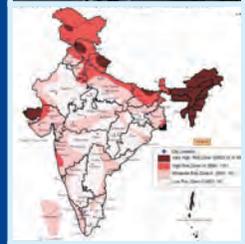


Training Module on URBAN RISK MITIGATION



LEGEND

- City Location
- Very High Risk Zone -V (MSK - V)
- High Risk Zone -IV (MSK - IV)
- Moderate Risk Zone-III (MSK - III)
- Low Risk Zone -II (MSK - II)

Source: Disaster Risk Atlas



NATIONAL INSTITUTE OF DISASTER MANAGEMENT
MINISTRY OF HOME AFFAIRS, GOVERNMENT OF INDIA



सत्यमेव जयते

Training Module on URBAN RISK MITIGATION

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TRAINING MODULE on URBAN RISK MITIGATION

ISBN : 978-93-82571-07-0

© NIDM, New Delhi

Edition: First, 2014

Published by

National Institute of Disaster Management, Ministry of Home Affairs,
New Delhi - 110 002

Citation

Bandyopadhyay, Chandrani (2014) : Training Module on Urban Risk Mitigation. National Institute of Disaster Management, New Delhi - 110 002, Pages 138

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The document can be downloaded from <http://www.nidm.gov.in>

Design and Printing

Chandu Press, D-97, Shakarpur, Delhi-110092, Ph.: 22526936



Vice Chairman
National Disaster Management Authority
Government of India

FOREWORD

Urbanization has been the most significant fall-outs of demographic transition in the twentieth century. While cities grew as centres of economic, commercial, administrative, educational and recreational activities, we see uncontrolled and unregulated growth, leading to over-population, settlements in marginal, often unsafe locations, inadequate facilities and amenities, limited access to resources and a host of other issues. Half of the world's urban population lives in Asia; seven out of the ten most populous cities in the world are located in this region. In such a scenario, where people, assets and networks are densely concentrated in cities, risk of disasters increases manifold.

The impact of disasters in urban areas is exacerbated by the complexities of urban systems. While cities have provided the momentum of growth to the economy, they have also proved to be extremely vulnerable during disasters, resulting in heavy loss of life and assets. The UNISDR estimates that out of the 3.3 billion people currently living in cities, 2.2 billion live within 100 Km of the coast, making them vulnerable to many disasters. Climate change impacts are making cities more susceptible to environmental risks.

The solution lies in building sustainable cities that are resilient to face the impacts of changing climate and disasters, whether natural or human-induced. There is an urgent need to build the capacity of urban managers to deal with urban risks in a holistic manner. It is in this context that training on

urban risk mitigation is important. The Training Module on Urban Risk Mitigation aims to equip a multi-disciplinary team of professionals engaged in urban planning and development to identify urban risks and integrate aspects of mitigation in urban development.

I congratulate NIDM for taking up the issue of urban risks through its training programmes, research studies and documentation. I am glad that a comprehensive Training Module on Urban Risk Mitigation is being published. I am sure this module will benefit trainees and professionals alike and raise sensitivity to urban risks and their mitigation.

New Delhi
3rd May 2013



(M. SHASHISHAR REDDY)

Dr. SATENDRA, IFS
Executive Director

Preface

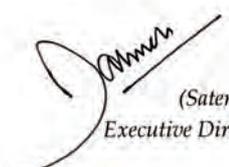
Frequently occurring disasters all over the world leave a trail of destruction causing heavy loss of life and assets. The urban areas in the global hotspots are especially vulnerable to various hazards, exacerbated by a larger population density and unplanned human actions. For the first time in history in 2007, global urban population exceeded the rural. This trend is expected to continue in future; by 2030 more than 60% of the people are expected to live in cities, with heavy population concentration in larger urban areas and megacities.

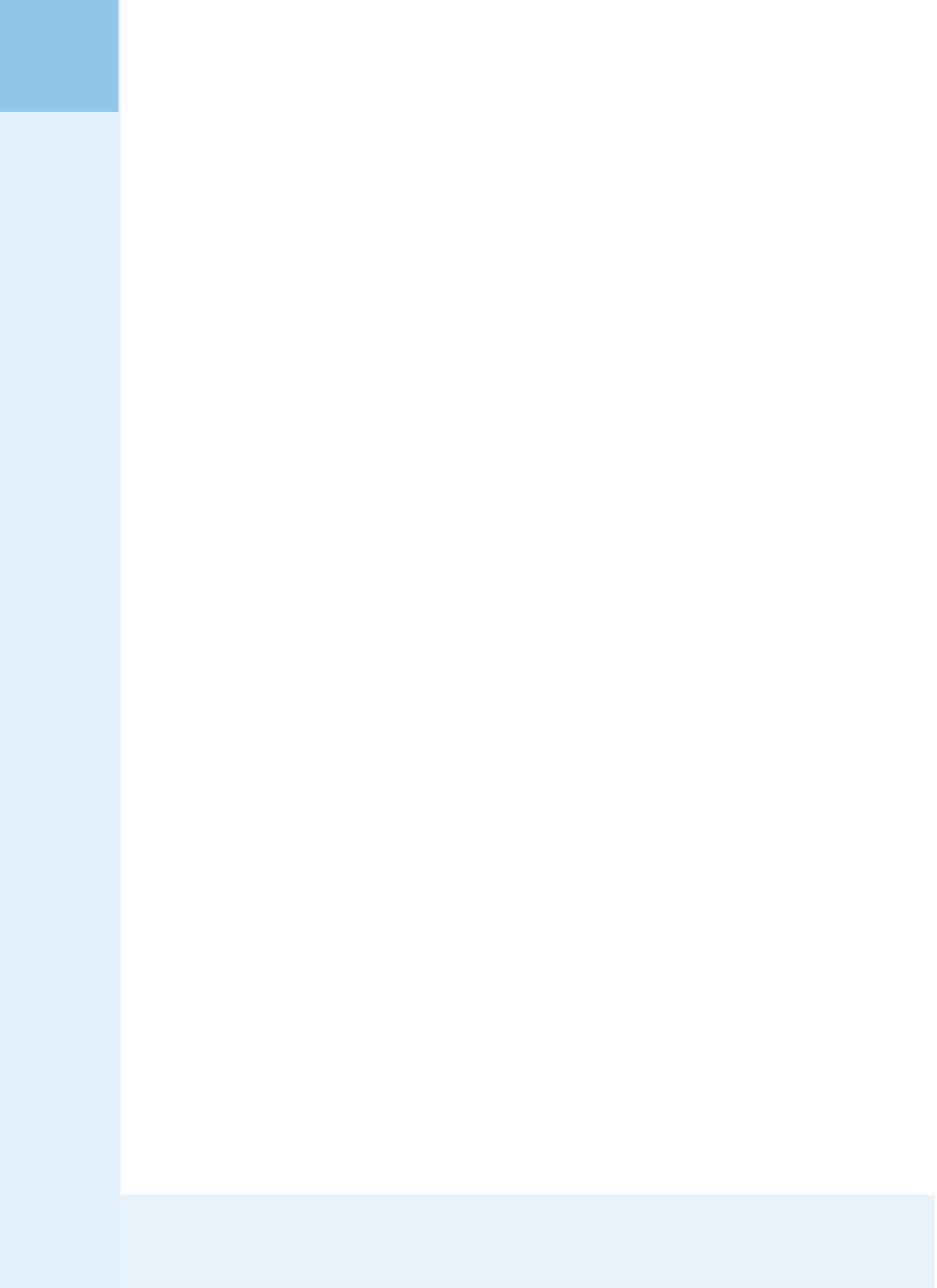


It is also estimated that cities in more developed countries (MDCs) will grow at the rate of 0.38 percent, a doubling time of 185 years, while cities in less developed countries (LDCs) will double their size in just 29 years. By 2015, 12 out of the largest 15 cities in the world will be in developing countries. Compounding the problems of urban growth are the natural hazards of floods, earthquakes, cyclones, landslides etc, and layers of physical, social and economic vulnerabilities that expose the urban dwellers of the developing world to increasing risks.

In such a scenario, the need for a proactive system to deal with existing and emerging risks in urban areas cannot be over-emphasized. Identifying personnel involved in the risk mitigation process and building their capacities entails increasing knowledge and skill in the subject. As per its mandate, NIDM has been consistent in its efforts for capacity building in the field of urban risk mitigation through training and research projects. This training module was finalized over a period of three years wherein it was delivered in NIDM and comments, suggestions and recommendations of participants, resource persons and faculty members have been incorporated. This module is now placed in the public domain in the hope that it will be useful to trainers of urban development in their endeavour to build a disaster resilient society.

New Delhi
April 2014


(Satendra)
Executive Director



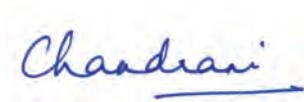
Acknowledgement

This module is the outcome of inputs, suggestions and discussions with practitioners, administrators and colleagues, each of them significant for the value they have added to the module design and presentation. I take this opportunity to convey my gratitude to all of them, who have enriched my understanding of urban DRR and its manifold implications on humanity.



I am grateful to Dr Satendra, Executive Director of the National Institute of Disaster Management for his support and encouragement in the course of preparation of this module. My thanks are due to Prof Chandan Ghosh of NIDM for his inputs in module design and all my colleagues for their suggestions. I thank my colleagues in NIDM for their inputs and support. I am grateful to Prof (Dr) Sanjukta Bhaduri of the School of Planning and Architecture, New Delhi who has painstakingly reviewed the module and streamlined it to the present format through her suggestions. I am grateful to all the resource persons who have taken classes during the trainings conducted at the national and state levels and added to our knowledge and understanding of urban issues. Thanks are due to all participants to this training, who with their experience sharing and feedback have helped to modify and finalize the module. Last but not the least, a big thank you to my family, who has been with me always, no matter what.

I dedicate this module to you, dear reader, with the hope that together we will work for a resilient nation. Any flaw, or inadequacy is however, my responsibility.



(Chandrani Bandyopadhyay)

New Delhi
April 2014

The Module - In Brief

Name of Module: Training Module on Urban Risk Mitigation

Developed by: National Institute of Disaster Management

No of sub-modules: Five

Training Days: Five

Training Time: 25 - 27 hours

Training Method: One sub-module per day

Training Team: Lead Trainer, Specialists, Training Assistants

Seating: Informal

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Module at a Glance

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1. Learning Unit 1.1: Pre-Training Assessment
2. Learning Unit 1.2: Hazard, Vulnerability & Risks: A Conceptual Approach to Disaster Management
3. Learning Unit 1.3: From DM to DRR: An Overview
4. Learning Unit 1.4: Identifying Risks & Vulnerabilities in the Urban Context
5. Learning Unit 1.5: Urban Disaster Risks: Perspectives & Approaches

MODULE 2: URBAN RISK IMPACT: ISSUES & CONCERNS

1. Learning Unit 2.1: Urban Disaster Impact and Role of Urban Planning for Risk Mitigation
2. Learning Unit 2.2: Environmental Impact on Urban Risks
3. Learning Unit 2.3: Implications of Urban Transport in Disaster Risk Reduction
4. Learning Unit 2.4: Health Issues for Urban Disasters
5. Learning Unit 2.5: Climate Change and Urban Risks: Impact for Present and Future

MODULE 3: ACTION PLANNING & STRATEGIES FOR URBAN DRR

1. Learning Unit 3.1: Mainstreaming DRR in Urban Development Policies & Governance
2. Learning Unit 3.2: Techno-legal framework for Urban Risk Reduction
3. Learning Unit 3.3: Earthquake Risks: Mitigation Framework for Structural Safety
4. Learning Unit 3.4: Earthquake Risks: Non-Structural Mitigation Measures
5. Learning Unit 3.5: Urban Flooding: Learning Lessons through Time
6. Learning Unit 3.6: Urban Fires: Inevitable or Preventable?

MODULE 4: TESTING REALITY

1. Learning Unit 4.1: City Observation Study: Identifying Risks
2. Learning Unit 4.2: Risk Assessment, Vulnerability Analysis and Mitigation Strategies

MODULE 5: FRAMEWORK FOR BUILDING RESILIENT CITIES

1. Learning Unit 5.1: Community based Urban Risk Management
2. Learning Unit 5.2: Technology for Urban Sustainability
3. Learning Unit 5.3: Framework for Resilient Cities
4. Learning Unit 5.4: Post-Training Evaluation and Closing

List of Abbreviations

ATI	Administrative Training Institute
BMTPC	Building Materials & Technology Promotion Council
DM	Disaster Management
DRR	Disaster Risk Reduction
HAZMAT	Hazardous Materials
HUDCO	Housing & Urban Development Corporation Ltd
ISDR	International Strategy for Disaster Reduction
JICA	Japan International Cooperation Agency
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
NBC	National Building Code
NDMA	National Disaster Management Authority
NIUA	National Institute of Urban Affairs
SIUD	State Institute of Urban Development
TCPO	Town & Country Planning Organization

"Communities will always face natural hazards, but today's disasters are often generated by, or at least exacerbated by, human activities. At the most dramatic level, human activities are changing the natural balance of the earth, interfering as never before with the atmosphere, the oceans, the polar ice caps, the forest cover and the natural pillars that make our world a livable home.

But we are also putting ourselves in harm's way in less visible ways. At no time in human history have so many people lived in cities clustered around seismically active areas. Destitution and demographic pressure have led more people than ever before to live in flood plains or in areas prone to landslides. Poor land-use planning; environmental mismanagement; and a lack of regulatory mechanisms both increase the risk and exacerbate the effects of disasters."

Kofi Annan
Former UN Secretary General

Cities and Thrones and Powers
Stand in Time's eye,
Almost as long as flowers,
Which daily die:
But, as new buds put forth
To glad new men,
Out of the spent and unconsidered Earth,
The Cities rise again.

-Rudyard Kipling

TRAINING MODULE ON URBAN RISK MITIGATION

About the 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 with the rapidity, 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 Mitigation 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 mitigation measures. In the five day full-time programme, the trainees will be oriented towards the major facets of urban risks and their mitigation.

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 National Institute of Disaster Management (NIDM), with inputs from professionals working in this sector. NIDM is the premier institute for training of officials from various states, central ministries and departments and autonomous organizations responsible for managing disasters.

Who shall use the 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 clientele for the module:

- Central level
 - o Ministries of Urban Development, Home Affairs and extended organizations viz TCPO, BMTPC, HUDCO, NIUA etc

- **State level**
 - o Departments of Urban Development, Town Planning Boards, State Institutes of Urban Development (SIUDs), Administrative Training Institutes (ATI), State Disaster Management Departments
- **City level**
 - o Professionals (engineers, architects, planners, administrators) from Urban Local Bodies (Municipal Corporations, Development Authorities, Municipalities etc)
 - o Elected representatives of urban local bodies
 - o NGOs working on urban issues

How to use the 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 mitigation. 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. If this module is being run at the state/city level, sessions on national policy, planning and governance can be substituted with those of the state or plans at the city level.

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.

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 weather and type of clothing recommended and welcome to the institute.

- The participants should be asked to fill out a 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 everyday to ensure better peer-to-peer interaction and sharing.

II. MODULE DESIGN BRIEF

Context/ Background

Rapid urbanization has been one of the most prominent features worldwide in the post- Industrial Revolution era. From 739 million people living in the urban areas in 1950 in the world, in 2006 it rose to 3.2 billion. It is estimated that about 65% of the world population will live in urban areas by 2025. A similar situation prevails in India, where about 31.2% of the population resides in urban areas, with increasing numbers migrating to these centers in a steady stream. Among the urban areas too, the metro cities attract the maximum migrant population, thereby registering unprecedented growth. Excessive urbanization of metros as witnessed in India has resulted in greatly increased vulnerability to major disasters, both natural and human-induced. Even natural disasters 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.

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.

Target Group

The training is targeted towards professionals involved in urban development and planning. This would involve senior and middle level officers from the Ministries and Departments of Urban Development in the states and associate organizations like the Town & Country Planning Organizations, Public Works Departments, Urban Local Bodies (Municipalities, Corporations etc). From the DM side, officials from the Revenue and Disaster Management Departments, especially those dealing with urban areas like Delhi etc. would be potential participants.

In addition, trainers from the State Institutes of Urban Development or from state ATIs would be potential target groups so that this training is further disseminated at the state level.

Preferable Group Size: 20-25 participants

Entry Behaviour

Level of participants: In service officers, in senior and middle level positions, with over 10 years of service and not less than one year in the present position.

Age Group: Less than 50 years

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

Disaster Experience: Desirable, but not mandatory

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.

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 mitigation of such risks.

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 development.
- ii. Describe the nature, extent of threat and significance of countermeasures required for urban risk mitigation.
- 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.

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 mitigation.

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 simulation drills
- Compact Disc: 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.

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.

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.

Language of Instruction

The medium of instruction will be English, however, in off-campus trainings (state level programmes), Hindi or any regional language may be used along with English in a bi-lingual format.

