can be taken for reduction of risks through effective utilisation of transportation sector.

#### 4. **Duration:** 40 min

#### 5. **Methodology**

- PowerPoint presentation
- Discussion

#### 6. **Teaching/Performance aids**

- i. Handout of presentation
- i. Flipcharts/Exercise Sheets

#### 7. **Trainers' Note & Session Plan**

This session should follow from the earlier sessions to draw out the issues relevant to disaster management. The trainer should underline the role of the transportation sector in terms of accidents, environmental pollution, accidents and other disaster risks. At the same time, the positive role that can be played by this sector like rescue and transportation, increased mobility leading to productivity should be brought to the fore. The session can be divided into two major sections, as explained in the indicative session plan:

<b>Contents</b>	<b>Trainers' Note</b>	<b>Duration</b>
<b>Role of Transportation sector in Urban Development</b>	PPT	20 min
<b>Urban Disaster risks vis a vis the transportation sector</b>	PPT and wrap up in a discussion mode	20 min

## Learning Unit 2.4: Urban Health Issues for Disaster Risk Reduction

### 1. Background

Public health constitutes an important aspect of the quality of life of the people. Disasters have an adverse impact on the health of the affected population. This session would identify the public health issues during and after a disaster, especially post-disaster disease surveillance to prevent health emergencies during disaster. Conversely, urban issues like pollution, waste disposal etc may result in influencing urban public health. This session therefore should deal with the health aspects of urban disasters.

### 2. Description of the Session

Urban public health is a dichotomy in itself. While on the one hand urban decay and urban poverty manifest in certain diseases among a section of the urban community, the “problem of plenty” among the affluent results in a typical urban morbidity pattern, on the other. Pre-existing morbidity scenarios become more aggravated and complicated during disasters. Moreover, public health issues include within its ambit water and sanitation, vector control, nutrition and food safety etc, all of which have a direct bearing on the disaster risk in an urban area.

Health implications of disasters in urban areas are varied and far-reaching. While deaths and injuries are the direct consequences, transmission of communicable diseases, epidemics and trauma are indirect consequences, which combine to create complex emergencies. Health care in disasters has too often been viewed as a purely immediate post-disaster acute phase problem, being dissociated from context of prevention and pre-disaster preparedness on one side and the long term effects and rehabilitation on the other. In an urban area especially, disaster health issues need to be considered comprehensively, dealing with implications of water and sanitation, waste disposal, pollution and lifestyle patterns. Diseases arising from faeco-oral contamination, vector contamination, lifestyle characteristics already influence the morbidity pattern of the population, which intensifies during and after a disaster.

An integrated system for pre and post-disaster situations would include, within its ambit, continuous surveillance for epidemics, planning for rescue, triage and treatment, deployment of field hospitals, hospital preparedness for mass casualty management. From an epidemiological point of view, the risk factors would require an analysis of the effects correlated to their supposed determinants, either behavioural or environmental. Identification of the vulnerable groups within a community would help in directing the preventive measures to the groups most likely to benefit from them. Educative measures for better preparedness are mostly based on this type of information

Preparedness strategies for health emergencies would include:

- Surveillance
- Laboratory Support
- Epidemiological Assessment
- Rapid Response Teams
- Institution of Public Health Measures
- Immuno-prophylaxis
- Chemoprophylaxis
- Hospital preparedness
- Stockpile of drugs/ Vaccines / disinfectants/ insecticides /PPE
- Risk communication
- Training/ capacity building

Urban areas contribute to mass casualties during disasters. For mass casualty management, prior preparedness of hospitals and staff are imperative. Relevant literature reviews indicate that about 60% of total casualties would require definitive hospital treatment and 1/3<sup>rd</sup> of these would require emergency surgery. Objective assessment of the local hazards, likely number of casualties and likely nature of injuries are components of the on-site protocol for mass casualty management. A plan of action has to be developed on the following:

- Prevention of risk
- Promotion of health
- Specific treatment
- Rehabilitation
- Disposal of the dead

It must be understood that a disaster can occur anywhere and at any time. It is no respecter of circumstances. It strikes with suddenness and fury and has a curious tendency of choosing the most inopportune moment. To deal with such sudden influx of a large number of casualties, quantitative extension of Hospital services, operations and safety measures are required. At the Time of Disaster there is No Time for PLANNING. That is the Time for DOING

### 3. Learning objectives

At the end of the session, the participants will be able to:

- Discuss the urban health profile in India and its implications in a disaster situation.
- Identify preparedness strategies for health emergencies w.r.t urban areas
- Discuss basic mass casualty management measures for urban emergencies.
- Discuss overall planning considerations for mass casualty management.

4. **Duration:** 60 min

5. **Methodology**

- Interactive PowerPoint presentation

6. **Teaching/Performance aids**

2.4.1 Handout of presentation

2.4.2 Flipcharts

7. **Trainers' Note & session Plan**

This session is very significant because it deals with the existing morbidity patterns as well as emergency health issues. The trainer should start the session from a public health aspect so that the continuity from earlier issues raised can be maintained. Thereafter, the session should progress to emergency situations and mass casualty management. The trainer should give an overview of MCM issues and then discuss preparedness planning strategies. Time permitting; participants can also be tasked to prepare an outline plan. The session can be divided into three major sections, as explained in the indicative session plan:

Contents	Trainers' Note	Duration
Urban Health scenario - Morbidity patterns due to urban decay and urban affluence - Impact of disasters on a vulnerable population - Lack of/Inadequate availability of health resources	Use a ppt to consolidate thoughts and ideas. Take inputs from participants	10 min
Health Emergencies during Disasters Disaster Impacts – physical and mental health Mass casualty management Post-disaster epidemic surveillance	Give a brief overview of MCM procedures, triaging, epidemiological and vector surveillance.	20 min
Preparedness Planning Preparedness planning strategies	This would deal with comprehensive planning for health emergencies. After a short outline by the trainer, participants can be divided into groups representing concerned sectors and prepare an outline plan.	30 min

***Note:** If time and scope permit, a brief demonstration of first-aid and basic CPR can be organised for about 30 minutes*

8. **Suggested Reference:**

WHO Report:[http://www.who.int/kobe\\_centre/publications/Health-systems-in-urban-disasters\\_2013/en/](http://www.who.int/kobe_centre/publications/Health-systems-in-urban-disasters_2013/en/)

## Notes

## Learning Unit 2.5: Climate Change and Urban Risks: Impact for Present and Future

### 1. Background

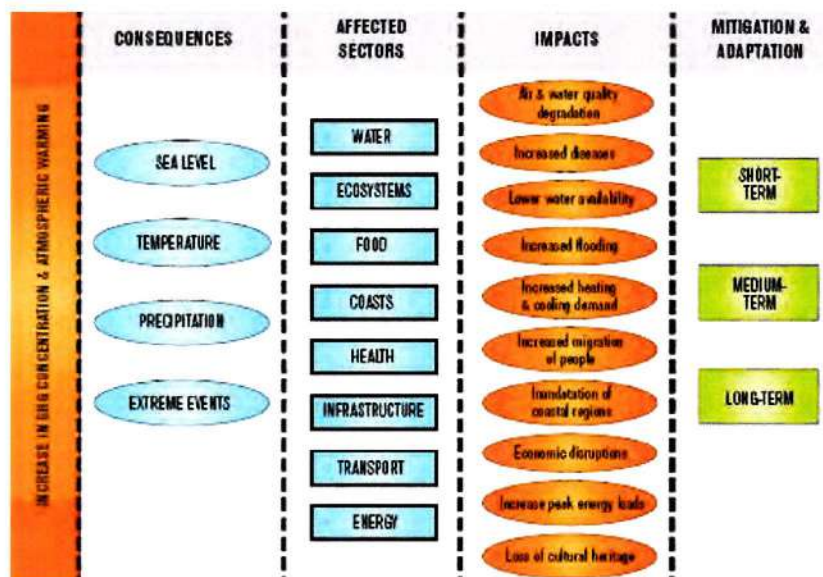
The impacts of changing climate no longer lie in the realms of probability but have become a reality. Changing seasons, extreme temperatures and rising sea levels have made it a challenge for policymakers. In addition to the inherent risks the cities have to also gear up for impacts of climate change in terms of extreme temperature phenomena, heat islands and inundation of lowlying coastal areas.

### 2. Description of the session

Climate change is a reality for the present, seen through unprecedented increases in global temperatures, change in the length and timing of seasons, and increasing ferocity of floods and cyclones. Out of the 3.3 billion people inhabiting the urban centres, 2.2 billion live in cities located within 100 Km of the coast.<sup>2</sup> The increasing threat of climate change has the characteristics of a system that is likely to generate possible disasters in the future. As per the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report 2014, *“over the period 1901–2009, the warming trend was particularly strong in the cold season between November and March, with an increase of 2.4°C in the midlatitude semiarid area of Asia.”*

Urban areas, where most of the people, resources and infrastructure are concentrated, are likely to face the most adverse impacts of climate change. Asia has a large—and rapidly expanding—proportion of the global urban exposure and vulnerability related to climate change hazards). In line with the rapid urban growth and sprawl in many parts of Asia, the periurban interface between urban and rural areas deserves particular attention when considering climate change vulnerability.

Climate change impacts manifest directly through visible disasters like increased number and intensity of extreme weather events such as heavy rainstorms (flooding), cyclones and typhoons and through invisible impacts on urban ecology, food supply and pricing resulting from shifting rainfall pattern. Invisible impacts of climate change manifest through urban drought and continuous stress on the water system. Significant health impacts in urban areas due to heat waves, vector- borne diseases would ultimately lead to economic impacts, especially as cities are centres of economic growth.