Content Design

	Session Title	Session Objectives	Time	Methodology
Module1 Introduction, Overview and Perspectives				
LU 1.1	Inauguration & Pre-Training Assessment	<ul style="list-style-type: none"> - Welcome participants - Introduce trainees and trainers - Overview of the training - Lay down ground-rules 	40 min	Interaction
	Icebreakers		20 min	Participatory Activities
LU 1.2	Hazard, Vulnerability & Risks: A Conceptual Approach to DM	<ul style="list-style-type: none"> - Explain the concepts of hazards, vulnerability, risk and resilience in the context of DM. - Describe the DM cycle and its stages. - Explain the impact of human actions on hazards and risks 	30 min	Q& A session/ Quiz
LU 1.3	From DM to DRR: An Overview	<ul style="list-style-type: none"> - Describe DM in the process of evolution - Explain Global paradigm shift - Explain Indian response to paradigm shift - Describe the change in orientation in DM system - Describe the DM Act - Describe the instruments of change in DM and Urban sectors 	60 min	PPT + discussion

	Session Title	Session Objectives	Time	Methodology
LU 1.4	Identifying Risks & Vulnerabilities in the Urban Context	<ul style="list-style-type: none"> - 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 - List the indicators for assessing risk 	60 min	Lecture + Guided discussion
LU 1.5	Urban Disasters: Perspectives & Approaches	<ul style="list-style-type: none"> - Describe the global urban characteristics - Describe the characteristics of Indian urban scenario - Identify the types, causes and factors aggravating urban risks - Explain the characteristics of resilient cities. 	60 min	PPT + discussion

	Session Title	Session Objectives	Time	Methodology
Module 2: Urban Risk Impact: Issues and Concerns				
LU 2.1	Urban Disaster Impact and Role of Urban Planning for Risk Mitigation	<ul style="list-style-type: none"> - 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. 	60 min	Case Study analysis
LU 2.2	Environmental Impact on Urban Risks	<ul style="list-style-type: none"> - Identify the relationship between urban environment and disaster risks - Discuss how urban environmental risk mitigation is imp for sustainable development - Identify ways of addressing environmental concerns in urban development policies 	60 min	Lecture + buzz group activity

	Session Title	Session Objectives	Time	Methodology
LU 2.3	Implications of Urban Transport in Disaster Risk Reduction	<ul style="list-style-type: none"> - Discuss the circulation patterns in urban areas leading to risks - Explain the risk arising from multi-modal transport system - Discuss the initiatives required for reducing transportation risk. 	40 min	Discussion/ Case Study
LU 2.4	Health Issues in Urban Areas	<ul style="list-style-type: none"> - 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. 	60 min	Interactive presentation
LU 2.5	Climate Change and Urban Risks: Impact for Present and Future	<ul style="list-style-type: none"> - Explain the relationship between climate change and disasters. - Describe the impact of climate change and its implications on the risk profile of cities - Explain the need for building climate-resilient cities 	60 min	Lecture + discussion

	Session Title	Session Objectives	Time	Methodology
Module 3: Action Planning and Strategies for Urban DRR				
LU 3.1	Mainstreaming Disaster Risk Reduction in Urban Development Policies & Governance	<ul style="list-style-type: none"> - Discuss the need for mainstreaming DRR into development initiatives to enable safe development - Discuss various initiatives at the national and state levels for urban development and disaster risk reduction - Identify ways of mainstreaming DRR into urban development plans and programmes in their respective states. 	60 min	Panel Discussion
LU 3.2	Techno-legal Framework for Urban Risk Reduction	<ul style="list-style-type: none"> - Describe the need for techno-legal backup for safe construction - Describe the techno-legal instruments available for safe urban development - Describe the recent initiatives and their implications on the urban risk scenario. 	45 min	Moderated Group Discussion

	Session Title	Session Objectives	Time	Methodology
LU 3.3	Earthquake Risks: Mitigation Framework for Structural Safety	<ul style="list-style-type: none"> - Discuss earthquake risks to various types of structures - Discuss the methodology for assessment of risk to buildings - Explain the structural safety features that should be adopted for earthquake resistant buildings - Describe case studies of earthquake reconstruction where structural safety features were followed. 	60 min	PPT + animations+ cases + discussions
LU 3.4	Earthquake Risks: Non-structural Mitigation Measures	<ul style="list-style-type: none"> - Describe the non-structural risks in buildings of different usage. - Discuss the rationale for reducing risks from non-structural elements. - Describe the basic mitigation measures that can be taken for anchoring or bracing of risky elements in a building. - Discuss the need and basic elements of household preparedness planning. 	60 min	PPT+ Group exercise

	Session Title	Session Objectives	Time	Methodology
LU 3.5	Urban Flooding: Learning Lessons through time	<ul style="list-style-type: none"> - 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. - Identify few actions at the household level as a mitigation strategy 	75 min	PPT+ discussion + activity
LU 3.6	Urban Fires: Inevitable or Preventable?	<ul style="list-style-type: none"> - Describe the causes and extent of fire risks in urban areas. - Explain the mitigation measures for reducing fire risks. - List the preparedness actions to be taken for urban fires. - Demonstrate the basic fire fighting techniques for household fires. 	40 min + 40 min demonstration	PPT + demonstration of fire tenders

	Session Title	Session Objectives	Time	Methodology
Module 4: Testing Reality				
LU 4.1	City Observation Study: Identifying Risks	<ul style="list-style-type: none"> - Identify complex risks in urban setting - Identify the causal and aggravating factors for risks present in the study area - Describe people's perception of hazard and their efforts at mitigation 	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"> - Apply knowledge gained in ground - Develop analytical skills for problem solving - Prepare a mitigation strategy for study area 	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
Module 5: Framework for Building Resilient Cities				
LU 5.1	Community based Urban Disaster Risk Management	<ul style="list-style-type: none"> - Explain the importance of participatory urban management - Describe the role of a participative community for urban risk mitigation - Discuss strategies for effective community involvement in the risk reduction process 	60 min	Lecture + discussion

	Session Title	Session Objectives	Time	Methodology
LU 5.2	Technology for Urban Sustainability	<ul style="list-style-type: none"> - 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 use of RS & GIS technology in risk analysis in urban areas 	60 min	Lecture + discussion
LU 5.3	Framework for Resilient Cities	<ul style="list-style-type: none"> - 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 	60 min	Panel Discussion
LU 5.4	Post-Training Evaluation & Conclusion	<ul style="list-style-type: none"> - 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 	60 min	Interaction

Note: LU: Learning Unit

Trainers/ Facilitators/ Resource Persons Required

As urban risk mitigation 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.

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 the national, 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 trainer participants for conducting training sessions on urban risk mitigation at the state and local levels.

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.

INTRODUCTION, OVERVIEW & PERSPECTIVES

The first module would provide the introduction to the course to the trainees, after assessing their entry behavior. The course, being interdisciplinary in nature, would use this module for providing an overview of both urban aspects and DM aspects, and the interface between the two. This module would be divided into 5 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 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.

Duration: 270 mins, preferably completed in the first day of training.

Methodology

Since this module 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 session to session. 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 module 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.

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. A Fish-Bowl method can be adopted by which ground rules and training norms are discussed in small groups, after which they are discussed in the larger group and adopted for the duration of the training. 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

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 behaviour of the participants and subsequently getting them on a similar platform so that the objectives of the course are met.

Session Objectives

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

Duration: 40 minutes

Methodology

- Expectation Exercise and Discussion
- Q & A Session

Trainers' Note

The session can be divided into two parts viz. the expectation and the entry behaviour. 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 behaviour 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.

Session Plan

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

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

Purpose & Scope

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.

Description of the Session¹

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 learnt 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.

A disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. Disasters are the result of a combination of exposure to hazards, vulnerability of the affected community and their capacity to cope with the disaster. A disaster is therefore the function of hazard, vulnerability and capacity.

A hazard is defined as a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. 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.

¹ All the definitions and explanations follow the UNISDR definitions found in www.unisdr.org

The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard is Vulnerability. Vulnerability can arise from various factors like physical, social, economic, and environmental. These factors act in combination to create a vulnerable community, which finds itself crippled when a hazard strikes.

Capacity is the combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals. 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.

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 is defined as the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events. The emphasis of disaster risk reduction is to manage the underlying causes of vulnerability, thereby acknowledging the intrinsic link between risk reduction and development. Safe development is sustainable as the underlying causes of vulnerability like poverty, malnutrition, food security; lack of empowerment, unsafe housing etc are dealt with.

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. The emergency response phase that follows immediately after a disaster normally comprises of damage assessment, search and rescue, medical first response, relief management. Response is a set of actions that ensure the provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. This

is followed by reconstruction and rehabilitation phases. Recovery is the restoration and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

The pre-disaster phase comprising of prevention, mitigation and preparedness are activities aimed towards reducing the risk of people and assets from future disasters. Mitigation relates to the lessening or limitation of the adverse impacts of hazards and related disasters. Mitigation measures encompass engineering techniques and hazard-resistant construction as well as improved environmental policies and public awareness. When the strategies undertaken ensure outright avoidance of disaster events, it is termed as prevention. Preparedness refers to the capacity developed by societies to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions. Efficient early warning systems and the last-mile connectivity of the warning is an effective preparedness measure.



When the strategies undertaken ensure outright avoidance of disaster events, it is termed as prevention. Preparedness refers to the capacity developed by societies to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions. Efficient early warning systems and the last-mile connectivity of the warning is an effective preparedness measure.

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.

Duration : 30 minutes

Methodology

- Q & A/ Quiz on definitions
- Discussion

Teaching/Performance Aids

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

Handout 1.2.2: Films on DM concepts (CD's)

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 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	10 min + 5 min
The DM Cycle Pre-disaster During Disaster Post-Disaster	Emphasise the Cycle as a comprehensive approach, then explain the concepts associated with each phase.	15 min

Learning Unit 1.3: From DM to DRR - An Overview

Purpose & Scope

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.

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, more than 255 million people were affected by disasters each year, on an average, between 1994 and 2003 (EM-DAT, 2004). During this decade disasters caused damage of an estimated US\$ 67 billion per year on an average, reaching a maximum figure of US\$ 230 billion. In a comparative analysis of the century, out of the 9821 events reported by CRED during 1900-2005, 65.8% (6466 events) occurred during 1950-1999, while only 567 events occurred during 1900-1949. That the trend shows increase can be gauged from the fact that 2788 (28.4% of century total) events have already been reported from 2000-2005. The economic cost associated with natural disasters increased 14 fold since 1950s. 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. That this was not enough was evident from growing concern about the impacts of disasters across the world. The United Nations acknowledged this concern by declaring the last decade of the 20th century 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.” A conference of the IDNDR programme was held in Yokohama in May 1994, where a plan of action called the Yokohama Strategy was evolved. 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.

At the close of the century, the International Strategy of Disaster Reduction (ISDR) was formed to carry forward the global momentum created by IDNDR. 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 January 2005, the World Conference on Disaster Reduction (WCDR, 18-22 January 2005, Kobe, Hyogo, Japan) was held that represents a landmark in worldwide understanding and commitment to implement a disaster risk reduction agenda. This commitment was captured in the *Hyogo Declaration* and the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters* adopted at the WCDR.

The Hyogo Framework constitutes the essential guide for implementation of the International Strategy for Disaster Reduction in the coming years and it reflects an unprecedented conceptual shift that takes into account the complexity of action in disaster risk reduction and the large variety of actors whose inputs are required in the pursuit of this objective. It provides the basic aims and prescribes an expected outcome; details three strategic goals for disaster risk reduction and a set of five priority areas for action; and assigns tasks to stakeholders at difference operational levels to reach the expected outcome.

The priorities for action for the nations refer to the following:

- I. Ensuring disaster risk reduction as a national and local priority,
- II. Improving the early warning technology and dissemination systems,
- III. Use of knowledge, innovation and education to increase resilience at all levels,
- IV. Reduce underlying risk factors and
- V. Enhance preparedness for response at all levels.

A well-acknowledged global hotspot of disasters, the Indian sub-continent faces a plethora of such events. However, relief administration has been the mainstay of disaster management in India until IDNDR and the global paradigm shift. While India can boast of a reasonably well-coordinated relief administration, proactive mitigation or risk reduction measures were conspicuous by their absence. After facing four mega disasters each with a toll of nearly 10,000 in a decade (Latur Earthquake 1993, Orissa Supercyclone 1999, Bhuj Earthquake 2001 and Indian Ocean Tsunami 2004), 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 mitigation and preparedness. The new approach proceeds from the conviction that development cannot be sustainable unless disaster mitigation is built into the development process.

The paradigm shift from relief-centric disaster management to overall risk mitigation has been operationalised through setting up of a dedicated institutional and legislative system. At the central level, the subject has been shifted from the Ministry of Agriculture & Cooperation to the Ministry of Home Affairs for a more comprehensive and holistic management process. The Disaster Management Act 2005 was one of the most significant initiatives taken by the Government of India for putting in place an institutional system dedicated to disaster management. Notified on 26 December, 2005, exactly a year after the Indian Ocean Tsunami, the Act was the first acknowledgement of the Government of India of the need for legislative backup to the governance system. The Act defines disasters as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence, which results in substantial loss of life, or human suffering, or damage to, and destruction of property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area.” The DM

Act 2005 is an attempt at setting up and institutionalizing a dedicated system for disaster management. To this end, it mandates the setting up of key institutions at the national, state and district levels. The Act aimed towards creating a hierarchy of institutions for policy and planning, implementation, capacity building, response force, thereby ensuring a holistic effort towards disaster management.

Learning Objectives

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

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

Duration : 60 minutes

Methodology

- Powerpoint Presentations
- Q & A sessions
- Discussion

Teaching/Performance Aids

Handout 1.2.1: Printed copy of presentation

Handout 1.2.2: Disaster Management Act 2005

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 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
<p>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</p>	<p>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 disaster-development interface.</p>	10 min
<p>The Global Agenda IDNDR & Yokohama Strategy... ISDR & HFA Paradigm shift - cause and effect The Process - relief to mitigation to risk reduction Building resilience among communities</p>	<p>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.</p>	20 min
<p>The Indian Experience of Paradigm Shift The Initial Years (Famine Commission, Ministry of Agr. The mega disasters, learning lessons. HPC, X FYP DM Act 2005</p>	<p>Concentrate more on the Act while mentioning the circumstances leading to the Act formulation. Conclude by summarizing and connecting all sections</p>	20 min + 10 min concluding 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

“Mind takes form in the city; and in turn, urban forms condition mind.”
Lewis Mumford (The Culture of Cities 1938)

Purpose & Scope

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.

Description of the Session

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.

Urban risks from a socio-economic perspective therefore deal with the various sections of 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. A migrant to a city is more vulnerable due to lack of social networks as backup. It is estimated that about 14 per cent urban household have no access to electricity, 31 per cent have no access to tap water facility (29 per cent as per NHFS-3), and 26 percent urban households have no access to toilet facility as per 2001 census (17 per cent as per NFHS-3 in 2005-2006). Further, about one-fifth of urban population is not covered by any sewer system. Therefore, identifying and analyzing urban risks in a socio-economic context is important.

(<http://www.openmeeting2009.org/abstracts/day1/A010.pdf>).

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.

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.

Duration : 60 min

Methodology

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

Teaching/Performance Aids

- 1.4.1 Handout of presentation
- 1.4.2 Flipchart/markers

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 population residing in urban areas and list them out on a flipchart. Then ask the group to identify aspects of 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:

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

References

Satterthwaite, David (ed)(1999): Sustainable Cities, Earthscan Publications, London.

Learning Unit 1.5: Urban Disaster Risks: Perspectives & Approaches

Purpose & Scope

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 to look at the urban scenario from a disaster risk perspective and identify the factors contributing to this risk.

Description of the Session

“Urbanization holds out the bright promise of an unequalled 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. Concentration of economic activities in urban centres leads to concentration of population which in turn results in 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 19th and 20th centuries and shows no sign of abating in the near future. Between 1950 and 2006, the urban population of the world has increased from 739 million to 3.2 billion. By 2025, around 65% of the world’s population is expected to live in cities. As generators of economic momentum, cities attract large numbers of people from the rural hinterland and in some cases, smaller urban centres. The developing world is at a greater risk because it is estimated that by 2010, about 70% of the world’s urban population will live in poorer countries. 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, landuse 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 India the urban population is only 31.2% of the total population, but with an absolute number of 377 million. In a country like India, where 85% of the area is vulnerable to one or more hazards, it goes without saying that most cities also lie over hazardous terrain. About 59% of the Indian landmass is prone to earthquakes and landslides of different magnitudes and about 12% of its geographical area (about 40 million hectares) is subject to riverine and flash floods of which about 8 million hectares are susceptible to annual flooding. Parts of north-eastern states of India receive the highest rainfall in the world while parts of northwest have the scantiest, just as some areas of trans-Himalayas are among the coldest habited places while part of Thar Desert is among the warmest. This wide variation of rainfall and climate make many regions of India susceptible to various hazards like droughts, flood, hailstorm, cloudburst, avalanche, heat and cold wave that claim lives, livelihood and property.

In the Indian context, a rapidly growing urban population is a reality. The urban population is growing at a higher rate than the overall population. A characteristic feature of the Indian urban scenario is the “metropolitanisation” or concentration of population in larger metropolises and stagnating smaller towns. As per Census 2001, 35 metropolitan or million plus cities are home to 107.7 million people viz. 37.8% of the urban population. In 2011, the number of metros went upto 53, with 160.7 million residents that comprised of 43% of India's urban population. This puts a very severe stress on the already overstressed water supply, sanitation, sewerage, housing and transport system of the cities. A large number of the migrant population settles down in vulnerable or marginalized areas within the urban limits like floodplains, unstable slopes, unhygienic living conditions in slums and squatter settlements.

A large part of the earthquake prone area supports one of the densest populations in the world, in addition to a large number of highly populated urban areas, including the national capital and few state capitals. About 60 cities with population exceeding half a million are located within zones III, IV and V. With return periods of earthquakes ranging from 5 years to 50 years, severe earthquakes hitting highly populated cities is expected.

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.

Learning Objectives

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

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

Duration : 60 min

Methodology

- Powerpoint Presentation
- Discussion

Teaching/Performance Aids

1.3.1 Handout of presentation

1.3.2 Relevant reading material

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
The Urban Context Global urban population and density 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
The Urban Context in India 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, focus on the increasing growth of metros and stagnation of small towns, ask trainees to analyse causes and possible impacts on urban risk scenario	20 min (15 min ppt + 5 min discussion)

Contents	Trainers' Note	Duration
Urban Risk Perspectives Urban hazards and risks - types & features Urban centres 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 analyse this. Conclude with a discussion on applicability of resilient cities concept.	30 min (20 ppt + 10 concluding discussion)

References

Mitchell, James K (ed)(1999): **Crucibles of Hazard: Mega-cities and Disasters in Transition**, United Nations University Press, Tokyo.

Census of India, 2011 : Directorate of Census Operations, Govt. of India

URBAN RISK IMPACT: ISSUES & CONCERNS

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: Health Issues for Urban Disasters

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

The primary 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

Duration : 6 hours, 360 min. preferably completed in 1 day.

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.

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. As this module would ideally begin on the second day, after the overview, the following ideas may be considered:

1. **Recapitulation:** At the start of a module, about 10-15 mins can be spent on recapitulation so that the concepts given earlier are reiterated and retained. It is best if the participants are asked to form groups and each recapitulates one session of the previous day. The group should be encouraged to use innovative methods for recapitulating the session. This can be continued on all days of the training to encourage peer-to-peer interaction.
2. **Energisers:** Energisers provide the much-needed break in between sessions. At least one energizer a day, preferably in the post-lunch session would relieve the monotony of sessions. This could take the form of games or exercises, where every trainee is required to participate.

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

Purpose & Scope

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.

Description of the Session

Urban landscapes are characterized by its builtform, landuse, 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 accrue 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 India and most of South Asia, 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 Hyogo Framework for Action recognizes unplanned urbanization as a key factor in increasing global vulnerability and disaster losses. The Global Platform on Disaster Risk Reduction

held in June 2009 in Geneva has also committed that *“By 2015, all major cities in disaster prone areas to include and enforce DRR measures in their building and land use codes.”*

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 neighbourhood 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.



Source: <http://www.disastermgmt.bih.nic.in/Reports/Ward%20Disaster%20Management%20Plan.pdf> retrieved on 25 June09.

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.

Duration : 60 min

Methodology

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

Teaching/Performance Aids

2.1.1 Handout of presentation

2.1.2 Case Study sheet

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 <ul style="list-style-type: none"> - 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
Risk sensitive Urban Planning	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

Learning Unit 2.2: Environmental Impact on Urban Risks

Purpose and Scope

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.

Description of the Session

“Disasters and conflicts can impact the environment in ways that threaten human life, health, livelihoods and security. Disaster managers and humanitarian workers must therefore identify and address acute environmental risks quickly and consistently as an integral part of effective emergency response.”

John Holmes,
Under-Secretary General for Humanitarian Affairs and
Emergency Relief Coordinator

“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. According to the data given by 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. Only 72 Indian cities have partial sewerage facilities. 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/db900SID/ACOS-64C2G4?OpenDocument>

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 mitigation is important for sustainable development

- Identify ways of addressing environmental concerns in urban development practices.

Duration : 60 min

Methodology

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

Teaching/Performance Aids

2.2.1 Handout of presentation

2.2.2 Case Study sheet

2.2.3 Flipcharts/Exercise Sheets

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
Environment & Disasters - The Intrinsic Relationship - Disasters cause environmental concerns - Degraded environment affects disasters - Urban environment	Use a ppt to consolidate thoughts and ideas and underscore the disaster-environment relationship	20 min
An Environmental Disaster Case Study Philippines Trash Slide	Discuss the disaster from an environmental point of view	20 min
Buzz Group Activity Environmental Impact of Tsunami	Group activity	20 min

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

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

Purpose and Scope

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.

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

Learning Objectives

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

Urban Risk Impact: Issues & Concerns

- 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 mitigation of risks through effective utilisation of transportation sector.

Duration : 40 min

Methodology

- Powerpoint presentation
- Discussion

Teaching/Performance Aids

2.3.1 Handout of presentation

2.3.2 Flipcharts/Exercise Sheets

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:

Contents	Trainers' Note	Duration
Role of Transportation Sector in Urban Development	PPT	20 min
Urban Disaster Risks vis a vis the transportation sector	PPT and wrap up in a discussion mode	20 min

Learning Unit 2.4: Urban Health Issues for Disaster Risk Reduction

Purpose and Scope

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.

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 predisaster 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 1/3rd 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.

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.

Duration : 60 min

Methodology

- Interactive Powerpoint presentation

Teaching/Performance Aids

2.4.1 Handout of presentation

2.4.2 Flipcharts

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

Urban Risk Impact: Issues & Concerns

Contents	Trainers' Note	Duration
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.

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

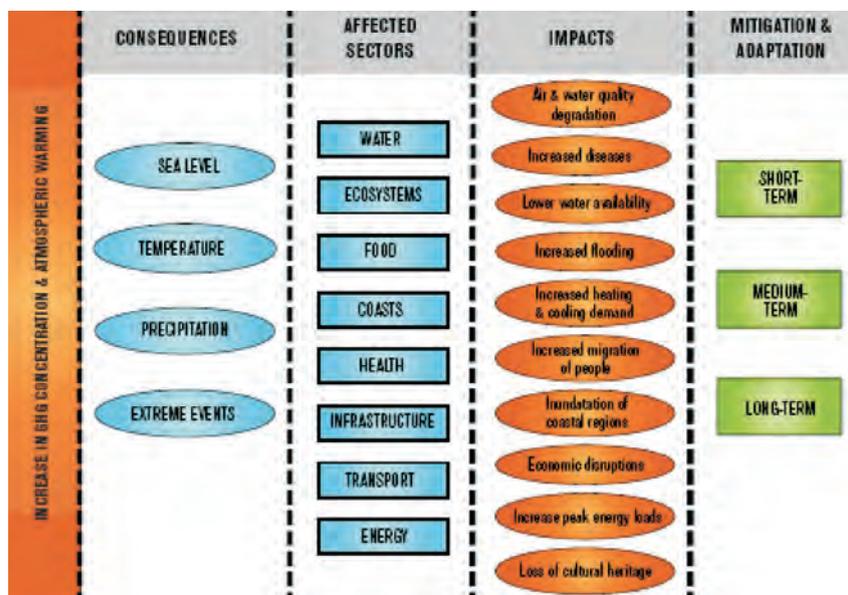
Purpose and Scope

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.

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.² 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 6.4C 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.

² Excerpted from a message by Ms Margareta Wahstrom, Special Representative of the Secretary General for Disaster Risk Reduction, on the occasion of launch of "Making Cities Resilient" Campaign for South Asia, New Delhi, 8 June 2010.



Source: Climate Resilient Cities, 2008 Primer

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.

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.

Duration : 60 min

Methodology

- Powerpoint Presentation
- Discussion

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)

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.

Suggested References

1. Asian Cities Climate Change Resilience Network (2009): Responding to the Urban Climate Challenge (can be downloaded from <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

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.

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 Safety

Learning Unit 3.4: Earthquake Risks: Non-Structural Mitigation Measures

Learning Unit 3.5: Urban Flooding: Learning Lessons through Time

Learning Unit 3.6: Urban Fires: Inevitable or Preventable?

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 risks in India
- 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

Duration: 6 hours, 360 min.

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.

Trainers' 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

Purpose and Scope

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.

Description of the Session

Governance refers to the process whereby elements in society wield power and authority, and influence and enact policies and decisions concerning public life, and economic and social development. Governance is a broader notion than government. Governance involves interaction between these formal institutions and those of civil society. (*The Governance Working Group of the International Institute of Administrative Sciences 1996*). The national and local governments are stakeholders in both risk reduction and development process. In reality, one cannot be seen as separate from the other as development is sustainable only in a disaster resilient society.

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. 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.

Growing urbanization denotes growing risks that call for concerted action at the local level, focused on risk analysis of the community. Mainstreaming of DRR into urban governance framework requires a multi-hazard, multi-sectoral and multi-layered approach. Given the large number of stakeholders and roleplayers in an urban setting, all connected to a complex system of networks and risks, an inclusive system with synergic links to all sources is the need for success of mainstreaming. Therefore slum relocation would transcend from a mere urban development initiative to a less vulnerable location for slum dwellers. Similarly, rainwater harvesting or waste recycling would have environmental as well as risk reduction implications as well.

In recent years, there have been some efforts towards mainstreaming of DRR into regular development activities. The Tenth Five Year Plan recognized disaster management as a development issue for the first time. The Plan devoted a separate chapter on Disaster Management and made a number of operational suggestions. The Eleventh Five Year Plan follows similar sentiments and emphasized on projects and programmes that develop and nurture safety of the community and integration of disaster prevention and mitigation into the development process. The Plan emphasized the need to analyze development projects from a DRR perspective and incorporate risk reduction into development and poverty alleviation programmes.

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 74th CAA. Therefore, urban disaster risk reduction strategies can be laterally incorporated into the city and regional plans.

Learning Objectives

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

- Discuss the need for mainstreaming DRR into development initiatives to enable safe development

- Discuss various initiatives at the national and state levels for urban development and disaster risk reduction
- Identify ways of mainstreaming DRR into urban development plans and programmes in their respective states.

Duration : 45 min

Methodology

- Interactive Panel Discussion

Teaching/Performance Aids

2.5.1 Handouts of 74th Constitutional Amendment Act, 1992

Trainers' Note & Session Plan

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.

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

Purpose and Scope

The techno-legal framework in terms of regulations, bye-laws and guidelines are the mainstay of the urban governance structure. They aid implementation of urban governance. This session focuses on the enabling mechanisms for urban development. The aim of this session would be to identify the regulatory mechanisms and their significance in urban risk mitigation.

Description of the Session

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

Safe constructions for engineered structures are governed by the National Building Code (2005). **National Building Code is a document containing standardized requirement for the design & construction of most types of building in the country.** The Code was first published in 1970 at the instance of Planning Commission and then revised in 1983. Thereafter three major amendments were issued, two in 1987 and the third in 1997. A series of natural calamities and developments in the field of building construction resulted in revision of the NBC and it was brought out as the National Building Code 2005. Formulated by the Bureau of Indian Standards, the NBC spells out new regulations for safe building practices. It contains mainly administrative regulations, development control rules and general building requirements, fire safety requirements, stipulations on use of materials, structural design and construction and building and plumbing services. (<http://www.commonfloor.com/articles/tag/india-national-building-code>). IS 1893 suggests the criteria for earthquake resistant design of structures while IS 4326 defines the Code of Practice for Earthquake Resistant Design and Construction of Buildings.

The Ministry of Home Affairs has also issued model building by-laws for town and country planning legislation and development control legislation in 2004 and 2006 wherein the municipalities and city development authorities all over the country have been advised to make necessary changes in their respective regulations in accordance with the model laws. The states have also been requested to incorporate natural hazard mitigation, while formulating

development plans at various levels like perspective plan, development plan, zonal development plan and area plan. Additional provisions for formulating regulations for landuse zoning and development control/building regulations for natural hazard mitigation have been recommended.

The National Guidelines for management of Earthquakes developed by the National Disaster Management Authority (NDMA) is based on six pillars of management as given:

- Earthquake resistant construction of new structures
- Selective Seismic Strengthening and Retrofitting of existing priority structures and lifeline buildings
- Regulation and enforcement
- Awareness & Preparedness
- Capacity Building
- Emergency Response

Over the years, urban development programmes have focused on improving the quality of life particularly of the urban poor. From provision of urban basic services, slum upgradation, development of small and medium towns and counter-magnets the programmes were geared towards “development”. That urban safety is an integral part of urban development needs to be understood and activated at all levels of planning and implementation. The Jawaharlal Nehru National Urban Renewal Mission (JnNURM) with a total investment of about Rs 55,000 crores has identified 63 cities for urban renewal. Of them, 8 cities are in seismic Zone 5 (Very High Damage Risk), 14 in seismic Zone 4 (High Damage Risk) and 24 are in seismic zone 3 (Moderate Damage Risk). With respect to cyclones, 7 coastal cities face very high damage risk and 5 cities face moderate to high damage risk. 10 cities are in very high damage risk to landslides. Redevelopment of inner city/core areas, sanitation and waste management, heritage development, preservation of water bodies and landslide management are some of the mission objectives focusing on disaster risk reduction and urban safety.

The Delhi Master Plan (MPD) 2021 has, in an attempt to evolve an inclusive development model included disaster management as an important part of its vision. The MPD 2021 envisages setting up of Disaster Management Centres in each administrative zone, landuse zoning according to micro-zonation and developing building regulations as per seismic zone for safety purposes. These measures, though small, would be instrumental in promoting urban safety.

Learning Objectives

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

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

Duration : 45 min

Methodology

- Interactive Panel Discussion

Teaching/Performance Aids

1.1.1 Handouts of NDMA Guidelines, JNNURM outline

1.1.2 Summary of Recommendations of MPD 2021

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 What is techno-legal regime? How does it promote urban development?	Use a ppt to consolidate thoughts and ideas. Take inputs from participants	10 min
Regulatory mechanisms NBC Bye-laws and codes Guidelines Programmes	Give a brief overview of the mechanisms in place	20 min
III. New Initiatives Model bye-laws 2004 MPD 2021	Give a brief overview followed by discussion on the session.	15 min

Learning Unit 3.3: Earthquake Risks: Mitigation Framework for Structural Safety

Purpose and Scope

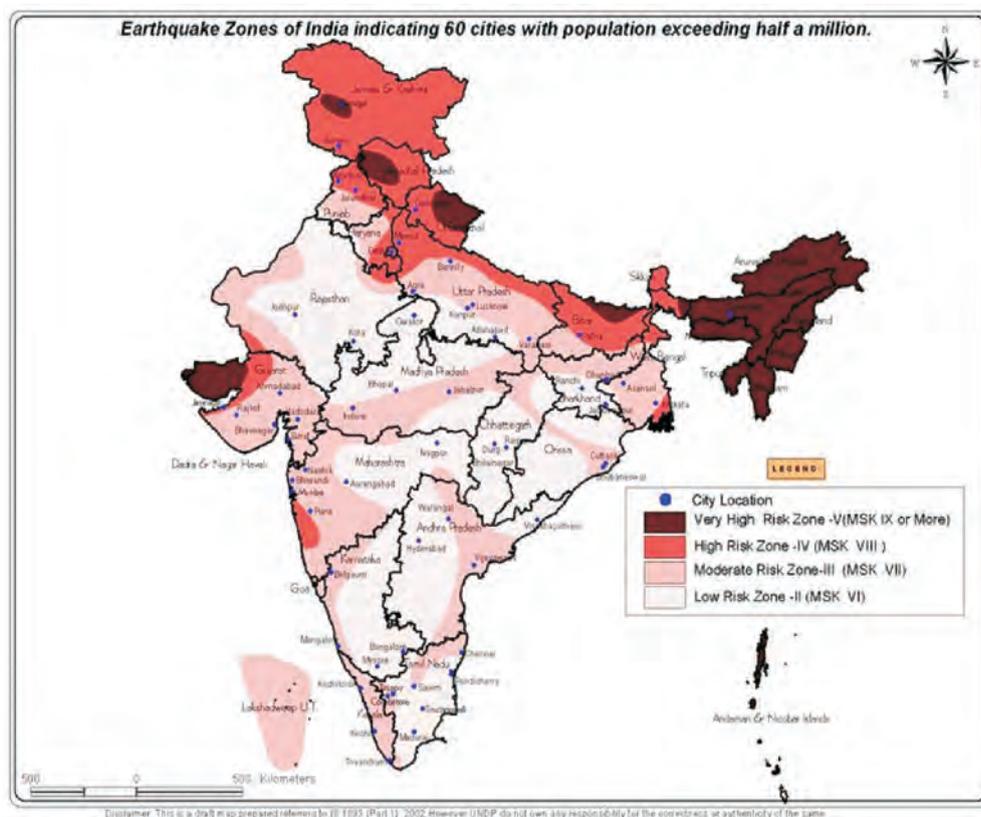
Nearly 60% of the country is vulnerable to earthquake hazards. Most urban areas, with growing population, unplanned human settlements and unsafe building practices exacerbate the existing vulnerability. Structural safety of buildings form a significant part of earthquake risk mitigation. As a large number of participants are expected to be involved in construction practices, this session would aim towards providing a holistic viewpoint of earthquake risks in vulnerable Indian cities, urban characteristics that increase the risk and methods of assessment and mitigation to enhance structural safety. This session will build upon the issues raised in session 2.1 and show how earthquake resistant construction practices contribute to risk reduction.

Description of the Session

South Asia is one of the most earthquake-prone regions of the world. The Hindukush Himalayas region is one of the most tectonically active regions of the world and has seen some of the worst earthquakes in recorded history. Peninsular India as well as the Andaman and Nicobar Islands have major seismic fault-lines that have ruptured again and again over the centuries. A large part of the coastal areas of Bangladesh, India and Pakistan are vulnerable to underwater earthquakes, originating in Indian Ocean and Arabian Sea. During the last two decades, India experienced 6 major earthquakes that have resulted in over 23,000 deaths and caused enormous damage to housing and infrastructure. The latest seismic zone map shows that about 59% of the country's total land area is vulnerable to moderate or severe seismic hazard i.e prone to shaking of MSK intensity VII and above.¹ In addition, most Indian cities are witnessing phenomenal growth of built spaces and physical infrastructure. In this scenario, earthquake risk assessment and mitigation for structural safety is of crucial importance to ensure long-term structural safety of buildings.

According to the seismic hazard map, most of the larger cities are located in high risk earthquake prone zones. This includes the national capital and many of the state capitals. With lack of knowledge among the citizens as well as builders in addition to slack building code implementation in many cities, poor performance of urban and semi-urban buildings in earthquakes

¹ SAARC Workshop on Earthquake Risk Management in South Asia, 8-9 October 2009, Islamabad, Pakistan



is a foregone conclusion. This also points towards the need for trained professionals to design buildings according to the earthquake vulnerability of the site. As nearly 60% of the country's landmass falls under serious seismic hazards, it requires that 3 out of 5 architects must have working knowledge of disaster resistant codes and practices.