People living in low-lying coastal zones and flood plains are probably most at risk from climate change impacts in Asia. Half of Asia's urban population lives in these areas. Compounding the risk for coastal communities, Asia has more than 90% of the global population exposed to tropical cyclones. The impact of such storms, even if their frequency or severity remains the same, is magnified for low-lying and coastal zone communities because of rising sea level (medium confidence). Vulnerability of many island populations is also increasing due to climate change impacts. Settlements on unstable slopes or landslide-prone areas, common in some parts of Asia, face increased likelihood of rainfall-induced landslides (IPCC AR5). In such a scenario, a process of composite multi-hazard risk adaptation process should be taken up, focusing on the following:

- Temperature and precipitation variability
- Urban drought
- Flooding and extreme rainfall
- Cyclone and storm surge
- Sea-level rise
- Environmental health risk

The combined pressures of climate changes, increased urbanization and related issues together affect various sectors – mainly energy, transport, infrastructure, health, coasts, food, ecosystems, and water. Managing and climate proofing this growth, especially in terms of new construction of buildings and infrastructure to ensure resilience is a major challenge. Therefore, the potential action for building climate resilient cities should be both global and regional levels. At the local level, the action should concentrate on a three step risk management process

- **Assessment: Scenario**

Identify vulnerable communities and areas

- **Planning: Action Plan**

Municipal Adaptation Plan (MAP)

Municipal Mitigation Plan (MMP)

- **Implementation Actions**

Start small and gather momentum OR

Start big and scale down

In the context of the reality of changing climate patterns, DRR initiatives need to be integrated with climate change adaptations. Hotspot analysis, priority actions and local level initiatives will be the key for building climate resilient cities.

### 3. Learning objectives

At the end of the session, participants will be able to:

- Explain the relationship between climate change and disasters.
- Describe the impact of climate change and its implications on the cities
- Describe strategies to build climate resilient cities.

### 4. Duration: 60 min

### 5. Methodology

- PowerPoint Presentation
- Discussion

### 6. Teaching/Performance aids

5.1.1 Handouts/ session notes from the trainer

5.1.2 Case studies of best practices

5.1.3 Documentary Film: *An Inconvenient Truth* by Al Gore (optional, time permitting)

### 7. Trainers' Note & session Plan

The session has to be designed to focus on the link between climate change and urban DRR. The trainer should facilitate understanding of the relationship between climate changes leading to intensive risks that further lead to developmental implications. The trainer can design the session according to the felt-need and may include lecture, discussion and case study interpretations.

## 8. Suggested References

1. Asian Cities Climate Change Resilience Network (2009): Responding to the Urban Climate Challenge (can be downloaded from [http://www. preventionweb.net](http://www.preventionweb.net)).
2. ISDR (2008): Climate Resilient Cities 2008 Primer, Reducing Vulnerabilities to Climate Change Impacts and Strengthening Disaster Risk Management in East Asian Cities
3. World Bank (2011) Climate Change, Disaster Risk, and the Urban Poor Cities Building Resilience for a Changing World
4. IPCC Fifth Assessment Report (Available on: <https://www.ipcc.ch/report/ar5/>)

## Technical Session 3: Action Planning and Strategies for Urban DRR

Subsequent to the inputs on impact and issues, this module would deal with solutions for urban disaster risk reduction. While the previous module identifies various issues which have a direct bearing on urban safety and sustainability, this module deals with identifying strategies for the most prominent of urban disasters viz. earthquakes, floods and fire.

### 1. The module will be delivered through six learning units as follows:

Learning Unit 3.1: Mainstreaming Disaster Risk Reduction in Urban Development Policy and Governance

Learning Unit 3.2: Techno-legal Framework for Urban Risk Reduction

Learning Unit 3.3: Earthquake Risks: Mitigation Framework for Structural & Non- Structural Safety

Learning Unit 3.4: Urban Flooding

Learning Unit 3.5: Urban Fires

Learning Unit 3.6: Climate Change & Urban Risks

### 2. The primary objectives of the module would be to:

- Explain the process for mainstreaming of DRR in urban development and governance
- Describe the initiatives taken for providing techno-legal backup for mitigating urban risk
- Identify structural and non-structural mitigation strategies for earthquakes
- Examine the anthropogenic causes of urban floods and identify mitigation strategies
- Describe an urban flood case study and identify the lessons learnt from the disaster
- Identify major causes of fire in high density urban areas and describe the mitigation strategies

### 3. Duration: 320 mins.

### 4. Methodology

This module would take the trainee back to hard-core DRR issues and strategies and concentrate on specific disasters in an urban context. From the various issues and concerns raised in the previous module on urban risks, this module would attempt to collate all the inputs into concrete mitigation strategies. This module would be trainer-led, with more trainee participation as compared to the earlier module.

## 5. Trainer's Note

Coming mid-way into the training, this module would form the crux in giving inputs on mitigation strategies. Through this module, the training goes beyond raising risk issues to finding solutions to the issues and concerns and above all, integrating them into the broad mosaic of urban development. While delivering this module, the trainer should bear in mind the hazard vulnerability of the city of training and focus on the context of the city to make it more relevant to the participants. It should be delivered to enable participants to identify or some specific actions on their part for mitigation at the individual, household, community or professional level. The trainer should also facilitate peer-to-peer interaction for getting the best out of the session. The module could begin with the trainees recapitulating the key messages delivered to them in the previous sessions. At the end of the recapitulation, the trainer can collate all the messages and initiate discussion on the next stage (solutions) that many participants would be looking for.

## **Learning Unit 3.1: Mainstreaming Disaster Risk Reduction in Urban Development Policy & Governance**

### **1. Background**

Urban development initiatives form an important agenda for the government. With increasing urban population especially in developing countries the challenge of managing cities better to improve the quality of life and living standards assumes more and more importance. The government is an important stakeholder in disaster risk reduction process. In most cases, urban development and DRR initiatives run along parallel tracks, often leading to overlapping and duplication of efforts. Therefore, a comprehensive development process combining urban development as well as risk reduction initiatives is the need of the hour. This session will look at the urban development and DRR initiatives to understand how the two sectors can be combined and mainstreamed for a comprehensive development process.

### **2. Description of the session**

Three landmark events of 2015—the Sendai Framework on Disaster Risk Reduction 2015–2030, adopted at the Third World Conference on Disaster Reduction in March 2015, the 2030 Agenda for Sustainable Development, adopted by the United Nations General Assembly in September 2015, and the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), accepted by States in December 2015—have created new windows of opportunities for mainstreaming DRR within development.

The Sendai Framework has substantially expanded the scope of DRR to include natural hazards as well as human-made and all related environmental, technological and biological hazards and risks. It has broadened the task of mainstreaming to include the private sector, cultural heritage and tourism. It has advocated an all-of-society and whole-of-government approach for DRR. It has set seven global targets of risk reduction to be achieved by 2030 and prescribed 91 activities for DRR at all levels, clustered within four priorities for action.

The 2030 Agenda for Sustainable Development includes 17 Sustainable Development Goals (SDGs) that now replace the Millennium Development Goals. These goals, with 169 targets, cover every sector of development that concerns the economy, society and the environment. At least eight of the goals and their targets have elements of DRR and building resilience embedded within them. Reducing the risk of disasters across all these sectors is no longer a task of an agency responsible for DRM but of all sectors engaged in a society's development.

The Paris Agreement under the United Nations Framework on Climate Change has recognizes the importance of averting, minimizing and addressing loss and damage associated with the adverse

effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage. The Paris Agreement has undertaken to enhance “understanding, action and support” in eight areas of DRR. These are early warning systems; emergency preparedness; slow-onset events; events that may involve irreversible and permanent loss and damage; comprehensive risk assessment and management; risk insurance facilities, climate risk pooling and other insurance solutions; non-economic losses; and resilience of communities, livelihoods and ecosystems. This emphasis clearly implies that industrialized countries should provide the necessary support for reducing the risk of climate-related disasters, which account for more than 80 per cent of disasters in the world. It also implies that the opportunities for integrating DRR with Climate Change Adaptation (CCA) should be expanded.

In the Indian context, the Disaster Management Act, 2005 provides the overarching legislation for DRR and management of disasters. The DM Act has made it mandatory for every Ministry/Department at National and State level to prepare disaster management plans and integrate DRR in the ongoing development programmes and the same has been mandated in Gujarat State DM Act 2003. However, development and management of urban areas is assigned to the states according to the Indian Constitution. Therefore, state governments and urban local bodies are natural partners for DRR practices. The effort of mainstreaming should be to bring the DRR provisions into development practices in urban areas. Assessment of hazards, vulnerabilities and capacities at the micro-level help city administrators to identify the nature of interventions required for increasing public safety and to avert or minimize the casualties and losses.

The Constitution (74th Amendment) Act 1992, aimed at strengthening municipal governance in India broadly provided a framework for physical and economic development of urban areas through decentralized planning. Urban planning has therefore become the domain of the local bodies. Through CAA, a three tiered planning structure was put in place at the state level viz. a) Local Level planning by Panchayats and Municipalities, b) District Development Plan and Metropolitan Area Development Plan at the regional level, c) State Plans at State Levels. As the DM Act 2005 envisages preparation of comprehensive Disaster Management Plans at the District, State and national levels, and similar provisions are already available under the 74<sup>th</sup> CAA. Therefore, urban disaster risk reduction strategies can be laterally incorporated into the city and regional plans.

### 3. Objectives

At the end of the session the participants will be able to:

1. Understand and discuss the conceptual issues of disasters, development, nexus of disasters with development, DRR, sustainable development, the importance of DRR for sustainable development, the Sustainable Development Goals and how they relate to DRR

2. Discuss the strategic approach to mainstreaming DRR within sustainable development, the global and regional initiatives on mainstreaming DRR, the strategic framework of DRM and national and state level initiatives for mainstreaming DRR within development
3. Identify ways of mainstreaming DRR into urban development plans and programmes

#### **4. Duration:** 60 mins

#### **5. Methodology**

- Interactive Panel Discussion

#### **6. Teaching/Performance Aids**

- Handouts of SFDRR, COP21 and SDG's
- Handouts of 74th Constitutional Amendment Act, 1992
- Handout of DM Act 2005 and 2003
- Handout of Relief Manual

#### **7.Trainers' Note**

The session would be significant because almost all participants would identify with the development initiatives taken at the urban level as their work would be directly linked to these programmes, either in the planning or operational stages. There would be little requirement of describing the components of the programmes and policies, but the need would be to really connect the DRR components into existing programmes. Therefore, panelists for the session would be experts with practical experience of working in the urban development sector and DRR practitioners so that each can focus on identifying specific areas for mainstreaming. This would enable the participants to identify areas for integrating their learning within their spheres of work. The panel discussion has to be monitored by the trainer so that the required focus remains intact within the time frame. The last 15 minutes of the session could be utilized for an individual exercise to identify the mainstreaming option (s) and activities within his/her sphere of work. The session plan would depend on the specific areas of expertise of the panelists invited and the focus of the session. Maintaining an interactive mode among the panelists as well as the participants would make the session interesting and informative.