According to the Vulnerability Atlas of India, more than 80% of the houses are non-engineered constructions mainly load-bearing buildings. However, many of the RCC framed structures, constructed without any consideration to resist earthquake forces are equally at risk. Structural safety of buildings should be ensured through strict implementation of the National Building Code. A well designed building must contain 4 virtues viz. strength, stiffness, ductility and configuration respectively. While safe construction features should be incorporated at the design stage itself, for the vast number of vulnerable buildings, post-construction retrofitting measures for strengthening are imperative. A case study on the Kobe Earthquake of 1995 showed that about 54% of the deaths resulted from crush injuries and other types of physical trauma sustained in the collapse of buildings.

Learning 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 safety features that should be adopted for earthquake resistant buildings
- Describe case studies of earthquake reconstruction where structural safety features were followed.

Duration : 60 min

Methodology

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

Teaching/Performance Aids

- 1.1.1 Handouts of relevant sections of the National Building Code
- 1.1.2 Housing vulnerability data from the Vulnerability Atlas of India (according to the states that the participants belong)
- 1.1.3 Construction Guide for Household (MHA publication)

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 trainer can also take a call on devoting half of the session time on landslide risk mitigation strategies if the participants hail from landslide-prone areas of the country. The session can be divided into three major sections, as explained in the indicative session plan:

Contents	Trainers' Note	Duration
Earthquake Risk Assessment Rationale for Assessment Assessment Tools & Techniques	Use a ppt for explaining assessment techniques, consolidate the knowledge by a short exercise for 10 min	30 min
Earthquake Risk Mitigation Risk resistant construction practices Do' and don'ts of safe construction Retrofitting for existing structures	Use a ppt for initial explanation, then continue in a discussion mode with participants	60 min
Case Studies Kobe Earthquake, 1995 Bhuj Earthquake, 2001 Any other	Use films, audio recordings or pictures from earlier earthquakes to establish the issue of risk reduction	30 min

Learning Unit 3.4: Non-Structural Aspects of Earthquake Risk Mitigation

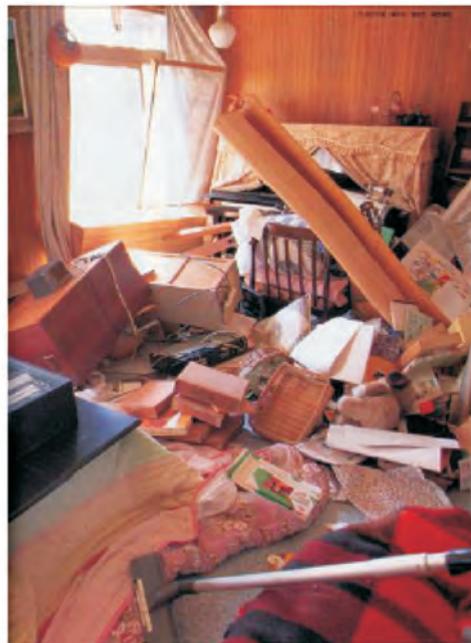
Purpose and Scope

While most of the damage in an earthquake is due to the damage to the structural elements in buildings, non-structural elements pose similar risk of casualties. A holistic risk mitigation strategy should incorporate both structural and non-structural elements. While non-structural elements may mean rules, regulations, bye-laws for supporting structural mitigation in some discourses, in the present context they refer to the architectural and electrical elements in a building as well as the building contents like furnishing and equipment. These elements often result in casualties and serious injuries during earthquakes.

Description of the Session

Architectural elements, electrical systems and building contents make up the non-structural elements in a building. A building need not necessarily fail to inflict casualties. Architectural elements comprise of cladding, veneer, windows, pipelines, infill and partition walls, parapets and cornices, stairways, chimneys, suspended ceilings, canopies and walkways, water towers and tanks, pipes etc. Electrical systems include lighting, heating and air-conditioning systems, elevators, escalators, transformers etc while all furnishing and equipment make up the building contents. Failure of any one component during a disaster can cause serious injuries. A study conducted after the Kocaeli Earthquake in Turkey (1999) showed that structural elements induced injuries affected 40% of the total injured while 50% of the injuries were caused by non-structural elements. Only 10% of the total injuries were the result of combined failure of structural and non-structural elements, thereby underlining the need for comprehensive non-structural mitigation strategy. Failure of non-structural elements can result in injury, blocked exits hampering rescue, destruction of assets, records, fire risks due to spillage/leakage of hazardous chemicals/gases etc. An undamaged building may also be rendered unusable due to failure of non-structural elements during disasters.

The key strategy for risk mitigation from non-structural elements lies in objective assessment of the risk. Risks in schools (blackboards, furniture, overhead fittings, chemicals in laboratories etc) would be different from those in hospitals (hospital equipment, storage facilities, operation areas, medical equipment etc) and homes. Therefore assessing the risk objectively would pave the way for reducing them subsequently. Primarily, relocation of risky elements is recommended; however, if relocation is not possible,



The Building need not collapse for an Earthquake to cause losses.

anchorage, bracing and restraining measures against shaking should be taken up. The construction process of buildings should accommodate for deformation wherever there is differential motion like providing flexibility to pipes, ducts, and conduits between buildings or across joints, attachment to equipment and tanks and partitions. In addition, preparedness planning with pre-defined roles and responsibilities for each user should be ready, with regular monitoring and updating. Similarly, in households assessment of structural and non-structural risk should precede mitigation measures for increasing safety during disasters.

Learning Objectives

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

- Describe the non-structural risks in buildings of different usage.
- Discuss the rationale for reducing risks from non-structural elements.
- Describe the basic mitigation measures that can be taken for anchoring or bracing of risky elements in a building.
- Discuss the need and basic elements of household preparedness planning.

Duration : 60 min

Methodology

- Interactive Lecture
- Short films
- Group Exercise

Teaching/Performance Aids

III.0.1 Non-Structural Risk Reduction Handbook for Schools

III.0.2 Reducing Earthquake Risks in Hospital

(both available for free download at www.geohaz.org or www.geohaz.in)

Trainers' Note & Session Plan

The session follows from the earlier session and should build up on it. The main intent of the session would be to draw the attention of trainees towards everyday risks at home, office or school. This session has to be designed and conducted from a non-technical point of view so that it underlines the grave risks faced in everyday situations and locations, which are normally considered to be safe havens. Therefore this session should be conducted in an interactive manner, with examples and cases from real life. The session could start with an animated video of a disaster, focusing on non-structural damage and then reiterate the issue through a powerpoint-aided lecture. It should be noted that this session should focus on the risks and follow through to identify key mitigation strategies for non-structural risks. The session should be designed to convey the key message of individual initiatives at home or at the workplace for reducing risks that involve relocation or strengthening of risky elements. It should appeal to the issue of personal contribution to the cause of risk mitigation through simple changes or modifications in living space.

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

Contents	Trainers' Note	Duration
Short Film/Animation on Non Structural Elements at risk from earthquakes	Use the film to underline the risks from non-structural elements; start a discussion, elicit comments and observations from participants	5 min for film and 5 min for discussion
Non-Structural Risks and Mitigation Strategies	Powerpoint presentation in a lecture and discussion mode	30 min
Group Exercise	Analysis of non-structural risks and mitigation strategies	20 min

(Note: An option for group exercise is enclosed, however, it can be freely modified or changed according to the situation or participants' demand).

Group Exercise 3.2.1

Group 1

1. Examine the training hall and identify the elements that pose a non-structural risk to the people present.

2. Discuss and identify the measures that need to be taken to reduce the assessed risk

Group 2

1. List the non-structural elements at risk in a kitchen/cafeteria.

2. Prepare a household plan for non-structural risk mitigation.

Learning Unit 3.5: Urban Flooding: Learning Lessons through Time

Purpose and Scope

Floods are an important part of urban catastrophic events, occurring almost annually in some cities. Though coastal and riverine cities face greater flood risks than those located inland, urban flooding by itself assumes importance because of the anthropogenic factors associated with it. Urban flooding is the interplay of various natural and human factors within the urban development scenario and needs a holistic interpretation of the cause and effect of all the factors.

Description of the Session

Floods are often described as a high-water stage in which water overflows its natural or artificial banks onto normally dry land, such as a river inundating its floodplain. They generally occur when peak discharge exceeds channel capacity; which may be brought about naturally by intense precipitation, snow- and ice-melt, storm surges in coastal regions, and the rifting of barriers, such as ice dams; or by the failure of man-made structures, by deforestation, urbanization, which reduce infiltration, and by engineering works, such as land drainage and the straightening and embankment of rivers.

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 over-exploitation 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.

The Mumbai Floods of 26 July 2005 was an example of a natural disaster, aggravated by faulty development decisions. On July 26-27 2005, unusually heavy rains battered suburban Mumbai and Thane, causing one of the worst floods in the history of the state. Nearly half of the annual average rainfall in Mumbai (2363 mm) was received in a 24 hour period. About 644 mm was received in the 12 hour period between 8 AM and 8 PM. While 944.2 mm of rainfall fell over Santa Cruz, only 73.4 mm fell at Colaba within the city limits. Suburban Mumbai thus faced the brunt of the floods while Mumbai city was considerably less affected. High tides aggravated the flood conditions as the water could not recede from the city. Water levels rose rapidly within 3-4 hours, submerging roads and railway tracks. One third of the city got flooded; the metropolis was practically cut off from other parts of the country. According to the Govt of Maharashtra, 447 deaths were reported in Mumbai and 180 in Thane. In Mumbai deaths occurred due to drowning, landslides (116), stampede due to tsunami rumour (24), trapped in vehicle and suffocation (16) and house collapse (70).

The sudden floods that caused the city of Mumbai to grind to a halt for days have brought major developmental issues to the fore. It is possible to see the flood as a symptom of development gone awry. In the last few decades, the pressures of population and soaring demand for real estate resulted in unplanned and uncontrolled development, even by the government agencies. In the last two decades, huge real estate development projects have been taken up in the northern suburbs without comprehensive planning. 900 plots earmarked as green areas were dereserved to make way for construction purposes, 730 acres of mangrove were filled for Bandra-Kurla Complex, widening of roads without studying the environmental implications and construction of flyovers have resulted in interruption of the natural drainage system, leading to floods. The city has been surviving on a century old drainage system, built during the British era. The problems of river diversion have greatly impacted the flow of Mithi river. Diversions carried out for development of Bandra-Kurla Complex have affected natural flow of river.

The floods have shown us that such development is unsustainable and the costs (human, ecological, social and economic) are too much for the nation to bear. While on the one hand, the natural ecosystem balance has been systematically destroyed in the name of high-profile projects and development, the vulnerable poor, having been forced to settle on the river banks, have sought to enhance their living space by systematically dumping garbage, choking the river and subsequently encroaching on it. The natural system, fragile to begin with, has thus borne the brunt of the powerful as well as the most vulnerable. Human

actions, from design of airports and commercial complexes to the seemingly innocuous action of throwing a plastic wrapper on the road or railway track after enjoying peanuts have serious implications on risk reduction. State-of-the-art technology notwithstanding, community oriented awareness and sensitization efforts are required for translation of the public resilience into risk reduction. This makes it imperative that disaster risk reduction gets inculcated in the popular ethos and practices as a Culture of Prevention

Learning 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.
- Identify few actions at the household level as a mitigation strategy

Duration : 75 min

Methodology

- Interactive Lecture
- Case Study of Mumbai Floods 2005 (or any other city)
- Group Exercise

Teaching/Performance Aids

III.0.1 Handouts/ session notes from the trainer

III.0.2 Urban flooding case studies of other cities

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 keeping with the tenor of the earlier sessions, this also should incorporate the message of individual responsibility of the citizens, in terms of risk mitigation. Community level or household level actions can have a significant impact on

the city's development, if pursued by many. The session can be wrapped with two key messages of risk sensitive development and local level actions for risk mitigation.

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 Mumbai Floods 2005 Surat 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 3.6 : Urban Fires: Inevitable or Preventable?

Purpose and Scope

In a rapidly growing urban scenario, fires are perhaps the most frequent of events, often turning into major disasters. Fires are man-made disasters, which can occur as a consequence of a natural disaster like earthquake (eg Kobe earthquake 1995) or as an individual disaster. Fires have been the cause of destruction of many cities like Rome (64 AD), London (2-5 September 1666), San Francisco (1906, earthquake induced), Boston (1872) and Chicago (1871). In recent years in India, the Uphaar Cinema Fire (1997), Meerut Fire (2006), Kumbakonam School Fire (2004) and Stephen Court Fire in Kolkata (2010) bring to the fore the great risks from urban fires and the need for preventive action.

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 Delhi and Kolkata, population density in some areas often exceed 150,000 p/sq. Km; for example, the Walled City of Delhi has a density of 166,300 p/sq. Km. 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 India are estimated to be more than Rs 1200 crores annually. The primary causes of fire are carelessness and apathy that ignite the initial spark of a conflagration. According to data compiled by the Delhi Fire Service, maximum number of fire accidents occurs due to short-circuiting or faulty electrical appliances. The following table shows the fire incidences in Delhi.

Table 3.4.1 Major Causes of Fires in Delhi

Electrical short circuit	70.4%
Human carelessness	18.37%
Overheating	1.73%
Fire Works	1.68%
Unknown Causes	1.49%
Naked Flame	4.59%
Intentional	0.90%
Miscellaneous	0.84%

Source: Delhi Fire Service

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.

Prevention and mitigation of fire risks depends on a critical risk assessment followed by preparedness and risk reducing measures. Major preventive measures in high rise buildings may be listed as the following structural and non-structural measures:

Table 3.4.2 Fire Prevention & Mitigation Measures

Structural	Non Structural
Strict adherence to all safety measures Building by-laws wrt to Fire Fighting & Safety Standards	Implementation of Fire Order - role & responsibility of occupant
Building to have proper Emergency Exit	Ensuring Good House Keeping - Occupant participation
Escape route to be properly marked	Careful smoking
Building to have Fire Ring main & network of Hydrant & Water Monitor	Careful use of Hazardous product like LPG & SKO by occupants
Building to have smoke /Fire detector	Use of BIS make Electrical appliance & Electrical fittings
Provision of Automatic Fire Siren System	Keeping means of Escape hindrance free
Dedicated Under Ground/Over ground Fire Water Tank & automatic Sprinkler	Evacuation Drill on regular Interval
Portable Fire Extinguisher	Regular Training of fire & Safety to occupant
Provision of Hose Reel	Regular Maintenance of Fire Safety Equipment
Lightning protection	Display of Important Telephone Numbers
Reticulated or piped gas Supplies of <u>LPG/PNG</u>	

Source: Delhi Fire Service

Urban Fire Hazards demands a shift from Fire Fighting to Fire prevention by ensuring enrollment of all partners (Community, Administration, Occupant, Fire Department) & to identify Vulnerable areas/activities, assessing Fire Risk & making Fire Safety an integral part of Town Planning & Building Design to avoid heavy Human & Financial Losses.

Learning Objectives

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

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

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

Methodology

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

Teaching/Performance Aids

III.0.1 Do's and don'ts of fire prevention in households

III.0.2 Firefighting equipment for demonstration

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 Delhi, for example, the HAZMAT vehicle, acquired for handling chemical fires are of special importance.

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

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.

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

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

Duration: 7 hours, 420 min. preferably completed in 1 day.

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.

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 landuse (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

Purpose and Scope

Most urban areas in India 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.

Learning 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

Duration : 240 min

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?

Teaching/Performance Aids

4.1.1 City Maps (Eicher or Googlemaps)

4.1.2 Introductory Note on the Study Area

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

Purpose and Scope

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.

Learning 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

Duration : 180 min

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.

Teaching/Performance Aids

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

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.

MODULE 5

FRAMEWORK FOR BUILDING RESILIENT CITIES

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. The module would be arranged as follows:

Learning Unit 5.1: Community Based Urban Risk Management

Learning Unit 5.2: Technology for Urban Sustainability

Learning Unit 5.3: Framework for Resilient Cities

Learning Unit 5.4: Post-Training Evaluation and Closing

The primary objectives of the module would be to:

- Examine the role of communities for leading disaster risk management efforts.
- 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 programme

Duration: 4 hours/240 min

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.

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: Community based Urban Risk Management

Purpose and Scope

As much as the buildings and infrastructure hold a place of prominence in cities, the urban community denotes the spirit of the city. The urban community is a vibrant entity, which is a part of the risk reduction process. The aim of this session is to describe the role of the community in managing urban risks.

Description of the Session

Haphazard and unrestrained urbanization is creating multiple risks at the local or community level. Urban areas, with the inherent complexities arising out of concentration of population, economic activities and infrastructure, all functioning within a complex set of networks, cope with their own vulnerabilities and risks. Community participation is the key to effective DRR implementation. Participation of the vulnerable community in planning and implementing of activities ensures their formulation according to the specific needs of the community. Engaging the community also ensures integration of the local knowledge and capacities into the programmes (UN-ISDR 2006:5,138). Partnership with the community in implementing DRR programmes ensures ownership and sustainability of the interventions. Therefore, community has a central role in ushering in the Culture of Prevention.

In order to promote inclusive and safe development, there is a need to evolve a people-centred approach for urban disaster risk reduction. This can be possible only in an environment of partnership and ownership of interventions between the municipal administration and the community. Local level interventions should maintain relationships and interdependencies connected with communities, ecosystems and activities. A community based approach therefore should comprise of:

- Participation
- Decision making
- Partnership
- Knowledge & Information
- Continuous evaluation

Learning Objectives

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

- Explain the importance of participatory urban management

- Describe the role of a participative community for urban risk mitigation
- Discuss strategies for effective community involvement in the risk reduction process.