## Notes

## **Learning Unit 3.2:      Techno-legal Framework for Urban Risk Reduction**

### **1. Background**

The past earthquakes (Uttarkashi 1991, Latur 1993, Bhuj 2001 and Kashmir 2005) have clearly exposed the vulnerability of our building stock, which caused wide spread damage resulting in loss of lives and property. This is mainly due to faulty design and construction practices which do not follow earthquake resistant features specified in Indian Standards and Building Codes. To create an appropriate Techno-legal regime in the country and effective enforcement mechanism, the Ministry of Home Affairs, Government of India constituted an Expert Committee to develop Model Building Bye-laws and Review the existing Town and Country Planning Acts and develop Control Zoning Regulations/Building Bye-laws. There is a need to adopt a multi-dimensional endeavor involving diverse scientific, engineering, financial and social processes, the need to adopt multi-disciplinary and multi sectoral approach and incorporation of risk reduction in the developmental plans and strategy.

### **2. Description of the session**

National standards/codes on disaster resistant structures including the National Building Code of the country are second to none in technical contents. However, to make their use mandatory, proper enabling provisions are required in the legal framework of the country. Laws pertaining to planning, development and building construction are very important to achieve planned and safe development in urban and rural areas. Building standards/regulations are derived from various laws pertaining to planning and development of different states. They provide the mandatory techno-legal framework for regulating building activity from planning, design to completion of construction.

Building Regulations/Bye-laws provide the mandatory techno-legal framework for regulating building activity from planning, design to completion of construction. Mainly such laws are State Legislations as the State is competent to legislate and make laws on such subjects. However, where the Central Government is to legislate on such subjects and where Parliament is to make law in this behalf such legislations are applicable in the Union Territories and in the State such as Delhi, where land use are reserved subjects with Central Government. One such Central legislation is Delhi Development Act, 1957. For other States, such Central laws are advisory and recommendatory in nature. Taking this legislation as Model, other State Governments formulate the rules and regulations with the help of local bodies, under the various legislations. After the approval, the concerned local bodies enforce these rules and regulations pertaining to development and building standards as building regulations /building bye-laws in their respective areas. To regulate the growth of urban

areas, the State Governments notify areas for planned growth under certain laws. These are notified under relevant Planning and Development Act. State Governments formulate the rules and regulations with the help of the local bodies, under the various legislation. After the approval, the concerned local bodies enforce these rules and regulations pertaining to development and building standards as building regulation/building bye-laws in their respective areas.

Effective governance depends on the regulatory mechanisms prevalent in the system. In an urban context, these mechanisms include building byelaws, zoning regulations, guidelines and codes. Municipal governance is administered by these mechanisms, for ensuring public safety and equitable development.

National Building Code prepared by the Bureau of Indian Standards in 1970 and subsequent revisions are advisory in nature and not mandatory. The various provisions in the Code are framed by a panel of experts keeping other standards in view. It lays down a set of minimum provisions designed to protect the safety of the public with regard to structural sufficiency, fire hazards and health aspects in buildings. So long these basic requirements are made, the choice of materials, method of design and construction is left to the ingenuity of the architect and the engineers and other experts engaged in such projects. The code also covers aspects of administrative requirements and bye-laws including building services.

Model Town and Country Planning Act, 1960 The Town and Country Planning Organization (TCPO), which is an organisation of Central government to deal with the subject of planning (regional, urban and rural) and developmental policies, formulated a Model Town and Country Planning Act in the year 1960. The Model Act provides as follows: a. Provisions for preparation of comprehensive Master Plan for urban areas of various states. The states may adopt the Model legislation with suitable modifications for this purpose. b. To constitute a Board to advise and to coordinate in the matter of planning and plan formulation by the Local Planning Authorities in the State. c. Provisions for implementation and enforcement of the Master Plans and the miscellaneous provisions to achieve planned urban growth of various urban areas in the state. The above model was revised in 1985. The revised Model Regional and Town Planning and Development Law has largely been the basis for the enactment of comprehensive urban and regional planning legislation in the States and UTs. This model is in the nature of a guideline and is the outcome of several reviews and revisions undertaken on the recommendations of the State Ministers Conference held from time to time. The legality of this model has been confirmed by the Ministry of Law. With a view to ensuring better overseeing and coordination of planning with plan implementation, the Model Law which dealt with the planning aspect only has been reviewed and revised and now a combined planning and development law has been formulated in consultation with the concerned Central Government Ministries. Under this law, planning and plan

implementation have been combined together so that a single agency could undertake both these functions. To do this, the planning and development authority to be constituted under the Law has been equipped with full planning and development powers to discharge this task. A revised model for Urban & Regional Planning and Development law was brought out, and guidelines on Urban Development Plan Formulation and Implementation (UDPFI) have been formulated in 1991. This was again revised as the Urban and Regional Development Plans Formulation and Implementation (URDPFI) Guidelines by Ministry of Urban Development in 2015.

The planning and development are mainly the State subjects and therefore, the development in the States is based on the legislative support as applicable in that State. The legislative support in the state is applicable to formulate Master Plans, Zonal Plan, Development Plans and Development Schemes and for their implementation and enforcement

At the local level, the Municipal Authorities and Panchayat regulate the development/ construction of buildings through the building regulation/building bye-laws as followed in their respective areas. The State Government from time to time issues directions/guidelines for safety against natural hazards, which are followed by local bodies while granting permission for construction of buildings/structures.

The State Governments have based their legislation, regulation and bye-laws on the guidelines issued by Central Government. Post disaster studies of some of the devastating earthquakes like Uttarkashi Earthquake (M-6.6) in October 1991, Killari earthquake (M-6.3) 1993, Chamoli Earthquake (M-6.8) in March 1999 and Kutchch Earthquake (M-6.9) in January 2001 showed the need for planning and engineering intervention in development plan, design and construction of buildings to make them strong enough to withstand the impact of natural hazards and to impose restrictions on land use so that the exposure of the society to the hazard situation is avoided or minimized. Due to lack of adequate or no land use restrictions in the hazard prone areas in the town and country planning laws, Master Plan rules or bye-laws, cities tend to expand in all directions, occupying even most vulnerable areas resulting in vulnerability of more and more areas getting threatened by natural hazards. Realizing this an urgent need was felt for establishing a proper techno-legal regime through appropriate provisions for safety against natural hazards.

The Expert Committee constituted by the Ministry of Home Affairs studied the existing guidelines, Acts, Regulations, Development Control Rules and Bye-laws and prepared a Model Building Regulations to enable the States in Seismic Zones III, IV and V (based on M.M.Intensities VII, VIII and IX or more respectively) to adopt them for safety against natural hazards.

Some of the initiatives includes Recommendations for Amendment in Model Town & Country Planning Act, 1960 and Model Regional & Town Planning and Development Law, 1985; Regulations for Land Use Zoning for Natural Hazard Prone Areas and Additional provisions in Development Control Regulations/Bye-laws for Safety in Natural Hazard Prone Areas.

### **Case Study: Strengthening of the Regulatory System for Safe Construction after Gujarat Earthquake**

During the 26<sup>th</sup> January 2001 earthquake, massive damage was observed in the epicentral region, several villages experienced 100% destruction to houses, all of which were made from local materials and had poor earthquake resistance. Only 10% of the structures in Kutch are engineered constructions but most of them do not comply with Indian Standard code provisions. During this earthquake, a very large number of engineered structures including those made out of reinforced concrete also suffered catastrophic collapse resulting in high casualty.

Inadequate design and construction technology can be attributed as reasons for the same. Owing to this, GSDMA conducted a study on “Review of Building Codes and Preparation of Handbook and Commentary”. GSDMA undertook this study through Indian Institute of Technology, Kanpur (IITK). The study identified the inadequacies in the existing BIS codes related to Earthquake, Wind and Fire and recommended changes/ improvements in the above codes to ensure hazard resistant building construction with specific reference to earthquakes, cyclones and fire.

The study also proved to be helpful in strengthening of existing codes and placed better understanding within the engineering community of the code provisions, strengthening the built environment against natural hazards, fire accidents etc. The revisions of building codes will be helpful in upgradations of General Development Control Regulations (GDCR) in Gujarat. GSDMA also undertook publication and distribution of handbooks and commentaries so as to disseminate information to the practicing engineers and the engineering associations in Gujarat.

For a wider dissemination of the revised building codes amongst the prospective users, soft copy of all the reports and guidelines are uploaded in the website of National Information Centre of Earthquake Engineering (NICEE) at Indian Institute of Technology Kanpur (IIT Kanpur). NICEE works to collect and maintain information resources/publication on earthquake engineering and make them available to interested users, as well as to undertake other outreach activities with a view to mitigate earthquake disaster.

(Source: [http://www.nicee.org/IITK-GSDMA\\_Codes.php](http://www.nicee.org/IITK-GSDMA_Codes.php))

### **3. Learning Objectives**

At the end of the session, the participants will be able to:

1. Describe the need for techno-legal backup and other enabling mechanisms for urban development.
2. Describe the major techno-legal instruments available for safe urban development
3. Describe the recent initiatives and their implications on the urban risk scenario.

### **4. Duration:** 45 min

### **5. Methodology**

- Interactive Panel Discussion

## 6. Teaching/Performance Aids

- Handouts of NDMA Guidelines, BMTPC techno-legal regime document.
- Review of Building Codes and Preparation of Handbook and Commentary

## 7. Trainers' Note & Session Plan

The session should be organized in continuity with the preceding session, dealing with specific interventions for mainstreaming. It will be analytical, in terms of examining the extent to which the regulatory mechanisms promote safe development. An indicative session plan is given below:

Contents	Trainers' Note	Duration
Techno-legal Regime	Use a ppt to consolidate	10 min
What is techno-legal regime?	thoughts and ideas. Take	
How does it promote urban development?	inputs from participants	
Regulatory mechanisms	Give a brief overview of the	20 min
NBC	mechanisms in place	
Bye-laws and codes Guidelines		
Programmes		
New Initiatives Model bye-laws	Give a brief overview	15 min
MPD 2021	followed by discussion	
	on the session.	