Duration : 60 min

Methodology

- Powerpoint Presentation
- Role play Exercise
- Group Discussion

Teaching/Performance Aids

5.1.1 Handouts/ session notes from the trainer

5.1.1 Case Studies on Community Involvement in Development - Bhagidari in Delhi

Trainers' Note & Session Plan

The session should be made as interactive as possible. A short powerpoint session on the importance of participatory management of urban risks could be followed by a role play exercise of various groups in an urban community on the issues of urban risk. This could be followed by a group discussion on the strategies for effective urban risk mitigation. An indicative session plan is given below:

Community based Urban Risk Management : Need, Role and Functions	Start with a brief introduction of urban community characteristics, followed by the role of CBUDRM	10 min
Community Interdependencies	Role play exercise followed by discussion	20 min
Group Discussion	Focus on Strategies for effective community participation for DRR	30 min

Learning Unit 5.2: Technology for Urban Sustainability

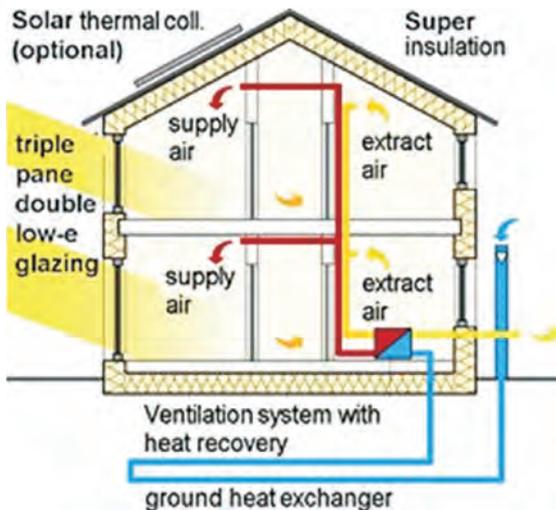
Purpose and Scope

Technology and its products have become an inherent part of the human civilization. The human mind pushes the frontiers of knowledge to look into the mysteries of nature and use the knowledge gained for creating suitable conveniences. Techniques in remote sensing, GIS, or those in new risk sensitive construction being developed, if appropriately adapted, can pave the way for sustainable urban development. This session would collate the ways in which major innovations are being used for sustainable urban development.

Description of the Session

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.

Internationally, the LEED (Leadership in Energy & Environmental Design) Green Building Ratings System is used for assessment of a building. In this system points are awarded for adopting green concepts in design and construction. A maximum of 69 points can be awarded, as per the following breakup:

• Sustainable Sites	(SS)	14
• Water Efficiency	(WE)	5
• Energy & Atmosphere	(EA)	17
• Materials & Resources	(MR)	13
• Indoor Environ. Quality	(EQ)	15
• Innovation & Design	(ID)	5

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. 8 of these 34 criteria are mandatory, 4 are partly mandatory, while the rest are optional. Each criterion has a number of points

Landscape architect	
Criteria 1	Site Selection
Criteria 2	Preserve and protect landscape during construction
Criteria 3	Soil conservation (Post construction)
Criteria 10	Reduce landscape water requirement
Architect with expertise in passive design/energy efficiency	
Criteria 4	Design to include existing site features
Criteria 7	Plan utilities efficiently and optimise on site circulation efficiency
Criteria 12	Efficient water use during construction
Criteria 15	Utilization of flyash in building structure
Criteria 16	Adopt energy efficient technology in construction
Energy analyst	
Criteria 13	Optimise building design to reduce conventional energy demand
Criteria 14	Optimise energy performance of building

Criteria 18&19	Renewable energy utilization
Criteria 33	O&M protocol for electrical and mechanical equipment
Public health engineer	
Criteria 8	Minimum sanitation and safety facilities for construction workers
Criteria 9	Reduce air pollution during construction
Criteria 29	Acceptable outdoor and indoor noise levels
Criteria 30	Tobacco and smoke control
Criteria 22	Reduction in waste during construction
Criteria 23	Efficient waste segregation
Criteria 24	Utilization of flyash in building structure
Criteria 25	Adopt energy efficient technology in construction
Plumbing engineer/MEP consultant	
Criteria 11	Reduce building water use
Criteria 20	Waste water treatment
Criteria 21	Water recycle and reuse

assigned to it. Different levels of certifications are awarded based on the total points earned, the minimum rating for which is 50.¹

The role of ICT in urban risk assessment and planning is acknowledged globally. The spatial aspect that is the mainstay of any DRR intervention is rendered expedient by the use of tools such as remote sensing and the Geographical Information System (GIS). Remote sensing, combined with GIS have proven to be important in analyzing large amounts of data with both spatial and temporal components. High resolution imagery in urban areas, coupled with required data in different layers help in pre and post-disaster assessment, modeling and mitigation initiatives. Primary datasets for assessment include geophysical, socio-economic, landuse and lifelines and services. At the urban level, modeling helps in scientific assessment for probabilistic disaster risk and impact scenarios, hazard assessment and quantifies potential loss scenarios. Dynamic downscaling of regional climate model simulations assist in formulating adaptation strategies.

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

¹ http://www.grihaindia.org/index.php?option=com_content&task=view&id=13

- Discuss use of RS & GIS technology in risk analysis in urban areas

Duration : 60 min

Methodology

- Powerpoint Presentation
- Discussion

Teaching/Performance Aids

5.2.1 Handouts/ session notes from the trainer

5.2.2 Additional information on Green Buildings rating system (if desired)

Trainers' Note & Session Plan

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.

The session can be divided into two major sections, as in the indicative plan:

Contents	Trainers' Note	Duration
Green Buildings - LEEDS - GRIHA	Use a ppt to give an overview of green buildings and the different rating systems	20 min
Discussion	Encourage discussion among participants on comparative rating systems	10 min
Role of RS & GIS in Urban DRR	Powerpoint presentation	20 min
Discussion following presentation		10 min

Learning Unit 5.3: Framework for Urban Resilience

Purpose and Scope

Objective assessment of urban risks and implementation of a mitigation framework would ultimately lead to long-term sustainable development and urban resilience. This goal can be achieved only with sustained efforts at the local, national and regional levels. The aim should be to concentrate on integrating the myriad risk issues with urban governance and development objectives to meet the goal of urban resilience.

Description of the Session²

Risk reduction in urban areas requires a multi-dimensional and multi-sectoral approach due to the many layers of physical, social and economic vulnerabilities. 65 cities in South Asia today have population of more than 1 million each, of which 5 have more than 10 million people, with 4 other cities closely following. Mumbai, Delhi, Kolkata and Karachi are expected to reach the status of 20 million people in a few years. The uncontrolled and largely unplanned growth of large cities has had negative effects on urban dwellers and their environment. The provision of infrastructure facilities and services is lagging far behind the pace of urbanization, and in consequence the urban environment, particularly in large cities, is deteriorating rapidly. The need of the hour is to manage the risks in the context of rapid urban growth and changing climate of the region, assess the critical gaps and formulate a framework for holistic risk reduction.

The framework for urban risk reduction has to incorporate all aspects of risk reduction, including assessment, microzonation, prevention, mitigation, risk pooling and transfer, preparedness, urban governance and management, citizen awareness, participation and partnerships with other stakeholders. Every city must have a sound urban risk management strategy that would prescribe:

- a. Risks that must be prevented at any cost
- b. Risks that may be mitigated to reduce the impact of disasters
- c. Risks that may be transferred to insurance or other mechanisms
- d. Risks that can neither be prevented nor mitigated nor transferred and has to be accepted

Sound City Risk Management Strategy involves determination of *Total Risks* of the city and the risks that are accepted, taking into account the level of the

² The session is based on the deliberations in the “Making Cities Resilient - My City is Getting Ready”- Launch of ISDR Campaign organized by NIDM at Vigyan Bhawan, New Delhi, 9-10 June, 2010.

risks and the resources at the command of the city to prevent, mitigate or transfer the risks. Every city must be fully prepared for the *Accepted Risks* and take all possible measures to deal with the consequences of the uncovered risks. Any gap between the *Accepted Risk* and *Preparedness* would be to leave open chance for disasters with all the consequences that it would entail. In this context, an urban risk reduction framework for a resilient city would entail:

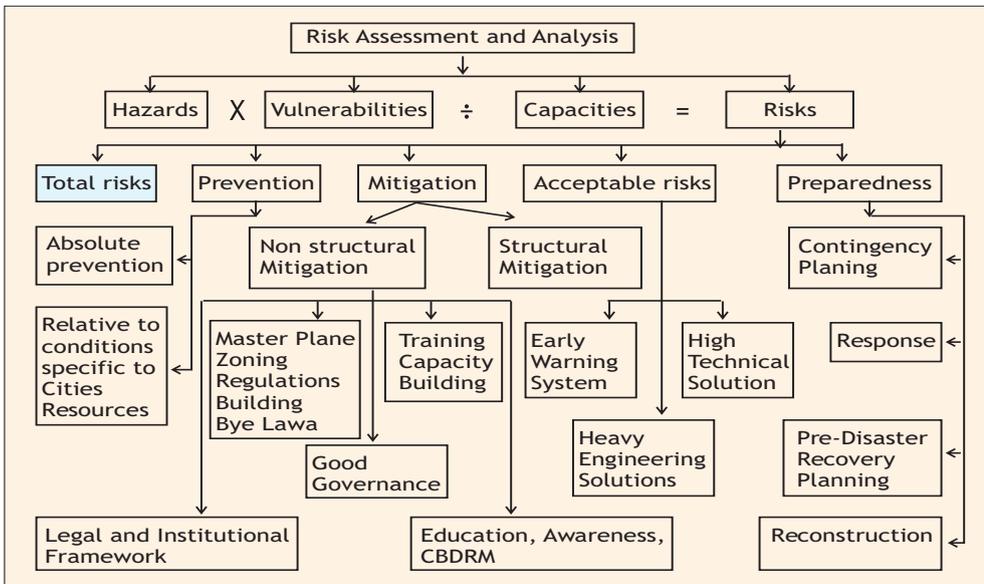


Fig 5.3.1: Proposed Framework for Urban Risk Reduction

The idea of reducing urban risks is to create a resilient city. A resilient city denotes a sustainable network of physical systems and communities. Physical systems include the roads, buildings, infrastructure, communications systems and the like while communities are the social and institutional components of the city. A resilient city requires a resilience of physical systems, operating systems, social systems, economic systems and environmental systems. **Resilient physical systems** are stable and use fail-safe design, can conduct early fault detection and take quick remedial measures, are dispersed rather than site specific, employ standardization, are composed of small, semi-autonomous units, rather than centralized at few points. **Resilient operating systems** are efficient, reversible, autonomous, and incremental. They take short lead time and have rapid response to stimuli. **Resilient social systems** involve all stakeholders, are compatible with diverse value systems, can satisfy multiple goals at the same time, distribute benefits and costs equitably and have high accessibility. **Resilient economic systems** employ incremental funding, provide a wide range of potential financial support, enjoy a high benefit-cost ratio,

give an early return on investments, and divide benefits and costs equitably. Resilient environmental systems minimize adverse impacts, and have a replenishable or extensive resource base.

Learning 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

Duration : 60 min

Methodology

- Powerpoint Presentation
- Panel Discussion

Trainers' Note & Session Plan

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 5 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.

Learning Unit 5.4: Post-Training Evaluation & Conclusion

Context & Description

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.

Session Objectives

- 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

Duration: 60 minutes

Methodology

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

- i) Formal structured questionnaire - Each trainee is asked to fill up a structured questionnaire that evaluates their knowledge gained through the course.
- ii) Quiz on the course - Divide into groups and give points for correct answers. The group that wins gets a small prize.
- iii) Informal discussion/bus-stop method - 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.

Trainers' Note and Session Plan

The session should be covered in two parts; evaluation of knowledge and exit behaviour and feedback of the training. The first 30 minutes of the training should be devoted to evaluation of knowledge gained during the course of the programme through any of the methods described above. The last 30 minutes should be devoted to taking feedback from the trainees and their suggestions for more effective implementation of training in future. This can be done either through a structured questionnaire or through discussion wherein the training team notes down the suggestions of participants.

Training/ Performance Aids

Depending on the methodology chosen:

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

This successfully concludes the TRAINING PROGRAMME ON URBAN RISK MITIGATION.

A formal closing ceremony can be organized according to the protocol/tradition followed by the host organization after the conclusion of the course.

1. Glossary of Terms
2. Power Point Presentations

1. GLOSSARY OF TERMS

A list of terms, considered important for conceptual, organizational and procedural purposes for urban disaster risk mitigation:

Acceptable risk : The level of loss a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions.

In engineering terms, acceptable risk is also used to assess structural and non-structural measures undertaken to reduce possible damage at a level which does not harm people and property, according to codes or "accepted practice" based, among other issues, on a known probability of hazard

Building codes Ordinances and regulations controlling the design, construction, materials, alteration and occupancy of any structure to insure human safety and welfare. Building codes include both technical and functional standards.

Capacity A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster.

Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability.

Capacity building Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk.

In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.

Climate change The climate of a place or region is changed if over an extended period (typically decades or longer) there is a statistically significant change in measurements of either the mean state or variability of the climate for that place or region.

Changes in climate may be due to natural processes or to persistent anthropogenic changes in atmosphere or in land use. Note that the definition of climate change used in the United Nations Framework Convention on Climate Change is more restricted, as it includes only those changes which are attributable directly or indirectly to human activity

Contingency planning A management process that analyses specific potential events or emerging situations that might threaten society or the environment and establishes arrangements in advance to enable timely, effective and appropriate responses to such events and situations.

Contingency planning results in organized and coordinated courses of action with clearly-identified institutional roles and resources, information processes, and operational arrangements for specific actors at times of need. Based on scenarios of possible emergency conditions or disaster events, it allows key actors to envision, anticipate and solve problems that can arise during crises. Contingency planning is an important part of overall preparedness. Contingency plans need to be regularly updated and exercised.

Coping capacity The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster.

In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards.

Counter measures All measures taken to counter and reduce disaster risk. They most commonly refer to engineering (structural) measures but can also include non-structural measures and tools designed and employed to avoid or limit the adverse impact of natural hazards and related environmental and technological disasters.

Critical facilities The primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency.

Critical facilities are elements of the infrastructure that support essential services in a society. They include such things as transport systems, air and sea ports, electricity, water and communications systems, hospitals and health clinics, and centres for fire, police and public administration services.

Disaster A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which

exceed the ability of the affected community or society to cope using its own resources.

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk

Disaster Risk Management The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) adverse effects of hazards.

Disaster risk reduction (disaster reduction) The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Early warning The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response.

Early warning systems include a chain of concerns, namely: understanding and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population, and undertaking appropriate and timely actions in response to the warn

Ecosystem A complex set of relationships of living organisms functioning as a unit and interacting with their physical environment.

The boundaries of what could be called an ecosystem are somewhat arbitrary, depending on the focus of interest or study. Thus the extent of an ecosystem may range from very small spatial scales to, ultimately, the entire Earth (IPCC, 2001).

Emergency management The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation.

Emergency management involves plans, structures and arrangements established to engage the normal endeavours of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management.

Geological hazard Natural earth processes or phenomena that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Geological hazard includes internal earth processes or tectonic origin, such as earthquakes, geological fault activity, tsunamis, volcanic activity and emissions as well as external processes such as mass movements: landslides, rockslides, rock falls or avalanches, surfaces collapses, expansive soils and debris or mud flows.

Geological hazards can be single, sequential or combined in their origin and effects.

Geographical Information Systems (GIS) Analysis that combine relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programmes for capturing, storing, checking, integrating, analysing and displaying data about the earth that is spatially referenced.

Geographical information systems are increasingly being utilised for hazard and vulnerability mapping and analysis, as well as for the application of disaster risk management measures.

Hazard A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity, frequency and probability

Hazard analysis Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behaviour.

Land-use planning Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions.

Land-use planning involves studies and mapping, analysis of environmental and hazard data, formulation of alternative land-use decisions and design of a long-range plan for different geographical and administrative scales.

Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion, and in the siting of service routes for transport, power, water, sewage and other critical facilities.

Mitigation Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Preparedness Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education, related to disaster risk reduction changing attitudes and behaviour contribute to promoting a "culture of prevention".

Public awareness The processes of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster.

Public awareness activities foster changes in behaviour leading towards a culture of risk reduction. This involves public information, dissemination, education, radio or television broadcasts, use of printed media, as well as, the establishment of information centres and networks and community and participation actions.

Recovery Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

Recovery (rehabilitation and reconstruction) affords an opportunity to develop and apply disaster risk reduction measures.

Relief / response The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term, or protracted duration.

Resilience / resilient The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Retrofitting (or upgrading) Reinforcement of structures to become more resistant and resilient to the forces of natural hazards.

Retrofitting involves consideration of changes in the mass, stiffness, damping, load path and ductility of materials, as well as radical changes such as the introduction of energy absorbing dampers and base isolation systems. Examples of retrofitting include the consideration of wind loading to strengthen and minimize the wind force, or in earthquake prone areas, the strengthening of structures.

Risk The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions.

*Conventionally risk is expressed by the notation
Risk = Hazards x Vulnerability. Some disciplines also include the*

concept of exposure to refer particularly to the physical aspects of vulnerability.

Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.

Risk assessment/analysis A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios.

Structural / non-structural measures Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure.

Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.

Sustainable development Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of “needs”, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and the future needs. (Brundtland Commission, 1987).

Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction.

Technological hazards Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills).

Urban Settlements or localities defined as “urban” by national statistical agencies.