## Notes

## **Learning Unit 3.3: Earthquake Risks: Mitigation Framework for Structural and Non- Structural Safety**

### **1. Context/ Background**

Gujarat is located in the “Himalayan Collision Zone”-where Indo-Australian tectonic plate slides under Eurasian plate-causing active fault lines beneath. The proportion of area in Gujarat that falls into these (MSK Intensity Scale) zones is as follows:

- Very High Risk: >MSK IX (19 percent)
- High: MSK VIII (13 percent)
- Moderate: MSK VII (66 percent)
- Low Damage: <= MSK VI (1 percent)
- Kutch District located in Very High Risk Seismic Zone – V.
- Parts of Jamnagar, Rajkot, Patan and Banaskantha in High Risk Zone – IV.
- Most other parts of the State lie in Moderate Zone - III and a very small part in Low Damage Zone – II.

Earthquake risk is very high in Gujarat and the State has suffered major earthquakes in - 1819, 1845, 1847, 1848, 1864, 1903, 1938, 1956 & 2001 (9 times in past 200 years). The 2001 Kachchh earthquake was the third largest and second most destructive earthquake in India over the last two centuries.

### **2. Description of the session**

The Earthquake Vulnerability Atlas of India reveals that 19% of the total area in Gujarat is at a very high risk for earthquake, i.e. seismic zone V. Another 13% area of the State is at a high risk for earthquake, i.e. seismic zone IV (details given in the Technical Session 1). As such, Gujarat State has a long history of earthquakes and in the recent past, it witnessed a major earthquake (6.9 on Richter scale) which had caused widespread loss of human lives and property (Source: GSDMA). In the recent past, most cities in the state have witnessed the phenomenal growth of multi-storied buildings, super malls, luxury apartments and social infrastructure as a part of the process of development. The rapid expansion of the built environment in moderate or high-risk cities makes it imperative to incorporate seismic risk reduction strategies in various aspects of urban planning and construction of new structures.

The Bhuj earthquake of 2001 caused widespread damage and destruction not only to residential buildings but also to government buildings, public infrastructure and to buildings housing industrial enterprises in more than 7,900 villages in 21 districts of Gujarat. The severe economic losses caused by the Gujarat earthquake were not only restricted to the local economy but also influenced the savings and investment patterns and stock market behavior.

In most earthquakes, the collapse of structures like houses, schools, hospitals and public buildings results in the widespread loss of lives and damage. Earthquakes also destroy public infrastructure like roads, dams and bridges, as well as public utilities like power and water supply installations. Past earthquakes show that over 95 per cent of the lives lost were due to the collapse of buildings that were not earthquake-resistant. Though there are building codes and other regulations which make it mandatory that all structures in earthquake-prone areas in the country must be built in accordance with earthquake-resistant construction techniques, new constructions often overlook strict compliance to such regulations and building codes. All new construction will be made to comply with earthquake-resistant building codes and the modified techno-legal regime, which includes the revised town planning bye-laws, land use zoning, Development Control Regulations (DCRs) and building codes.

Structural elements of a building act as a skeleton to support the rest of the building, and include the foundation, load-bearing walls, beams, columns, floor system, and roof system as well as the connections between these elements. A failure of one or more of these structural elements can lead to a collapse of the entire building. Similarly, for bridges and other non-building structures, structural elements are those elements that support or hold up the structure.

Non-structural elements are those elements that will not cause a building or structure to collapse if they fail. These elements rely on structural elements for support, and include exterior elements, interior elements, building utilities, and contents. A breakdown of these elements is listed below: 1. Exterior elements include parapets, chimneys, exterior facing, windows, and doors; 2. Interior elements include non-load bearing interior walls, partition walls, suspended ceilings, lights, and raised computer floors; 3. Building utilities include electrical, mechanical, and plumbing equipment, cables, pipes, ducts and connections for heating, ventilation, and air conditioning (HVAC), electricity, gas, water, wastewater, communications and elevator systems; and 4. Building contents include all furnishings and equipment such as tables, chairs, bookcases, file cabinets, cubicle wall partitions, computers, or wall hangings.

One of the most challenging tasks in earthquake preparedness and mitigation is the sensitisation of all stakeholders to the prevalent seismic risk, and educating and training them to participate in earthquake preparedness and mitigation efforts. If the community recognises the importance of incorporating seismic safety measures in the construction of residential buildings, tremendous gains can be achieved in earthquake mitigation.

Training artisans in specialised skills is a critical step in ensuring proper quality control in earthquake-resistant construction of all structures. Both in class training and on field training will be undertaken for the artisans involved in different trades including masons, bar benders, welders, carpenters, plumbers and electricians.

### ***Patanka New Life (PNY) Plan***

After the Gujarat earthquake of January 2001, PNY was initiated as joint initiative of diverse organizations including government, non-government, academics and international organizations for community based effective rehabilitation. The aim of the initiative was to train and empower local masons and communities with proper earthquake-safer technologies focusing on local tradition and culture. Emphasis was to ensure confidence building and long-term use of traditional technologies. There were two major components of the initiative: one construction and rehabilitation of model village, and training and confidence building of communities through shake-table demonstration testing. The characteristic feature of the initiative was to focus on the holistic approach of the rehabilitation including livelihood. The initiative was successful, especially in terms of community involvement and ownership. The initiative was considered a successful model for sustainable community recovery. The PNY was conceived as a model program right from its inception stage. It sought to empower the affected community to the extent that they are sufficiently resilient against future disasters.

### **3. Objectives**

At the end of the session, the participants will be able to:

- Discuss earthquake risks to various types of structures
- Discuss the methodology for assessment of risk to buildings
- Explain the structural and non- structural safety features that should be adopted for earthquake resistant buildings
- Describe case studies of earthquake reconstruction

### **4. Duration:** 60 min

### **5. Methodology**

- Interactive Lecture - Case Studies (Gujarat, Kobe) - Short Films - Experience sharing with participants

### **6. Teaching/Performance Aids**

- Handouts of relevant sections of the National Building Code
- Housing vulnerability data from the Vulnerability Atlas of India
- Non-Structural Risk Reduction Handbook for Schools

### **7. Trainers' Note & Session Plan**

In the context of earthquake vulnerability of a large part of the country, this session is very crucial as it

discusses mitigation strategies. The session should be geared towards meeting the training needs of the construction professionals as well as the policy-makers who are participating. The session has to be designed so that technical aspects of risk reduction can be followed by non-technical participants also. The session should include case studies on innovative design and construction practices, especially on traditional earthquake resistant structures. The session can be divided into three major sections, as explained in the indicative session plan:

## Learning Unit 3.4: Urban Flooding

### 1. Background

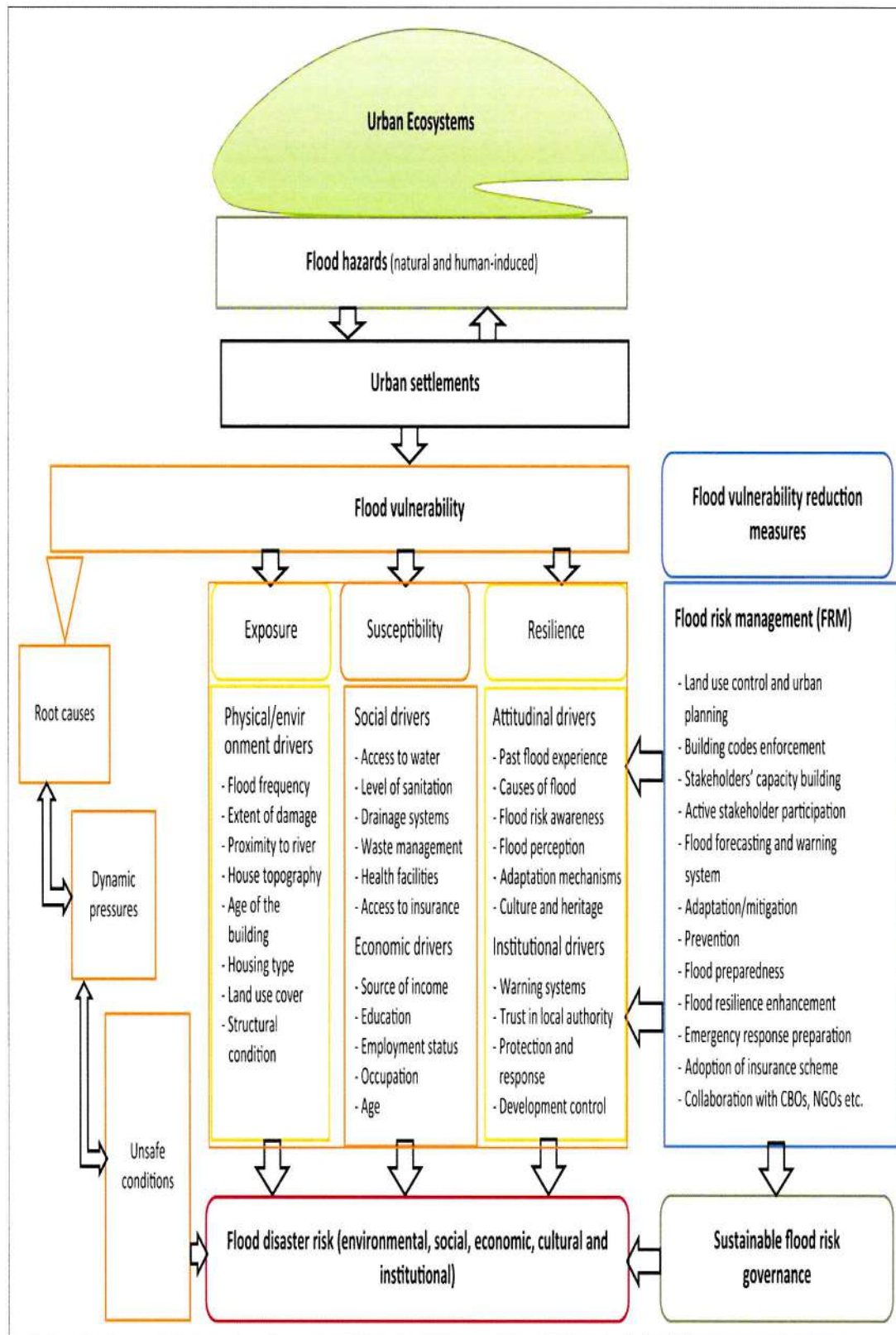
Urban areas are centres of economic activities with vital infrastructure which needs to be protected 24x7. In most of the cities, damage to vital infrastructure has a bearing not only locally but could even have global implications. They are also densely populated and people living in vulnerable areas, both rich and poor, suffer due to flooding. It has sometimes resulted in loss of life, damage to property and disruptions in transport and power, bringing life to a grinding halt, causing untold misery and hardships. Even the secondary effects of possible epidemics and exposure to infection takes further toll in terms of loss of livelihood, human suffering, and, in extreme cases, loss of life. Therefore, management of urban flooding has to be accorded top priority. Increasing trend of urban flooding is a universal phenomenon and poses a great challenge to urban planners the world over. Problems associated with urban floods range from relatively localised incidents to major incidents, resulting in cities being inundated from a few hours to several days. Therefore, the impact can also be widespread, including temporary relocation of people, damage to civic amenities, deterioration of water quality and risk of epidemics.