Urbanization The process of transition from a rural to a more urban society. Statistically, urbanization reflects an increasing proportion of the population living in settlements defined as urban, primarily through net rural to urban migration. The level of urbanization is the percentage of the total population living in towns and cities while the rate of urbanization is the rate at which it grows.

Urban growth The increase in the number of people who live in towns and cities, measured either in relative or absolute terms.

Natural increase *The difference between the number of births and number of deaths in a given population.*

The urban transition *The passage from a predominantly rural to a predominantly urban society.*

Vulnerability The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

2. Powerpoint Presentations

Note: The powerpoint presentations included here are excerpts from presentations of resource persons and experts invited to lead sessions on various aspects of Urban Risk Mitigation. However, these are not exhaustive, but merely indicative and should be taken as guidance tools for training in Urban Risk Mitigation. NIDM and the author are not responsible for originality or authenticity of the content presented.

1.1



From DM to DRR: An Overview

Disasters: What are they...?

- Origin from French word DESASTRE
 - Meaning 'bad star'
- Sudden or great misfortune... calamity (Concise Oxford Dictionary)
- Sudden calamitous event producing great material damage and distress (Webster)

The Traditional Thinking

- Traditional concerns considered disasters as "interruptions" in normal functioning
- Disasters seen in the context of emergency response
- Development programmes as "peace-time" operations.
- Development programmes not assessed in the context of disasters.
- Communities under disaster stress were considered too turbulent for development initiatives.

As a result...

- We waited for disasters to strike...
- Impact
 - Loss of valuable resources (human, economic)
 - Disruption of economic activities
 - Loss/disruption of livelihood
 - Adverse effect on investment climate
 - Loss of years of development benefits.
 - Political destabilization

Devastations



Muzaffarabad Earthquake 2005

Destructions



Orissa Super Cyclone 1999

Damages



Kobe Earthquake 1995



Japan Tsunami March 2011

Sufferings



Nepal- Bihar Flood 2008

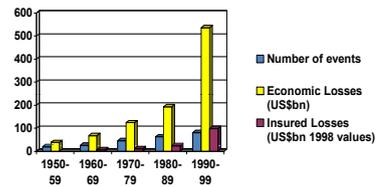


What did we do?

- We managed the event:
 - Food & medical aid
 - Basic dry/wet rations
 - Special needs for vulnerable groups were rarely met
 - Govt led, allegations of inequitable distribution
 - Relief Camps
 - Basic facilities
 - No standards for individual/private space
 - Reconstruction
 - To the same condition as it was before the disaster struck

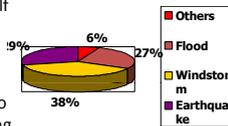
So disasters continued to happen...

Disasters 1950-99



Some facts...

- About 250 great natural catastrophes struck in the later half of the 20th century.
- They claimed about 1.4 million lives
- 90% casualties due to windstorm or flooding



The Global Agenda...

- 1989: UN General Assembly announces International Decade for Natural Disaster Reduction (IDNDR,1990-1999) – promotion of disaster reduction, technical and scientific innovations for disaster management
- 1994: First World Conference on Disaster Reduction:
 - Global Culture of Prevention
 - Adoption of prevention, preparedness and response
 - Promotion of regional cooperation and participation of private sector, NGOs and civil society.
 - Development and strengthening of human resources and material capabilities
 - Improved risk assessment, broader monitoring and communication of forecasts

Major disasters during IDNDR

Year	Country/Region	Event	Fatalities	Ec Losses (US\$ million)
1991	Bangladesh	Cyclone Gorky	139,000	3000
1991	Japan, Kyushu, Hokkaido	Typhoon Mireille	62	6000
1992	USA, FI, LA	Hurricane Andrew	62	30,000
1993	Latur, India	Earthquake	9475	280
1994	US, California, Northridge	Earthquake	61	44,000
1995	Japan, Kobe	Earthquake	6348	> 100,000
1998	China Yangtze	Flood	3650	30,000
1998	Honduras, Nicaragua	Hurricane Mitch	9200	5500
1999	Turkey, Izmit	Earthquake	> 17,000	> 13,000
1999	Taiwan, Taichung	earthquake	2400	>11,000

The New Millennium

- Millenium Development Goals
 - Ending poverty and hunger
 - Gender equity,
 - Maternal & child health,
 - Education
 - HIV/AIDS prevention
 - Environmental sustainability
 - Partnership actions
- 2000: International Strategy for Disaster Reduction (ISDR) - increased public commitment and linkage to sustainable development, enlarged networking and partnerships. Institutional mechanisms: IATF/DR, ISDR secretariat, UN Trust Fund for Disaster Reduction

HFA 2005-15

- World Conference on Disaster Reduction 18-22 January Kobe, Hyogo, Japan, 2005
- Hyogo Framework for Action 2005-15
 - ✓ Ensure that disaster risk reduction is a national and a local priority
 - ✓ Identify, assess and monitor disaster risks and enhance early warning
 - ✓ Use knowledge, innovation and education to build a culture of safety and resilience
 - ✓ Reduce the underlying risk factors.
 - ✓ Strengthen disaster preparedness for effective response at all levels.

From Yokohama to Hyogo

- Disaster Risk Management: The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters.
- **Disaster risk reduction:** The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development

The Indian Approach

- ### Disasters & the Indian Ethos
- Disasters integral part of living in India
 - High profile disasters like earthquake, cyclone, flood, landslide, avalanche take heavy toll of life.
 - Silent disasters like drought, starvation, epidemics, infant & maternal mortality take even heavier toll of life.
 - Communities have learnt to cope with the disasters, but more often they are resigned to their fate
 - Similar attitude of fatalism seem to have pervaded State Policy or lack of it till the nineties.

DM in India

- Originated with drought response
 - Famine Commission 1878 AD
 - Famine Codes 1883 AD
- Post Independence
 - Under DAC, Ministry of Agriculture
 - Scarcity Relief Division
 - Natural Disaster Management (NDM) Div
- Since June 2002
 - Nodal responsibility MHA (except drought)
 - National Disaster Management (NDM) Div
 - National Disaster Management Authority



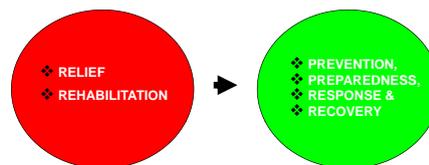
Major Natural Disasters in the country : 1990 - 2004

Major Cyclones	- Four
Earthquakes (M 6+)	- Five
1991 Oct 20 Uttarakashi	M6.6
1993 Sept 30 Latur	M6.3
1997 May 22 Jabalpur	M6.0
1999 March 29 Chamoli	M6.8
2001 Jan 26 Bhuj	M6.9
2004 Dec 26 S. India & A&N	
Severe Floods	- Every Year
Severe Droughts	- Every 2-3 year

Initiatives after IDNDR...

- The Reports of the High Powered Committee (HPC) and National Committee on Disaster Management (chaired by PM) identified wide-ranging issues and concerns.
 - Shift in focus from reactive response oriented action to proactive prevention, preparedness and mitigation oriented action.
 - Mainstreaming of Disaster Management into the development process was the major thrust of the HPC reports.
- Planning Commission accepted the need for a Safe National Development
 - A Chapter on Disaster Management incorporated in the Tenth Plan document.

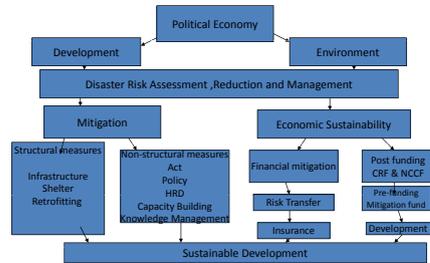
The paradigm shift



The New Paradigm

- Multi-disciplinary & multi-sectoral approach
- Incorporate risk reduction in development process to make it sustainable
 - Development cannot be sustainable unless disaster mitigation is built in the development process.
 - Objective is that hazards may be prevented from turning into disasters by taking mitigation and preparedness measures.
- Holistic mitigation spanning across all sectors of development

Framework – at a glance



Central Legislation- The Disaster Management Act, 2005

- The Disaster Management Bill, 2005 was introduced in the Rajya Sabha on 11.5.2005 and notified on December 26, 2005.
- The Act aims to put in place requisite institutional mechanism for a holistic and coordinated approach to disaster management and prompt response to any disaster situation.

Legal-institutional framework

- National Disaster Management Authority
- State Disaster Management Authority
- District Disaster Management Authority
- National Disaster Response Force
- National Response Fund
- National Disaster Mitigation Fund
- National Institute of Disaster Management

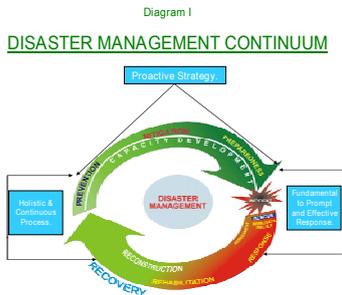
A Disaster is...

“Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence, which results in substantial loss of life or human suffering, or damage to, and destruction of, property, or damage to, or degradation of environment, and is of such nature or magnitude, as to be beyond the coping capacity of the community of the affected area.”

DM Act 2005

DISASTER MANAGEMENT

- Disaster management means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for-
 - Prevention of danger or threat of any disaster
 - Mitigation or reduction of risk of any disaster or its severity or consequences
 - Capacity building
 - Preparedness to deal with any disaster
 - Prompt response to any threatening disaster situation or disaster
 - Assessing the severity or magnitude of effects of any disaster
 - Evacuation, rescue and relief
 - Rehabilitation and reconstruction



Mitigation

The lessening or limitation of the adverse impacts of hazards and related disasters.

Preparedness

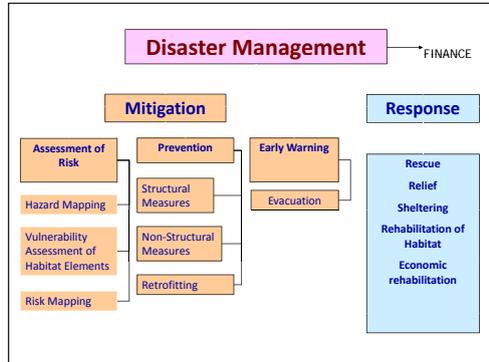
The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

Disaster risk management

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.

Disaster risk reduction

The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.



Urban Risk Mitigation – Issues & Perspectives

National Institute of Disaster Management

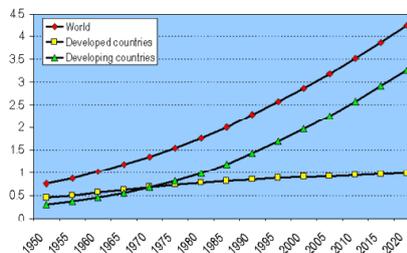
Disaster Statistics 1991-2005

- Human losses
 - About 1 million people were reported killed
 - 3.5 billion people were affected
 - about 200 million people affected per year (6times more than conflicts)
 - 600,000 people are exposed to natural hazards each day.
 - On average, about 200 deaths per day are recorded in different parts of the world.
- Economic losses were
 - Total about \$1.2 trillion
 - Average about \$120 billion per year,
- or about 300 million per day

Unprecedented Urban Growth: A Global Challenge

- 1950 -2006: Urban population of the world has increased from 739 million to 3.2 billion
- By 2025, around 65% of world's population is expected to live in cities
- By 2010, more than 75% of world's urban population will live in poorer countries (State of the World 2007)
- More than 40% of the world's children are expected to be living in polluted cities of the developing world (WHO)

World urban population



Million plus world cities

Cities	1975	2000	2015
1 million +	68	173	346
5 million +	19	38	67
10 million +	4	21	26
15 million +	2	6	14
20 million +	0	1	7



An Overview

- 31.2 per cent of India's population (377 million) live in urban areas as per 2011 census.
- Proportion of urban population is low, as compared to many other developed countries
- Urban population growth in metro cities in the past decade has been reflected higher
- By 2025 more than 50 percent of the country's population would be urban
- In India and most of the developing countries, urban development is mostly uncontrolled and unplanned.

Types of Cities & Towns

- Mega cities-over 5 million (50 lakh) population
- Million or Metro cities - between 1million and 5 million population.
- Medium and small sized Cities - One lakh to below 1 million population.
- Towns- Below one lakh

Trend of urbanization

	1951	1991	2001	2021
No. of towns	2795	3768	4378	-
Urban population (million)	62.0	217.0	285.00	550.0
As % of total population	17.3%	25.72%	27.8%	41%

Urban morphology (2001 Census)

Class	Size	Number	% of total urban
Class I	100,000+	393	68.2%
Class II	50,000-100,000	401	12.0%
Class III	20,000-50,000	1151	11.1%
Class IV	10,000-20,000	1344	6.8%
Class V	5,000-10,000	888	2.6%
Class VI	- 5,000	201	0.3%

Problems of Skewed Growth

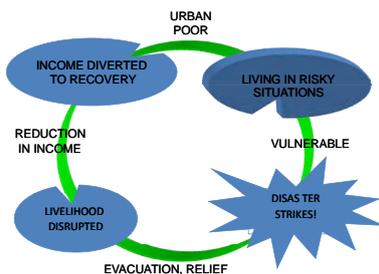
- Top heavy growth
 - Class I cities are growing faster than smaller cities
- Asymmetrical growth:
 - Total towns increased from 1827 in 1901 to 4368 in 2001.
 - 1 lakh+ towns have increased from 24 in 1901 to 393 in 2001
- Stagnation at the bottom
- Shadow growth: Suburbanization

Concerns

- Skewed growth leads to inequity and serious social and environmental imbalances
- About 25.7% urban population live BPL
- Urban planning has tried density control through physical planning, but failed to check in-migration or address the issue of basic services
- High level of inequity in provision of basic services, poor pushed to the periphery.



LET US BREAK THIS CYCLE!



Urban risks Facets and dimensions

What is risk?

Risk is the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions.

$$\text{Risk} = \text{Hazards} \times \text{Vulnerability} - \text{Capacity}$$

DISASTERS IN URBAN AREAS

- ✓ **Impact magnified**
(concentration of people, buildings, activities, infrastructure)
- ✓ **Complex Emergencies**
- ✓ **Multiplicity of authorities**
- ✓ **Low Awareness levels**
- ✓ **Community capacities untapped**

Urban risk factors

- Location of towns in hazard maps
 - Seismic – flood - cyclonic – landslide zone
- Types of constructions
 - Engineered - non-engineered - structural safety
 - non-structural elements - fire safety
- Human development
 - Poverty - education - health
- Infrastructure
 - Drainage - road - solid waste management
 - water - sewerage - power - hospitals - fire brigade
- Crime, public order, terrorist violence
- Urban governance

Urban earthquakes

“With few exceptions (Tokyo 1923; Tangshan, 1976), recent large earthquakes ($M > 7.5$) have spared the world's major urban centers. This will not persist indefinitely. In the next millennium several mega cities will be damaged by significant earthquakes. We are most certain of the fate of those cities near plate boundaries, however, mid-continent earthquakes also occur, albeit infrequently (c.f. $M > 8$ events in the eastern US and India in the early 18th century), and these events will wreak great havoc in mid-continent cities where earthquake resistant construction is not mandated”.

Bilham, R., Earthquakes and Urban Growth, *Nature*, 336, 625-626, 1988.

Urban flooding

Natural : heavy rainfall in cities and catchments areas

Manmade : unplanned growth, dam discharge, paved surfaces > low infiltration > faster run off, inadequate drainage



Cyclones in coastal cities



Urban landslide



Urban epidemics

- Supply of safe potable water and sanitation arrangements are two biggest challenges of cities in developing countries
- Problem is compounded by inadequate solid waste disposal system
- Result is poor public health standard, often reflected in epidemics like cholera, malaria, plague etc



Chemical disasters

Bhopal gas tragedy

- 2,000 people died immediately
- Another 13,000 died next fifteen years
- 10-15 persons dying every month
- 520,000 diagnosed chemicals in blood causing different health complications
- 120,000 people still suffering from
 - Cancer
 - Tuberculosis
 - Partial or complete blindness,
 - Post traumatic stress disorders,
 - Menstrual irregularities



Terror attacks



Nuclear and biological disasters

- Cities of the world, particularly large cities are increasingly getting exposed to nuclear threats
- Threats of pandemics like avian flu and human induced biological disasters are also looming large



Slow onset disasters?...

- Air pollution and mobility crisis
 - Vehicular pollution
 - Congestion costs
- Solid Waste Disposal
 - 120,000 tonnes of garbage daily in Indian cities
 - Limited disposal, recycling culture
 - Waste to energy remains a non-starter
- Water: Per capita water supply ranges from 9 lpcd to 584 lpcd in Indian cities
- Energy crisis
- Land constraint: Urban sprawl

Urban risk mitigation Approaches and issues

Prevention and Mitigation : Structural and non-structural

Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure.

Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.

Each of the urban disasters have specific structural and non-structural measures for mitigation

Preparedness

- Early Warning System
- Pre-Disaster Planning
 - Search and rescue
 - Evacuation
 - Temporary shelter
 - Emergency medical relief
 - Caracac disposal
 - Debris disposal
 - Damage assessment
 - Restoration of utilities
- Standard Operating Procedure defining role and functions of each agency and individuals
- Training and re-training
- Mock drills

Our goal

- We can not prevent natural hazards and the risks associated with these hazards, since these are endemic to our geo-climatic conditions
- We can not altogether prevent natural or man made disasters since there are complex web of factors which can not always be anticipated even with best of structural and non-structural mitigation measures
- But we can certainly make efforts to keep the impact of disasters to its minimum, so that cities are able to cope with it with minimum adverse effects.
- **Our goal is to make our cities resilient** – they may bend for some time, but they should never break down.

How to do it?

- Make communities aware of their risks
- Encourage local initiatives of RWAs etc
- Take up urban CBDRM programmes
- Make local level disaster preparedness plans
- Involve schools in safety programmes
- Involve hospitals, civil defence, fire service
- Take up innovative Public-Private-Partnership in disaster risk reduction

Planning and Structural Mitigation Issues – Need for Synergy

Indian Institute of Public Administration

Environmental Issues

- Understanding Urban Environment
- Carrying Capacity of a City
- Sustainable Urban Development

Understanding Vulnerability

- Potential Hazards
- Physical, Economic and social Vulnerability
- Mitigation plans
- Culture of Preparedness
- Culture of Mitigation
- Culture of quick Response

Case Studies

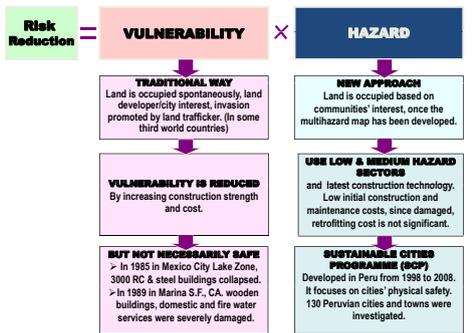
- Sustainable Urban Development in Peru
- Mitigation plan for Floods in Japan
- Sustainable Urban Development in India-Case of Surat

SUSTAINABLE CITIES PROGRAMME 1998 – 2008. RESULTS



From 11/1998 to 12/2008, 133 cities and towns with 6.4 million inhabitants have been studied. Agreements have been signed with participating local national universities: In 10 years some 80 consultants have been trained on the job.

NEW APPROACH TO REDUCING THE RISK OF DISASTER



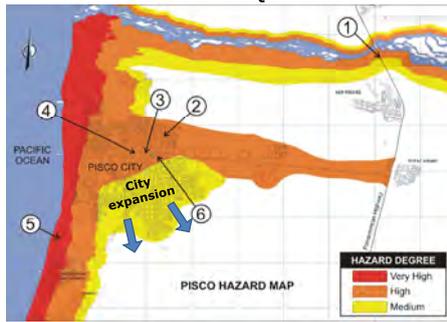
SUSTAINABLE CITIES PROGRAMME
Key orientation table: Sectors classified per degree of hazard

DEGREE OF HAZARD	CHARACTERISTICS	EXAMPLES	RESTRICTIONS AND RECOMMENDED USAGE
1. SATURATED	Presence of rivers or streams, close to or along them, that mean a high probability of flooding from the surrounding areas. The use of embankment structures is not recommended. The use of water pumps is not recommended.	Buildings constructed by traditional construction and modernization of existing structures. Construction of new structures by government forces or firms, based on guidelines originating in the context of urban outgrowth, and those of other urban areas that can be affected by such flows.	Prohibition to use these sectors for urban purposes. It is recommended to use them for agricultural uses or for some industrial activities, or for the construction of flood protection works.
2. HAZARDOUS	The natural hazard is high, but the urban development measures can be taken to reasonably prevent significant damage to people and property.	Structures resistant to very high hazard zones. The absence of construction materials and the presence of construction materials that are prohibited in these zones.	Urban use permitted with strict controls on the type of construction, to specify degree of hazard level. In the event of the absence of urban development measures, the construction of new structures is not permitted.
3. MEDIUM	Medium hazard zone.	Buildings of intermediate quality, with moderate seismic resistance.	Buildings for urban use. Partial prohibition of urban expansion.
4. LOW	Low hazard zone.	Buildings of good quality, with moderate seismic resistance.	Buildings for urban use. Full prohibition of urban expansion.

APPLICATION EXAMPLES

- E-1 Sustainable Cities Programme 1st step (SCP-1S) 1998-2008, resulted in the hazard maps and land use plans for 133 cities and towns. This is an Official Peruvian Central Government – UNDP Programme.**
- E-2 Relocation of the town of Tipón, an initiative of Prof. Ruperto Benavente of the Nat'l. Univ. of Cusco, one of 80 on the job trained consultants. The purpose is to boost decentralization in Peru.**
- E-3 Development of new town El Pinar, located in a generally very-high-hazard region, by a private consultant with the advice of the author. This is an example of good use of the site characteristics. Nice view, stiff and dry soil, inundation and avalanche free, respecting the original natural drainage system. This project sought to promote private participation.**

THE PISCO 2001-02 HAZARD MAP INDECI/UNDP AND THE 2007 EQ EFFECTS



EXAMPLE E-3 : THE DEVELOPMENT OF THE NEW TOWN OF EL PINAR

Location :
Upper part of Huaraz, capital city of the Ancash Region.

Disasters in Huaraz :
In 1941 an avalanche killed some 5 000 people. During the Ancash, 1970 EQ, the downtown area was totally destroyed, causing some 10 000 victims who perished under the debris of their own adobe houses, built on soft, water-saturated soil.

Developer :
Antamina Mining Company, a polymetallic producer, one of the largest in Peru. El Pinar provides housing for some 5 000 residents, Antamina personnel.

Consultants :
Miguel Romero, urban planner and former Vice-Minister of Housing and Construction. The author developed the hazard map and provided physical safety advice.

THE PROJECT: DEVELOPED IN 2000



SUSTAINABILITY OF THE INTEGRATED NATURAL RISK REDUCTION IN PERU

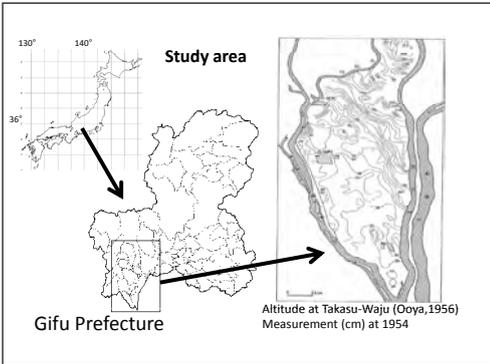
- Peru's Prime Minister's Office has provided funds for the fiscal year 2009 for Peru's Civil Defence to continue conducting the SCP-1S. The Organization of American States (OAS) is supporting a binational Peru – Ecuador SCP-1S.
- In 2009 great efforts will continue to be made to introduce new courses at university level:
 - "Disaster Risk Reduction Engineering" to include geological and climatic disasters.
 - Architecture and Planning for Reducing the Risk of Disaster.
- The process of implementing the SCP-1S will be decentralized through regional governments with the assistance of 80 consultants of SCP-1S who have been trained on the job in the past ten years.
- More involvement of local authorities and communities is needed through the 2008 – 2021 Route Map of SCP-1S for Peruvian Municipalities. This is a very difficult task.

UNDAMAGED SCHOOL BUILDINGS



Flood Mitigation in Japan

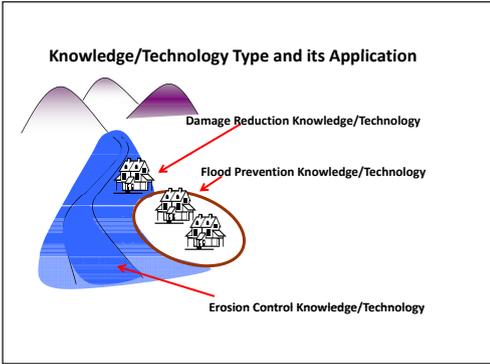
- Traditional Practices
- New Technology



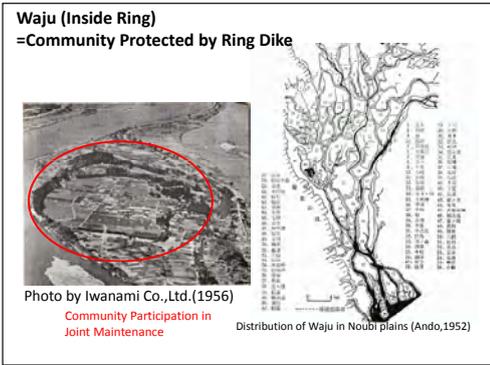
Background

- Noubi plains experienced many flood disaster.
- In old days, people struggled to some flood and developed some knowledge/technology.
- Those knowledge/technology were established in 18th century.

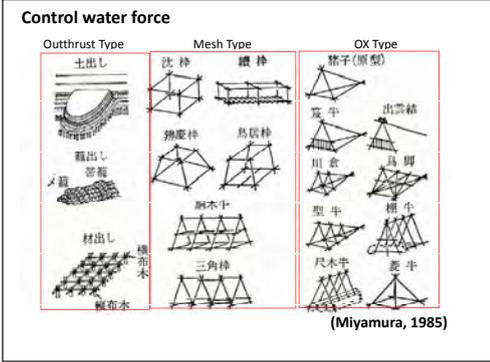
Photo by Iwanami Co.,Ltd.(1956)



Flood Prevention Knowledge/Technology



Erosion Control Knowledge/Technology

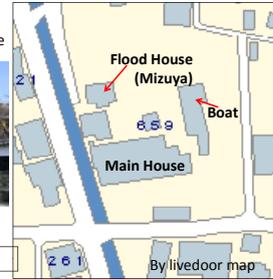


Damage Reduction Knowledge/Technology

Mizuya (Flood House)

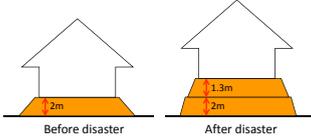


Photo by NIED-KU(2007)



Rich land owner has Mizuya.

By livedoor map



Increased Mizuya height after flood disaster in 1896

Jomei-dan (Evacuation platform)



Structural Mitigation

- Few Examples of traditional wisdom in Himalayan Countries

Evidences of Seismic Resistant Elements in Traditional Buildings

- Many old residential buildings in Bhaktapur are > 400 years old
- Signatures of 2-3 major earthquakes in same temple seen (Banepa)
- Existence of hundreds of monuments in Kathmandu since centuries



4 earthquakes producing MMI IX or greater in Kathmandu Valley occurred in the past 200+ years

Few Identified Traditional Earthquake Resistant Technology in Nepal

Observed Earthquake-Resistant Elements (1)



- Symmetric Configuration
- Small Length to Breadth Ratio
- Symmetrically Located Small Openings

Observed Earthquake-Resistant Elements (2)

- A low floor-height and a limited number of stories
- Wooden Bands

Mainstreaming disaster risk management into the development planning

- Looking critically at each activity we are planning, not only from the perspective of reducing the disaster vulnerability of that activity, but also from the perspective of minimizing that activity's potential contribution to the hazard. Each and every development plan of each ministry and department should incorporate elements of impact assessment, risk reduction, and the 'do no harm' approach

Urban Planning and Zoning

- This sector has generally not been adequately linked to flood or earthquake disaster mitigation in India so far, even though these issues have been mentioned repeatedly at different forums by administrators, practitioners and NGOs working in the area of disaster management. Human settlements must be viewed not only from the perspective of their vulnerability, but also from the perspective of the hazards that they create or that they exacerbate.

Building Codes and Code Enforcement

- Building codes are adhered to only in engineered structures, and not in the huge majority of houses across rural and urban India. The codes that apply to engineered structures are often quite adequate. The building codes have to be upgraded constantly as new information becomes available. The greatest challenge, however, is in respect to enforcement of the building codes. The methodology can be worked out by the concerned Ministry.

Housing Design and Finance

- Since individual houses do not usually follow the building codes in India, it is necessary to find alternative ways to encourage and facilitate individual home builders to use disaster-resistant designs, materials and techniques in the construction of their homes. There is a need to publicize these, making people aware of the appropriate designs and the cost difference (according to the Indian experts the difference between a building to a normal standard and a building to a seismically resistance standard is a difference of 4 to 8 percent in total cost). Probably, there also needs to be some financial incentives that would assist people, particularly poor people or first-time homeowners, to incorporate safety features into their house.

Insurance

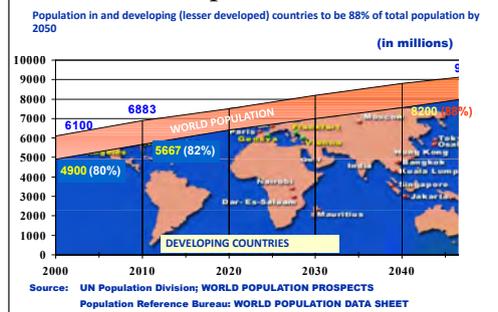
- Insurance distributes disaster risk among the broader society, and makes great sense when risk has been reduced to some acceptable level. The vulnerable states should take lessons from Gujarat in using insurance as measure for disaster risk reduction/transfer.

Urban Settlements and Housing

- There is need to give more emphasis on new settlements, which are being developed by private builders and developers and are increasing flood vulnerability in urban and rural areas of many states. If they continue to build new settlements in polders and low lying land reclaimed from lakes and riversides through the construction of levees, more and more areas will become prone to floods and consequently related disasters like epidemics. The settlements in the hilly areas need special attention. Planned urban settlements and housing is required for disaster risk management that leads to sustainable development, particularly in ecologically sensitive regions, high risk locations and high population density pockets such as urban centres.

Structural Safety & Techno-legal Issues in Urban Risk Mitigation

World Population Trends



Extent of Damages in Disaster Prone Areas

- The damages to unsafe buildings and infrastructure in disaster affected areas is colossal
- These affect **unsafe buildings** for uses of :
 - Residential (Housing – Individual of group housing)
 - Educational (Schools, Colleges, places of learning)
 - Institutional (Health Centres, Hospitals)
 - Assembly (Community Centres, Genemas, Auditoria, terminals)
 - Business (Offices)
 - Mercantile (Shopping, Trade, Commerce)
 - Storage (Ware houses, godowns, sheds)
 - Industrial (factories, production centres)

Extent of Damages in Disaster Prone Areas

- These also affect **unsafe infrastructure / structures** for:
 - Water supply (water tanks, treatment plant, networks)
 - Electrical installations (towers, transmission, distribution)
 - Sewerage system (treatment plant, networks)
 - Communication (telecommunication towers, lines, networks)
 - Transportation (roads, bridges, ports, airports, railways and buildings)

Nature of Damages due to Disaster

- Need for prudence in structural design and quality control in construction practices
 - Buckling of soft or lower storey columns at the stilts
 - Heavy floors, water tanks/ pools at intermediate/ upper levels
 - Inappropriate design of basements and penthouses
 - Incoherent building plan or form without adequate separation sections

Nature of Damages due to Disaster

- Absence of shear walls and bracing
- Failure of stairs due to inadequate flexibility or wrap-on effect
- Collateral damage due to collapse of buildings on adjacent structures
- Subsidence of parts due to liquefaction of soil and inadequate foundation design
- Unsafe fixing of roof members (steel of timber) and roof coverings with tiles or sheets
- Inadequate bracing and anchorage between horizontal and vertical members of roofs, walls and foundations

Key Elements of Safe Building Construction

- Key elements of Disaster Resistant / Safe Building Construction
 - ❖ A – Anchorage
 - ❖ B – Bracing
 - ❖ C- Connections
 - ❖ D- Detailing
 - ❖ E - External Environment Protection
- Most of the housing in the region are built by people themselves with the help of semiskilled artisans; ie, non-engineered construction
- Building (House) Design(s)
 - Flexibility
 - Range of options
 - User / local needs

Imperatives for Promoting Safer Buildings/ Construction

- With a view to ensure that the massive financial resource investments for housing and other public asset buildings and infrastructure are safe, strong, durable and perform well during life cycle, it is essential that these are:
 - Flood protected
 - Cyclone / typhoon resistant
 - Earth Quake resistant
 - Land slide protected
 - Sea erosion protected

Elements for Promoting Safer Building Construction

- Three critical elements for action areas to promote safer building construction are in creating:
 - Awareness
 - Appreciation
 - Application

Awareness

- Most communities unaware of vulnerability of neighbourhood to disasters (Wind-Prone, Flood basin, Seismic Zone, Landslide Zone) or Proneness of the area to one/multiple hazards
- Lack of organised hazard based risk assessment for indicating
 - Mapping for the same
 - Vulnerability Atlas (Japan, Sri Lanka, India)
- Awareness to permeate at the level of :
 - Community / beneficiary families
 - Practicing professionals
 - Building construction / delivery groups
 - Building regulatory systems

Appreciation

There is clear lack of appreciation amongst :

- General public
- Practicing professionals
- Building delivery groups
- Regulatory agencies

Appreciation

Lack of appreciation

- On safe locations (prohibited sites and restricted sites with precautionary limitations)
- On efficacy in the use of 'safe' and 'time tested' traditional/ technological construction practices providing for desired response / resistance to disaster induced forces / action / effects
- On the need to ensure effective quality control measures during construction / execution stages or the disastrous implications thereof

Application

- Safer building construction with disaster resistant / protected planning, design and construction would need to create enabling environment for Application of all norms for safety namely,
 - Structural Safety
 - Fire Safety
 - Health Safety
 - Construction Safety
- These can be ensured by adopting many action areas for Application

Imperatives for Disaster Resistant Building / Housing

- **EDUCATION**
 - Creating awareness among general public – use of audio-visual media [Demand Side]
 - Awareness among students of technical institutions- Upgradation of curricula [Supply side]
 - Capacity building of the concerned agencies/ administrators
 - To reform the housing delivery system, it is essential to provide training for the contractors, supervisors and master masons and workers in disaster resistant construction

Imperatives for Safer Disaster Resistant / Protected Building / Housing

ENGINEERING

- Demonstration units for live display of technologies to be put up – "seeing is believing" by using construction medium as a message
- Use of vulnerability/ hazard maps/ atlas for assessing the multiple vulnerability for effective and safe design to be introduced
- For **non-engineered buildings**, it is essential to ensure adherence to disaster resistant construction through **community awareness and preparedness**
- **Need for illustrated manuals, Do's and Don'ts and Guidelines to be published in vernacular languages.**

ENFORCEMENT

India has its comprehensive National Standards and codes on disaster resistant design and construction

NBC	National Building Code of India 2005
IS : 875 –5 parts	Code of practice for design loads (other than earthquakes) for buildings and structures (- loads, forces and combination in 5 parts)
IS 1893	Criteria for Earthquake Resistant Design of Structures
IS 4326	Earthquake Resistant Design and Construction of Buildings – Code of Practice

ENFORCEMENT

IS-4967	Recommendations for Seismic Instrumentation for River Valley Projects
IS-6922	Criteria for Safety and Design of Structures Subject to Underground Blasts
IS- 13827	Improving Earthquake Resistance of Earthen Buildings – Guidelines
IS- 13828	Improving Earthquake Resistance of Low Strength Masonry Buildings – Guidelines
IS-13920	Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice
IS-13935	Repair and Seismic Strengthening of Buildings – Guidelines

Enforcement



The Building Regulatory Media consisting of

- Building Byelaws
- Building Codes
- Planning Standards
- Development Control Rules
- Town Planning and Hazard Mapping Rules

to be brought in line with Disaster Risk Perceptions and Mitigation Needs

Information Dissemination and Capacity Building

- Programmes on mass media like television and radio on disaster resistant construction.
- **Community buildings** need to be constructed with multi-purpose orientation with **stricter standards** and foresight, to withstand the impact of a potential disaster and serve as relief or rescue shelter in the event of calamities with longer life span.