### 2. Description of the session

Urban flooding is significantly different from rural flooding as urbanisation leads to developed catchments which increases the flood peaks from 1.8 to 8 times and flood volumes by up to 6 times. Consequently, flooding occurs very quickly due to faster flow times, sometimes in a matter of minutes. 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. 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.

However, urban flooding results from both natural and anthropogenic factors. As undeveloped land is paved for construction, it loses its ability to absorb rainfall. Rain water cannot be absorbed into the ground and becomes runoff, filling low-lying areas, making roads into rivers, and flooding basements and businesses. The direct consequences of urbanization are often urban flooding during rains and water scarcity during the dry season. While construction and paving hinders absorption of rainwater and causes run-off leading to flooding, the underground aquifers are not replenished, resulting in acute water shortage during lean season. Mitigation of urban flooding therefore implies mitigation of the urban water shortage problem. Urban floods are thus a development issue, aggravated by lack of spatial planning and foresight, uncontrolled development, governmental apathy and lack of a monitoring mechanism, awareness & sensitivity of citizens, pressure on limited civic amenities

leading to overexploitation of resources, deforestation and filling up of natural catchment and reservoirs. While risk-sensitive development is imperative, the role of individual citizens in apparently unrelated efforts like rainwater harvesting, waste segregation, recycling of waste etc would be significant mitigation measures from urban floods and also water scarcity.



Source: Adopted from Birkmann (2006a); Chambers (1989); Jean-Baptiste et al. (2013); Vojinović (2015) and Wisner et al. (2004)

The flood vulnerability assessment: conceptual framework

The management of urban flooding is an emerging subject, and as such it has to be treated holistically in a multi-disciplinary manner. There are many issues that need to be considered in order to develop sound, reliable and most representative urban flood/disaster management strategies. A significant part of this management framework is dependent upon the use of science and technology for improved monitoring, modeling/ forecasting and decision-support systems. One way of improving the preparedness for urban flooding is by setting up a vulnerability-based geospatial framework to generate and analyse different scenarios. This will help in identifying and planning for the most effective/ appropriate actions in a dynamic way to incorporate day-to-day changes that take place in urban areas, having the potential to alter the prevailing vulnerability profile.

### 3. Objectives

At the end of the session, the participants will be able to:

- Describe characteristics of urban flooding
- Discuss the anthropogenic causes of urban flooding
- Discuss the relation between risk sensitive development and disaster safety.
- Compare the lessons learnt through case studies of urban floods.

### 4. Duration: 75 min

### 5. Methodology

- Interactive Lecture
- Case Studies
- Group Exercise

### 6. Teaching/Performance Aids

Handouts/ session notes on Urban flooding case studies

### 7. Trainers' Note & Session Plan

This session is significant because this is the first time in the course of the programme, the issue of urban flooding is taken up. In the span of 75 minutes, the issue has to be explained, along with a case study and a short exercise. Therefore, the session should be designed as a crisp, to-the-point presentation of issues, with a focus on the close relationship between disasters and development. The case study should be objectively dealt with to bring out the underlying issues related to the flood, rather than a description of the event.

In this context, the session can be divided into three major sections, as explained in the indicative plan:

Contents	Trainers' Note	Duration
Analogy of Urban Flooding Urban Floods – Causes and Implications Impacts of urban flooding	Use a ppt to consolidate knowledge of urban floods and its impact	20 min
Case Studies Banaskantha/ Amreli Floods 2017/ 2015 Chennai Floods 2015 Surat Floods 2006 Any other	Powerpoint presentation in a lecture and discussion mode	40 min
Group Exercise/ Group Discussion	Community/individual level actions for water conservation and optimal usage	15 min

## Learning Unit 3.5: Urban Fires

### 1. Background

India's cities – big and small, in the north and south – are sitting around a bonfire of regulations, basic tenets of urban planning and precious human lives. There is a close correlation between deaths due to fire-related accidents and population density associated with urbanisation. Recent and earlier fire incidents have clearly demonstrated the need to reduce the vulnerabilities towards the hazard. The Mayapuri incident in our country is a very recent example of what can happen if a radiological device gets damaged. We need to examine whether our fire services of cities have the capability to respond in a fire incident when radiological equipment has got damaged.

Further, Gujarat is one of the most industrialized states in the country and known for its large concentration of chemical industries, particularly, in a stretch of 400 kilometres from Ahmedabad to Vapi, known as the 'Golden Corridor'. The fast pace of industrialization in Gujarat with the extensive use of hazardous materials/ chemicals and increased construction of multi-storied buildings, especially in urban areas has enhanced the risks due to fire accidents. Many of these factories are located near to the urban settlements and bring to the fore the great risks from urban fires. Ahmedabad Fire and Emergency Services (AFES), receive about 3500 fire and Emergency Rescue related calls every year for the areas under their jurisdiction (CFO, AFES) which poses great danger to lives and property and the need for preventive action.

### 2. Description of the Session

Fires are perhaps the most frequent disaster in urban areas. Urban issues like high population, overcrowding, unregulated commercial activities are frequently responsible for urban fires. In cities like Ahmedabad and Surat, population density in some areas often very high. Fire has emerged as critical issue in Urban Planning due to rising frequency of Fire accidents, leading to huge losses of life & property. Fires can occur with the same ferocity in residential buildings, slums and squatter settlements, public places like auditoria, cinema halls, shopping malls, LPG godowns/petrol pumps, industries, chemical handling units, etc. Direct and indirect losses due to fire in Gujarat is also very high. The primary causes of fire are carelessness and apathy that ignite the initial spark of a conflagration.

The number of city fires in a year has multiplied by 10 times in the last three decades. Haphazard growth of the city, proliferation of slums, and fragile infrastructure aggravates the situation. In a building, fires are primarily due to electrical short-circuiting, overloading, improper earthing, tripping, failures of fittings, improper use of inflammable gases etc. In slums and squatter settlements, closely packed construction, construction with inflammable materials, narrow, winding lanes inhibiting access to fire engines, unauthorized tapped electrical connections, stocking of highly

flammable and toxic scrap material, loose or unsafe wiring are major causes of fires. In old residential areas, encroachment, household industries dealing with flammable materials, narrow roads result in fires, while unsafe handling of flammable substances, non-adherence to safety norms like use of mobile phones etc are major causes of fires in petrol pumps/gas stations.

### 3. Objectives

At the end of the session, the participants will be able to:

- Describe the causes and extent of fire risks in urban areas through case studies.
- Explain the mitigation measures for reducing fire risks.
- List the preparedness actions to be taken for urban fires.
- Demonstrate the basic firefighting techniques for household fires.

### 4. Duration: 80 min (40 min lecture and discussion + 40 min demonstration)

### 5. Methodology

- Interactive Lecture
- Case Study presentations
- Demonstration of Fire Fighting Techniques/Basic Fire Drill

### 6. Teaching/Performance Aids

- Do's and don'ts of fire prevention in households
- Firefighting equipment for demonstration

### 7. Trainers' Note & Session Plan

Given the high risk from fires in urban areas and the urban-centric participation, this session is significant not only because it provides an overview of the fire risks, but also enhances individual life skills through the demonstration. While the first half of the session should be spent on an overview of the fire risks and case studies of major fire occurrences, the demonstration by fire service personnel would augment and refresh the existing skills of the participants. A prior request to the city's Fire Service is generally adequate to organize this demonstration. In addition to demonstrating simple fire-fighting skills, some of the state-of-the-art technologies acquired by city Fire Services can also be showcased and explained.

In this context, the session can be divided into four major sections, as explained in the indicative plan:

Contents	Trainers' Note	Duration
Urban Fires: Causes and Consequences Cause & Effect Urbanization and Fire Risks	Use a ppt or a short film, if available	15 min
Fire Case Studies Kumbhakonam School Fire Dabwali/Uphar Cinema Fire Great London Fire	Powerpoint presentation in a lecture and discussion mode	10 min
Prevention & Mitigation of Fire Risks Residential Structures Industrial Units Cinema halls/malls etc	Powerpoint presentation in a lecture and discussion mode	15 min
Demonstration/ Fire Drill	Fire Service Professionals	40 min

## Notes

## Learning Unit 3.6: Climate Change and Urban Risks

### 1. Background

The impacts of changing climate no longer lie in the realms of probability but have become a reality. Changing seasons, extreme temperatures and rising sea levels have made it a challenge for policymakers. In addition to the inherent risks the cities have to also gear up for impacts of climate change in terms of extreme temperature phenomena, heat islands and inundation of lowlying coastal areas.

### 2. Description of the Session

Climate change is a reality for the present, seen through unprecedented increases in global temperatures, change in the length and timing of seasons, and increasing ferocity of floods and cyclones. Out of the 3.3 billion people inhabiting the urban centres, 2.2 billion live in cities located within 100 Km of the coast.<sup>2</sup> The increasing threat of climate change has the characteristics of a system that is likely to generate possible disasters in the future. The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report 2007 predicts a rise in world temperatures between 1.1 and 6.4°C and a corresponding rise of sea levels from 18 to 59 cm. The East Asia region is expected to face the brunt of climate change. Urban areas, where most of the people, resources and infrastructure are concentrated, are likely to face the most adverse impacts of climate change. The East Asia Pacific Region shows one of the fastest growing urban populations in the world and projected to nearly double from 2000 to 2030, from 665 million to 1.2 billion people. As centres of economic activities, cities would, in the near future, be affected by climate change impacts. Climate change impacts manifest directly through visible disasters like increased number and intensity of extreme weather events such as heavy rainstorms (flooding), cyclones and typhoons and through invisible impacts on urban ecology, food supply and pricing resulting from shifting rainfall pattern. Invisible impacts of climate change manifest through urban drought and continuous stress on the water system. Significant health impacts in urban areas due to heat waves, vector borne diseases would ultimately lead to economic impacts, especially as cities are centres of economic growth.

Urbanized coastal areas are under greater risk because of the sheer number of people and livelihoods they support. The Low Elevation Coastal Zone (less than 10 m elevation) has less than 2% of the world's land but supports 10% of its population. In such a scenario, a process of composite multi-hazard risk adaptation process should be taken up, focusing on the following:

- Temperature and precipitation variability
- Urban drought
- Flooding and extreme rainfall
- Cyclone and storm surge
- Sea-level rise
- Environmental health risk

The combined pressures of climate changes, increased urbanization and related issues together affect various sectors – mainly energy, transport, infrastructure, health, coasts, food, ecosystems, and water. Managing and climate proofing this growth, especially in terms of new construction of buildings and infrastructure to ensure resilience is a major challenge. Therefore, the potential action for building climate resilient cities should be both global and regional levels. At the local level, the action should concentrate on a three step risk management process:

- **Assessment: Scenario**

- o Identify vulnerable communities and areas

- **Planning: Action Plan**

- o Municipal Adaptation Plan (MAP)
- o Municipal Mitigation Plan (MMP)

- **Implementation Actions**

- o Start small and gather momentum OR
- o Start big and scale down

In the context of the reality of changing climate patterns, DRR initiatives need to be integrated with climate change adaptations. Hotspot analysis, priority actions and local level initiatives will be the key for building climate resilient cities.

### 3. Objectives

At the end of the session, the participants will be able to:

- Explain the relationship between climate change and disasters.
- Describe the impact of climate change and its implication on cities.
- Describe strategies to build climate resilient cities.

### 4. Duration: 60 min

### 5. Methodology

- Power-point presentations
- Discussion

## 6. Teaching/Performance Aids

- Case studies of best practices
- Documentary film, if time permits

## 7. Trainers' Note & Session Plan

Given the high risk The session has to be designed to focus on the link between climate change and urban DRR. The trainer should facilitate understanding of the relationship between climate changes leading to intensive risks that further lead to developmental implications. The trainer can design the session according to the felt-need and may include lecture, discussion and case study interpretations.

In this context, the session can be divided into four major sections, as explained in the indicative plan:

Contents	Trainers' Note	Duration
Explain the concept of climate change	Use a ppt or a short film, if available	15 min
Explain the effect of climate change on civilization at large: Case study of Tuvalu	Powerpoint presentation in a lecture and discussion mode	10 min
Discuss the Action Plans on Climate Change	Powerpoint presentation in a lecture and discussion mode	15 min
An Inconvenient Truth	Documentary Film	30 min

## Notes

## Technical Session 4: Testing Reality

This module takes the learner from the realm of theory to that of practice. Designed entirely as a field based exercise, this module encourages the participant to use the knowledge gained from the first three modules into practical action. It is also expected that the field exposure would enable the participants to look at urban elements from a “disaster eye” i.e from the perspectives of hazard, risks and vulnerability of structures, people and networks. While the city observation study will give a real-time feel of the class-room based inputs, the subsequent exercise based on the surveyed area will help in enhancing the application skills in terms of devising mitigation strategies, preparedness plans and other interventions.

### 1. The module will be delivered through two learning units:

Learning Unit 4.1: City Observation Study: Identifying Risks

Learning Unit 4.2: Risk Assessment and Mitigation Strategies

### 2. The primary objectives of the module would be to:

- Apply knowledge gained in ground
- Develop analytical skills for problem solving
- Prepare a mitigation strategy for study area

### 3. Duration: 420 mins. preferably completed in 1 day.

### 4. Methodology

This module would not only take the trainee from a class-room centric and trainer centric inputs to a trainee-centric and practical, hands-on approach, but also help in developing skills for real-time application. For the field study, the participants will be divided into teams (4-5 persons per team) and each team given a specific area, along with a map for the survey and study. They will then be dropped at the designated locations and given about 4 hours for reconnaissance survey, vulnerability and risk identification and community interaction. On their return, they sit together in a group for risk analysis and preparation of risk mitigation strategies. At the end of the exercise, the findings are presented to the plenary and discussed. The entire process would have to be moderated by the trainer.

### 5. Trainers' Note

The trainer should identify few areas with elements of high urban risks and prepare maps and sketches for distribution to the teams. The study areas may be identified on the basis of predominant land use (residential, commercial, institutional etc) or on urban characteristics (historic city core, regularized colonies, squatter settlements etc) or any other relevant parameter. However, the sites should not be too far from the training venue, so that the commuting time gets saved. The module

should begin with a briefing by the trainer as to the objectives, methodology to be followed and the expectations of the participants. The trainer may also like to give a brief introduction of the study areas as an introduction. At the end of the presentation and discussion, the trainer could summarize the main points for an overall understanding. The entire module is designed as participant-led, with the trainer acting as a facilitator and moderator.

## Learning Unit 4.1: City Observation Study: Identifying Risks

### 1. Background

Most urban areas are replete with elements at risk, ranging from unauthorized extensions of buildings, open wires, encroachment to pollution and waste management. Looking at a city and identifying risks is the initial step in finding solutions. This exercise is aimed towards giving a feel of the urban environment of some select areas of a city with its inherent complications and problems and looking at these areas from a disaster manager's point of view.

### 2. Objectives

At the end of the session, the participants will be able to:

- Identify the complex risks in urban setting (Hazard, Vulnerability, Capacity)
- Identify the causal and aggravating factors for the risks present in the study area
- Describe people's perception of the hazard and their efforts at mitigation

### 3. Duration: 240 mins

### 4. Methodology

According to the number of participants, few probable study sites will have to be identified and reconnoitered. The final selection will depend on variation of urban characteristics, traveling distance from the training venue, convenience of the training team and safety and security of the participants. Before leaving for the field, the trainer should brief the participants about the requirements of the study and the methodology to be followed. An indicative exercise methodology is given below; however, the trainer is free to devise her/his own exercise.

#### Step 1

##### Risk Register

- Observations of problems / phenomena
- Location
- Possible Causes / Sources
- Potential Impact

#### Step 2

- Identify a broad future course of action from
- Government
- Community

#### Step 3

- What is the group's impression about risks that are aggravated by human actions?

### 5. Teaching/Performance Aids

- City Maps (Google maps)
- Introductory Note on the Study Area

## 6. Trainers' Note

In forming the teams, random selection is advisable; however, in case of teams composed of out-station participants, the trainer can depute one local participant with each group, as per his/her discretion. Alternatively, the trainer can join each group at regular intervals and facilitate the study (this will be possible if the study sites are not too far from each other). In order to retain focus for the study, the teams should be closely monitored by the training team and guided towards achieving the objectives.

## Learning Unit 4.2: Risk Assessment and Mitigation Strategies

### 1. Background

The information collected from various sources during a field study need to be collated and put together to arrive at solutions. A field study enriches not only through data and information, but also observation of the participant. This session will help to collate and analyse the information, discuss with other group members and come up with a presentation on risks, vulnerability and mitigation strategies.

### 2. Objectives

At the end of the session, the participants will be able to:

- Identify and assess the disaster risks in the study area.
- Formulate a risk mitigation strategy for the area

### 3. Duration: 180 min

### 4. Methodology

After returning from the field trip, the participants should sit together in groups and discuss their findings in terms of risk and vulnerability assessment of the area. Subsequently, they should use the assessment as a base to formulate mitigation strategies. Each group should then select a presenter among the group and present their findings to the plenary. The groups should be encouraged to prepare their presentations either on power-point or flip charts or any other training aid to make the session interesting.

### 5. Teaching/Performance Aids

-Flip charts/markers/ computers/OHPs as required.

### 6. Trainers' Note

The trainer should facilitate the groups to discuss and prepare the presentations. The trainer can move from group to group clearing doubts and concerns and helping participants to prepare their mitigation strategies. The idea is to see how far the participants are able to apply the knowledge gained in the preceding modules to real-time situations. The emphasis should be more on the application and less on the presentation skills.

## Notes

## Technical Session 5: Resilient Cities Framework

The concluding module is aimed towards looking at the emerging scenario in terms of measures for safer urban development. The future of cities and that of humankind will have to be looked through the prism of community participation, technology enabled governance approach and extreme climatic events. Cities therefore will have to be planned to cope with the existing as well as emerging risks. This module will encapsulate the expected risks and some of the innovations for risk reduction.

This module will essentially consist of 4 learning units, of which 3 would focus on resilient cities while the concluding unit would deal with the closing of the training through post-training evaluation and closing formalities.

### 1. The Module will be Delivered through two learning units.

Learning Unit 5.1: Climate Change & Cities

Learning Unit 5.2: Technology and Innovations for Urban Sustainability

Learning Unit 5.3: Framework for Resilient Cities

### 2. The primary objectives of the module would be to:

- To understand the role of cities in addressing climate change both as part of a solution as well as building resilience against the impacts of climate change in the local and global context.
- Explain the uses of technology and modern innovations for reducing disaster risk and promoting urban sustainability.
- Discuss a framework for urban risk reduction
- Evaluate the quality of training imparted through the program

### 3. Duration: 180 mins

### 4. Methodology

The concluding module should be imparted in concise sessions, with the aim of building on the earlier sessions and focusing on urban resilience and sustainability. Therefore, it needs a judicious mixture of theoretical inputs on issues like Smart cities, green buildings etc and a participant-oriented discussion on a framework including actions at policy level, city governance level and community level so that there is a synergic effort towards urban resilience. The technical sessions should be taken up in a discussion mode to bring out the ideas through knowledge gained over the past sessions. It is also important to leave the sessions a little open-ended so that continuous addition of the knowledge base can take place even after the training is officially over. The idea would be to create the requisite interest on the subject so much so that it becomes a process of learning, from a one-time training activity.

## 5. Trainers' Note

Being the concluding module, it has to be delivered to retain the interest of the participant until the end. Through this module, the trainer will have to collate the inputs from the earlier modules, reiterate the underlying messages and take the course on to the next level. The challenge therefore would be to provide a conclusion to the entire course, while leaving the options open for a more advanced level training in future. The closing session should be devoted to the evaluation of training, either through formal or informal methods. The trainer can use either a structured proforma or use an unstructured discussion session to evaluate the programme. Evaluation is important for further improvement and future sustainability of the training.

## Learning Unit 5.1: Climate Change and Cities

### 1. Background

Urban areas are both greatly affected by the impacts of climate change and major contributors to the emission of greenhouse gases. Urban adaptation and mitigation therefore provide significant opportunities, with cities having a key role to play in addressing climate change.

Urban areas are responsible for up to 70% of global anthropogenic greenhouse gas emissions, of which the largest source is related to fossil fuel consumption. An important step in analysing the greenhouse gas emissions of cities is the development and use of standardised methodologies. Such methodologies enable comparability between cities and give information on the contribution of cities to national emissions levels and targets. Cities are increasingly taking action by setting city-level targets for emissions reduction or for other contributing measures such as increasing the use of renewable energy technologies.

More than half of the world's population currently live in urban areas, and urbanisation is one of the key trends of this century. Urbanisation is expected to continue with around 60% of world population living in cities in 2030. At the same time, many of the key and emerging climate risks, such as sea level rise or extreme weather events, are affecting cities, in particular informal settlements in developing country cities. Urban climate change-related risks are likely to increase and will impact on infrastructure, ecosystems, housing, service delivery, as well as the livelihoods and health of urban communities. Urban adaptation will therefore continue increasing in importance.

This is especially relevant for India since it is set to witness immense urbanisation in the coming years with projections indicating that the urban population in the country would rise at a fast pace from 377 million in 2011 to 609 million in 2030. The major impacts of climate change on cities will be caused by floods, water scarcity, and increased morbidity and mortality due to increasingly severe hot and cold periods. Low-lying and densely populated coastal cities such as Surat are likely to face additional stress from sea level rise and increased cyclonic storms frequency. Climate change has affected the intensity and frequency of these natural hazards over the last decades, whereas the large growth of population and its migration in urban areas has led to greater vulnerability of the cities. These would further disrupt urban economies and exaggerate the problems related to rapid urbanisation such as water scarcity, disruptions in water supply systems, health impacts (heat stress and higher incidence of vector borne diseases), and increased energy demands.

The inclusion of cities at the Lima Paris Action Agenda (LPAA) at COP21 in Paris and the Sustainable Development Goals (SDGs) has demonstrated the recognition of cities as global

solution hotspots with the capability to contribute proactively to each country's climate action targets. To build on the momentum, there is a need for increased support and capacity building for cities in creating or scaling up their climate goals by addressing the barriers for the integration of a climate focus into the cities' policies, action plans and urban planning. Issues such as lack of awareness and capacity often hamper the ability of cities to explore their potential for efficiency and innovation. The environment for city level action on climate created globally needs to be replicated at the national level to enable Indian cities to be agents for transformational change and key contributors to the realization of the national climate goals.

## 2. Description of the session

This session was aimed at understanding the role of cities both as part of the solution as well as building resilience to the impacts of climate change. The purpose was to discuss the issues, challenges, solutions and best practices from cities that demonstrated the initiatives of the city to integrate climate change in their actions and plans.

The key strategies adopted by Gujarat in addressing climate change which focuses on people's participation, mobilise private investment, policy measures and public investment. Gujarat's Action Plan on Climate Change was developed in sync with the National Action Plan on Climate Change (NAPCC) and reflects the key priorities of the state. The nine sectors of the state action plan include – agriculture, water, health, forests, sea level rise & coastal infrastructure, energy efficiency & renewable energy (EE & RE), urban development, vulnerable communities, and green jobs. The total financial allocation for these sectors is INR 24755 crore for 59 projects, of which the maximum allocation is for water followed by urban development. The state of Gujarat also has a major focus on enhancing renewable energy deployment in solar, wind, biomass and biogas. The state is ranked third and second in the country with respect to solar and wind power capacity, respectively. The government has announced solar, wind, small hydel, as well as waste-to-energy policies. Especially relevant to urban areas is the thrust given to residential solar rooftop installations through the solar rooftop scheme. The state aims to achieve 40 per cent (3200MW) of its total solar energy target of 8000MW up to 2022 through rooftop solar. Other RE sectors are also being promoted through several incentives, exemptions and subsidies. Gandhinagar, Rajkot, Surat and Vadodara, the four cities in Gujarat that have been declared as solar cities are implementing a range of solar and energy efficiency projects that lead to reduced carbon emissions. These include projects such as solar roof top, solar street and LED street lighting, wind-solar hybrid installations, solar water heating, energy audits. Low carbon development is also being encouraged in the transport sector through effort such as bus rapid transport systems (BRTs), electric transportation pilots, shift to cleaner fuel (CNG). Various adaptation projects have been undertaken by the state in the agriculture and water sector.

Few proposals have already been submitted by the state to the National Adaptation Fund for Climate Change (NAFCC).

To initiate a discussion about the need for integration of climate resilience strategies, low carbon development, energy efficiency, renewable energy, and overall environmental sustainability in urban development and planning. Officials from city departments such as energy/renewable energy, environment, urban development, transport, solid waste management, water supply and sewerage, forest/biodiversity, pollution control boards, disaster management will be stakeholders.

### 3. Objectives

At the end of the session, the participants will be able to:

- To understand the role of cities in addressing climate change both as part of a solution as well as building resilience against the impacts of climate change in the local and global context.
- To facilitate the sharing of best practices to enable cities to think of innovative out of the box solutions for transformational change
- To identify opportunities for mainstreaming climate change in the development agenda and promote cities as change agents for addressing mitigation and adaptation related actions.

### 4. Duration: 60 min

### 5. Methodology

- Power-point Presentation
- Role play Exercise
- Group Discussion

### 6. Teaching/Performance Aids

- Handouts/ session notes from the trainer
- Case Studies on Cities and Climate Change

### 7. Trainers' Note & Session Plan

The trainer should facilitate the groups to discuss and prepare the presentations. The trainer can move from group to group clearing doubts and concerns and helping participants to prepare their mitigation strategies. The idea is to see how far the participants are able to apply the knowledge gained in the preceding modules to real-time situations. The emphasis should be more on the application and less on the presentation skills.

## Notes

## Learning Unit 5.2: Technology and Innovations for Urban Sustainability

### 1. Background

The technological component is perhaps one of the most important characteristics of modern cities. The dependence of humans on technology is in most cases a given, something that is not ignored in the sustainability debate. The development and implementation of new, “better” technologies is however hindered by the inertia that modern societies have and the influence of the dominant systems (e.g. economic systems based on growth, extraction of natural resources and environmental disturbance). So-called environmental technologies are not always able to efficiently compete against other technologies that are embedded in societies by lock-in mechanisms, e.g. learning by doing and using, scale economies, subsidies, and network externalities. Not only is the availability of technology of interest for understanding the impact it has on the environment, but also the intensity of its use. It is found that environmental technology is not only seen as a solution to environmental problems in cities, but every day more as a component of strategies to attract attention and compete for resources in national and international markets. Cities have different adaptation and learning strategies.

### 2. Description of the Session

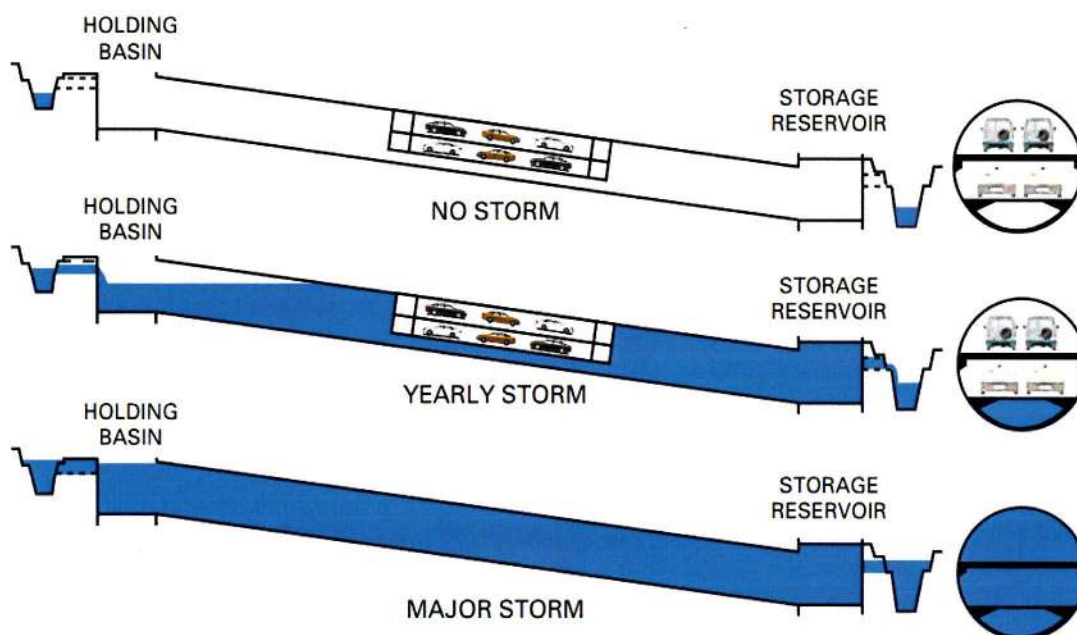
Networked infrastructures such as energy, water, wastewater, and transport systems have always been critical in the promotion of urban sustainability. These technical infrastructure systems mediate resource flows and vitally shape environmental problems in modern societies. At the same time their modernization holds important keys to solving socio-ecological problems. Both the formation of these environmental infrastructure problems and the development of socio-technical innovations and environmental solutions are geographically concentrated on the terrain of the urban and are vitally shaped by urban processes. Seen like this, issues concerning the ecological sustainability of these infrastructures are highly interrelated with urban sustainability.

Urban disaster risk is a function of many factors ranging from construction to networks to social behavior. While a holistic strategy for reducing risks is necessary, recent technological innovations have made it possible to undertake risk reduction measures in construction practices, planning and implementation. These seemingly small measures go a long way in reducing risk and improving sustainability through risk sensitive planning, positive impacts on environment etc. Innovative construction practices include use of environmentally sustainable materials and/or constructing “green buildings” that reduce the environmental risks. The concept of green buildings provide a new approach to save water, energy and material resources in the construction and maintenance of buildings in order to reduce the adverse impacts of the buildings on the environment. Green buildings are designed to have a three-fold advantage of retaining the external environment at the site, improve

internal environment for occupants and preserve the environment at the sourcing sites for raw materials. Retaining of external environment at the site implies landscaping to eliminate light trespass, innovative designing to conserve water and energy. Within the building, the natural and artificial lighting should be blended for maximum energy conservation. Building materials are responsible for about 20% of the green-house gases emitted by a building during its lifetime. Therefore use of alternative “green” raw materials would be useful in mitigating the environmental risks and those of climate change.

**Multipurpose Infrastructure Projects, such as Kuala Lumpur’s Storm-water Management and Road Tunnel (SMART)**

- The main objective of this tunnel is to solve the problem of flash floods in Kuala Lumpur and also to reduce traffic jams along Jalan Sungai Besi and Loke Yew flyover at Pudu during rush hour.
- There are two components of this tunnel, the stormwater tunnel and motorway tunnel. It is the longest multi-purpose tunnel in the world.
- The first mode, under normal conditions where there is no storm, no flood water will be diverted into the system. When the second mode is activated, flood water is diverted into the bypass tunnel underneath the motorway tunnel. The motorway section is still open to traffic at this stage. When the third mode is in operation, the motorway will be closed to all traffic. After making sure all vehicles have exited the motorway, automated water-tight gates will be opened to allow flood waters to pass through. After the flood has ended, the tunnel is verified and cleaned via pressure-washing, and the motorway will be reopened to traffic within 48 hours of closure



Source: Mott MacDonald Group 2009.

In India, the Green Rating for Integrated Habitat Assessment (GRIHA) is an initiative developed jointly by the Ministry of New & Renewable Energy (MNRE) and The Energy and Resources Institute (TERI). It pertains to the Indian context and is suitable for all climatic zones of the country. The GRIHA rating system consists of 34 criteria categorized under site selection and site planning, conservation and efficient utilization of resources, building operation and maintenance and innovation.

### **3. Learning Objectives**

At the end of the session, participants will be able to:

- Describe the characteristic features of Green buildings and need for such structures
- Discuss the LEEDS and other systems for identifying green buildings
- Describe Indian examples of Green buildings – GRIHA ratings
- Discuss the best practices of urban sustainability technology

### **4. Duration:** 60 min

### **5. Methodology**

- Powerpoint Presentation
- Discussion

### **6. Teaching/Performance Aids**

- Handouts on Green Buildings rating system

### **7. Trainers' Note**

The session should be designed in such a way that it underlines the theme of sustainable development through human interventions. Time permitting; it can even be extended to include more technological innovations that help to promote sustainability. Though detailed inputs on any of the topics covered may not be possible, it is essential to provide an overview of the recent efforts towards urban sustainability. The key message is that not all technology is detrimental to risk reduction but that technology, when used for risk reduction, promotes sustainable development.

## Notes

## Learning Unit 5.3: Framework for Resilient Cities

### 1. Background

As the 21<sup>st</sup> century unfolds, an increasing majority of the world's population will live in cities. Human wellbeing in cities relies on a complex web of interconnected institutions, infrastructure and information. People are drawn to cities as centres of economic activity, opportunity and innovation. But cities are also places where stresses accumulate or sudden shocks occur that may result in social breakdown, physical collapse or economic deprivation. That is, unless a city is resilient. Cities have always faced risks, and many cities that have existed for centuries have demonstrated their resilience in the face of resource shortages, natural hazards, and conflict. In the 21<sup>st</sup> century, global pressures that play out at a city scale – such as climate change, disease pandemics, economic fluctuations, and terrorism – pose new challenges. The scale of urban risk is increasing due to the number of people living in cities. Risk is also increasingly unpredictable due to the complexity of city systems and the uncertainty associated with many hazards – notably climate change. Risk assessments and measures to reduce specific foreseeable risks will continue to play an important role in urban planning. In addition, cities need to ensure that their development strategies and investment decisions enhance, rather than undermine, the city's resilience. If governments, donors, investors, policy-makers, and the private sector are to collectively support and foster more resilient cities, there needs to be a common understanding of what constitutes a resilient city and how it can be achieved.

### 2. Description of the session

The City Resilience Framework responds to this challenge by providing an accessible, evidence-based articulation of city resilience. Over the coming months, it will be further developed to create the City Resilience Index, which will introduce variables that provide a robust basis for measuring resilience at the city scale. City resilience describes the capacity of cities to function, so that the people living and working in cities – particularly the poor and vulnerable – survive and thrive no matter what stresses or shocks they encounter. Resilience is a term that emerged from the field of ecology in the 1970s, to describe the capacity of a system to maintain or recover functionality in the event of disruption or disturbance. It is applicable to cities because they are complex systems that are constantly adapting to changing circumstances. The notion of a resilient city becomes conceptually relevant when chronic stresses or sudden shocks threaten widespread disruption or the collapse of physical or social systems. The conceptual limitation of resilience is that it does not necessarily account for the power dynamics that are inherent in the way cities function and cope with disruptions. In the context of cities, resilience has helped to bridge the gap between disaster risk reduction and climate change adaptation. It moves away from traditional disaster risk management, which is founded on risk assessments that relate to specific hazards. Instead, it accepts the possibility

that a wide range of disruptive events – both stresses and shocks – may occur but are not necessarily predictable. Resilience focuses on enhancing the performance of a system in the face of multiple hazards, rather than preventing or mitigating the loss of assets due to specific events.

The framework for urban risk reduction has to incorporate all aspects of risk reduction, including assessment, micro zonation, prevention, mitigation, risk pooling and transfer, preparedness, urban governance and management, citizen awareness, participation and partnerships with other stakeholders.

Resilient systems are reflective, robust, resourceful, inclusive, integrated and flexible. Every city perceived resilience-building to be an integrated, ongoing process involving a multitude of actions at different scales. Across the six cities, there was a clear distinction between those cities which had experienced shocks, and those which had not. Different groups within the same city had different perspectives on, and priorities for, what makes their city resilient. This highlights the importance of inclusive consultation in resilience planning.

Urban resilience to climate change describes a city that is resilient on three levels: the systems of the city survives shocks and stresses; the people and organizations are able to accommodate these stresses into their day-to-day decisions; and that the city's institutional structures continue to support the capacity of people and organizations to fulfil their aims.

There is no single action that will make a city resilient to climate change. Resilience is instead achieved through a number of actions, building upon each other over time. These actions would be enhanced and progressed as peoples and institutions learn from past experiences and apply it to future decisions.

Urban areas that are most susceptible to external shocks and stresses (including climate change) are those that have fragile systems as well as large populations of the socially or economically marginalized. These impacts are most felt by vulnerable people as a result of their high exposure to hazards, or a lower ability to adapt and respond (due to physical limitations or financial capacity). The direct impacts of climate change are twofold: shocks and sudden impacts such as storms, typhoons, and heat waves; and stressors or impacts that build gradually over time such as sea level rise, average temperature increase, and long-term changes in rainfall patterns.

Indirect impacts on urban areas resulting from these shocks and stresses include: severe flooding (stopping port or train operations, thus affecting travel to work and preventing goods to reach market); blackouts (as energy generation is affected by storms); increased risk of water-or vector-borne diseases (due to rainfall and changes in temperature); and heat stress (exacerbated by temperature increase). An increase in disease incidence and heat stress can put pressure on the health system and infrastructure during climatic events.

Maintaining essential urban functions Actions to build resilience should respond to three key questions:

- How does the city work (the urban systems)?
- What are the direct and indirect impacts of climate change (climate change)?
- Who is least able to respond to shocks and stresses (vulnerable groups)?

### 3. Objectives

At the end of the session, participants will be able to:

- Discuss the need for developing urban resilience for long-term sustainability
- Explain the facets of resilient urban systems
- Describe the framework for enhancing urban resilience

### 4. Duration: 60 mins

### 5. Methodology

- PowerPoint Presentation
- Panel Discussion

### 6. Trainers' Note

The last technical session should be used for collating all the issues discussed during the training and coming to a conclusion regarding a future framework for action. The session should aim towards drawing a conclusion to all the inputs given during the training programme. Through the interactive discussion, the session should focus on the framework for action at the national and local level. Concluding the discussion, the trainer may ask the

participants to write down action points at the local level, on immediate, intermediate and long term basis for their respective cities. In this way, the training would end not as an academic discourse, but on an action-oriented approach. Ending a discourse on specific action points would be beneficial for taking the course forward in future through advanced study programmes.

## Notes

## Valedictory

At the end of the training, evaluation of the knowledge, skill and attitude of the participants would determine their exit behaviour. The level of increase of knowledge and skill from the inputs given through the training has to be evaluated. Feedback from trainees regarding the training and related facilities would help in modifying future modules to make it more effective.

The primary objectives of the module would be to:

- To understand the role of cities in addressing climate change both as part of a solution as well as building resilience against the impacts of climate change in the local and global context.
- Explain the uses of technology and modern innovations for reducing disaster risk and promoting urban sustainability.

### 1. Objectives

- Discuss a framework for urban risk reduction
- Evaluate the quality of training imparted through the program
- To assess the exit behavior of the participants at the end of the course.
- To evaluate the knowledge and skills gained during the course.
- To carry out formal internal evaluation

### 2. Duration: 60 mins

### 3. Methodology

Any one of the following methods can be followed, according to the trainers' discretion:

1. Formal structured questionnaire – Each trainee is asked to fill up a structured questionnaire that evaluates their knowledge gained through the course.
2. Quiz on the course – Divide into groups and give points for correct answers. The group that wins gets a small prize.
3. Informal discussion– The trainees divide into groups and identify the key learning points of the training and write them on a flip chart. After they finish, they move on to the next flip-chart and add or comment on the points raised by other groups. At the end of the exercise, all the points are collated by the trainer and discussed.

### 4. Training/ Performance Aids

Depending on the methodology chosen:

- Copies of pre-decided questionnaires or
- Flip charts, Markers, Tag-boards to pin the handouts

This successfully concludes the “Training Programme on Urban Risk Reduction & Resilience”.

## Notes