Techno-financing regime

- All building constructions by public, private, corporate, co-operative, community, joint and individual sectors receiving funds from any sources to adopt techno-financing regime without exception.
- Such contributors / financial institutions (DFIs / HFCs) and Banks to insist on disaster resistant construction and incorporation of disaster resistant features as a precondition for providing grants/ loans for projects
- Fixing the insurance premium / tariff to be linked to the incorporation of disaster resistant features in construction
- Provision for inspection and periodic audit and annual renewal certificate to ensure compliance.

Maintenance and Asset Management

- Creating safe assets for disaster mitigation is important.
- Equally important is to evolve appropriate maintenance and asset management strategies and actions for ensuring safe and long term life and continuous functional performance of the buildings .
- Calls for inspection systems at periodic intervals and carrying out non-structural/ structural upkeep, maintenance and repairs where needed.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

1. Creating awareness on vulnerability for hazards

Does the country, the state (province) or the city, the town or the village have appropriate awareness on the nature of vulnerability against any or many of the disasters? If not, the action plan for creating such awareness has to be evolved.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

2. Establishing Techno-Legal Regime

The methodology to be adopted for creating a techno-legal regime by evolving disaster resistant safe building construction features in the building regulatory media is to be established. In this context the effective enforcement mechanism is to be put in place at the stages of building permit to be given by the local body, construction supervision and completion certificate stages by the professionals and builders and also issue of occupancy certificate by local body.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

3. Associating the right professionals

The compulsory association of the right level of professionals will help in fixing responsibility and accountability on the owners, builders, practicing professionals be it the architect, engineer, structural engineer in the planning, design, construction and supervision stages.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

4. Adopting the techno-financing Regime

The methodologies to be adopted for a techno-financing regime for promoting safer building construction systems in disaster prone areas by using financing / insurance mechanism as instruments as a leverage for ensuring the same has to be clearly established.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

5. Evolving appropriate technology transfer system at the cutting edge level

Evolving methodologies for technology transfer at the grass root level for safer building construction systems for the construction work force including quality control measures should be given priority attention for suitable action.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

6. Creating awareness among general public for application

Creating awareness among the general public and the community on the theme of safer building construction is a pre-requisite for ensuring larger public participation and application.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

7. Evolving models for promotion of non-engineered construction systems

Evolving appropriate models for application of safer building construction and the methodology for use of non-engineered housing and building applications for the low income and disadvantaged groups through simple and user friendly medium should receive priority attention and action.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

8. Using the media for mass dissemination

Use of media (electronic, audio-visual and print) including demonstration units for wider dissemination of actual construction features for the use of general public be given importance.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

9. Creating new breed of enlightened professionals / builders

Creating the new breed of young professionals and builders with thrust on safer building construction features for disaster prone areas by giving exposure in the curriculum of architects and engineers and construction management professionals and builders for the graduates at degree and diploma level should be a priority area for technical education agencies and universities and also the building delivery professional groups.

Towards Promotion of Safer Disaster Resistant Building Construction – Issues for consideration and Way Forward

10. Mobilising participation of civil society

Mobilising people's participation including association of NGOs and CBOs converting the initiatives of safer building construction from the 'tokensim' stages to 'total-coverage' across the nation(s) should be considered as an important thrust and action area for promoting safer building construction.

Emerging Shift In Focus

Prediction, Preparedness, Prevention, Planning, Protection Promotion, Publicity, Participation & Partnership

for Pre-Disaster Mitigation

AS AGAINST ONLY

Post -Disaster Initiatives for

Rescue, Recovery, Relief, Rehabilitation, Reconstruction, Repair, Renewal & Retrofitting

HEALTH ISSUES IN URBAN DISASTER MANAGEMENT

NIHFW

HEALTH IMPLICATIONS OF DISASTERS

- **Direct health consequences**
 - Injuries
 - Deaths
- **Indirect health consequences**
 - Transmission of Communicable diseases
 - Rehabilitation
 - The Aftermath

- In case of natural disasters, reaction to the purely medical needs has often been remarkably ill-judged
- Doctors are the main need which is not true
- Field hospitals are required-which arrive too late to be of any use
- Any kind of supply will do, provided it has a medical connection- which is wrong.
- 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 predisaster preparedness on one side and the long term effects and rehabilitation on the other.

- The health management of disasters based on a “take each crisis as it comes” approach has been amazingly short-sighted. As soon as the acute phase of the disaster is over, interest seems to wane.
- After a few weeks or months, medical teams go home, medical aid (appropriate or not) is withdrawn, field hospitals are eventually left to stay as a memorial to past beneficence and testimony to present incompetence.
- The approach to the management of health problems in disasters has changed considerably over the last decade. the natural disasters can be viewed as an epidemiological problem, with the following aims:

To Define the Problem and Measure its Extent.

This can be given various names:

1. Community diagnosis or definition of priorities.
2. How many were injured and what types of injuries were of priorities.
3. Related decisions will bear on the kind and amount of resources needed for assistance: personnel, drugs, supplies, medical facilities.

To identify Risk Factors.

- What kills or injures people?
- How are casualties caused?
- This requires an analysis of the effects as correlated to their supposed determinants, either behavioural or environmental.
- This relates to prevention. Is this or that type of house associated with higher mortality or special types of fractures? Such factors could then be deal with, for example by adapting building techniques.

To Define Vulnerable Population Groups

- Who dies and who is injured?
- Are they the children, or urban dwellers, or passers-by?
- The objective is not very different from the previous one, but it aims at 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.

To Design Strategies

- When the health problems have been defined.
- What is then the best way to control them?
- Should we vaccinate prior to epidemics or keep the population under some kind of makeshift supervision to spot any unexpected increase in the frequency of diseases?

To Evaluate Control Measures

- What is the record of performance of control measures including external assistance, both for effectiveness and efficiency in preventing or reducing the health problem, from death to long-term changes in disease patterns?

Risk of disease following disaster

- **lack of utilities:**
 - water supply
 - sewage treatment
- **disrupted health services:**
 - damage to health facilities
 - loss of health personnel
- **poor environmental conditions:**
 - sanitation,
 - emergence of new breeding sites,
 - disruption of vector control activities,
 - overcrowding in shelters and camps

Post-disaster epidemic prone diseases

- **Water borne:** ADD (including cholera, dysentery), enteric fever, acute jaundice syndrome
- **Vector borne:** malaria, dengue, acute encephalitis (including JE), leptospirosis
- **Vaccine preventable:** measles
- **Others:** meningitis, HIV/AIDS

Preparedness strategies

- 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

Definition of an Outbreak

- The occurrence in a community of cases of an illness clearly in excess of expected numbers.
 - While an outbreak is usually limited to small focal area, an epidemic covers large geographic areas and has more than one focal point
- Or occurrence of two or more epidemiologically linked cases of a disease of outbreak potential (e.g. Measles, cholera, dengue, JE, AFP or plague)

Disease surveillance

- Epidemiological surveillance
- Laboratory surveillance
- Vector surveillance

PROTOCOL For ON-SITE CASUALTY MANAGEMENT

- **Assess likely number of casualties**
- **Assess the nature of the injuries**
- **Assess the presence of local hazards**



MASS CASUALTY MANAGEMENT

Casualty Management in Disaster situations are subject to different criteria. The focus is on mass medicine. Individual treatment recedes more and more into the background as casualty figures rise. “Do the best for the most”. Gravely injured may have to be neglected because of the sheer number of patients requiring optimal treatment.

CATEGORIES FOR PRIORITY OF TREATMENT

- Category -1 Requiring life saving treatment. Usually untransportable. About 20 percent.
- Category -2 Requiring delayed treatment. Within about 8 to 12 hours. About 40 percent. Would include fractures and dislocations, injuries to the abdomen or thorax, vascular injuries, head injuries, burns (2nd Degree-20-50% , 3rd Degree- up to 30%).
- Category -3 Patients whose lives are not in danger. About 40 percent. Fractures of small bones, sprains eye injuries, burns (Less than 20%).
- Category -4 Poor chance of survival.

PLAN OF ACTION

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

RESOURCE PLANNING

- Health manpower
- Medical stores and equipment
- Logistics requirements
- Ambulances
- Medical / health set up facilities
- Food and water

CONCLUSION

Finally, 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

Urban Fire Risk Mitigation & Management

Delhi Fire Services

INITIALLY THE FIRE IS SMALL



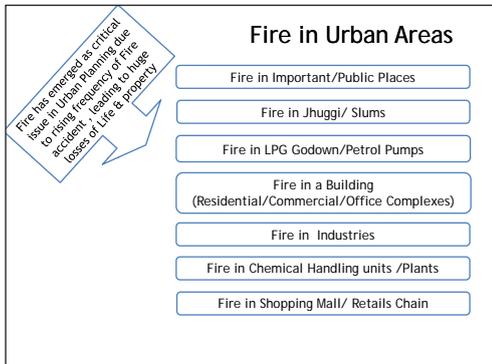
A LITTLE LATER IT BECOMES BIG---



LATER IT TURNS DEVASTATING..



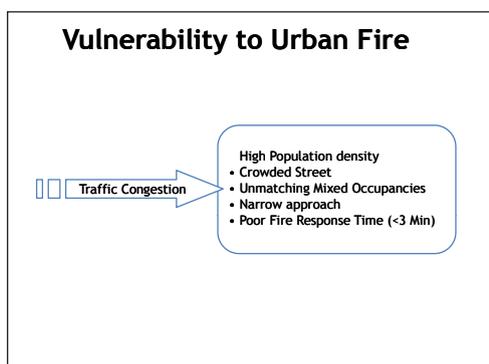
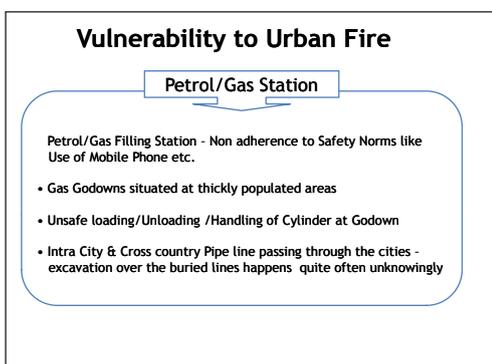
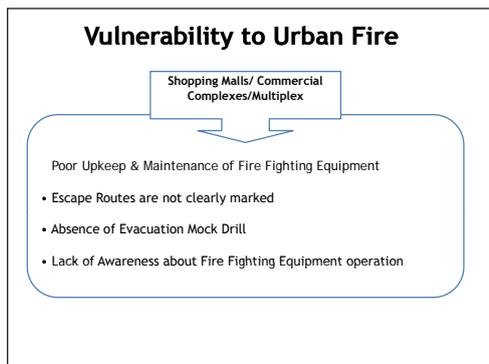
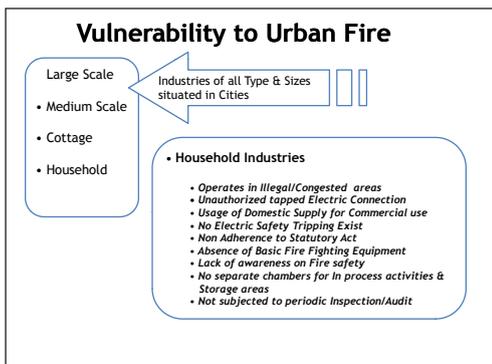
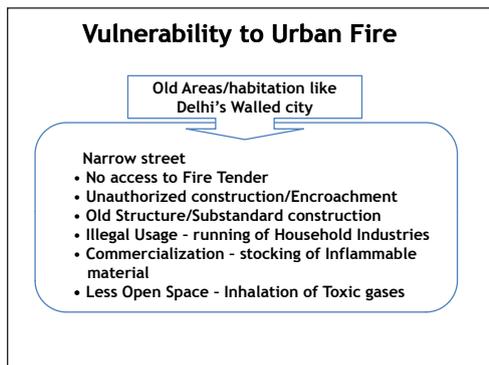
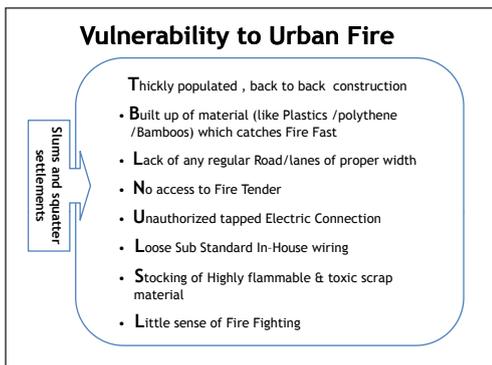
YEAR	PLACE	DEATHS
DEC1995	DABWALI	425
JUNE 1997	UPHAAR	59
AUG' 2001	MENTAL ASYLUM(TN)	28
JAN 2004	SRIRANGAM(TN)	54
JULY 2004	KUMBHAKONAM	91
APR 2006	MEERUT	50



Causes of Urban Fire

Electricity short circuit	70.40%
Carelessness	18.37%
Miscellaneous	0.75%
Spark M/Heat	1.73%
Fire Works	1.68%
Unknown	1.49%
Naked Flame	4.59%
Intentional	0.90%
Spontaneous	-
Radiation	-
Lighting	0
Children Playing with fire	0.00%

Source : Delhi Fire Service



Vulnerability to Urban Fire



- Fighting a lone Battle - Poor Coordination/help from other agencies
- Equipment Inadequacy
- Old Equipments /Poor Maintenance
- Lack of multi skilling
- Poor Coordination with existing Industries
- Poor participation in Joint Exercise /Mock Drills
- Poor Response Time
- Unavailability of Water Replenishment Points in the city

Building Bye Laws related to Fire

Clause No 6.2.4.1

- Multistoried Building > 15 m Height
- Special Building
- Assembly
- Institution
- Industrial Storage
- Hazardous Occupancy

Fire Safety Requirement for High Rise Building

- Approach - 6 m
- Water Storage 50 - 200 KL(underground or Over ground)
- Stationary Fire Pumps (Main/stand by/Diesel Driven/ Jockey)
- Access & means of Escape
- Air Conditioning - Ventilators/ Smoke Management system
- Emergency Power Supply
- Public Address System
- Lightening protection
- Intercommunication System
- Firemen Lift grounding Switch
- Exit Sign
- Protection of Electric Sub Station
- Hose Pipe , Hose Box
- Hose Reel
- Automatic Fire detection & alarm system
- Portable Fire Extinguisher
- Automatic Sprinkler system
- Manual Call Point
- Qualified Fire Officer & trained staff
- Housekeeping

Vulnerability to Urban Fire

High Rise Building

- Many Building have come up before Building Bye Laws
- Building Designer & Urban Planner has no formal Education of Fire safety
- Lack of awareness for Fire Safety in occupant
- Fire equipment System - like White Elephant : Poor Maintenance
- Absence of Periodic Checking of equipments
- Escape Routes/Stair Case become storage space
- Lack of Joint Exercise/Mock Drill

Mitigation & Preparedness

- Fire Safety to become Integral part of Town Planning & Building Design
- Mass awareness Program on Fire Safety
- Modernization of Fire Department
- Strict Adherence of Safety Norms by Industries
- Collaborative approach from all Departments to control Illegal hooking of Electrical Connection
- Special Fire Equipment to reach congested areas
- Regular Mock Drill/ Joint Exercise by Fire Dep't. with Industries/Occupants
- Strict Adherence to Building Bye laws for Fire & Safety
- Periodic testing & inspection of For Equipment
- Regular Electrical Safety Audits/Inspection

Mitigation & Preparedness (High Rise Building) - Structural

- Strict adherence to all safety measures , Building by-laws wrt to Fire Fighting & Safety Standards
- Building to have proper Emergency Exit
- Escape route to be properly marked
- Building to have Fire Ring main & network of Hydrant & Water monitor
- Building to have smoke /Fire detector
- Provision of Automatic Fire Siren System
- Dedicated Under Ground/Over ground Fire Water Tank & automatic Sprinkler
- Portable Fire Extinguisher
- Provision of Hose Reel
- Lightening protection
- Qualified Fire Officer/ Staff
- Reticulated or piped gas Supplies of LPG/PNG



Mitigation & Preparedness (High Rise Building) - Non Structural

- Implementation of Fire Order - role & responsibility of occupant
- Ensuring Good House Keeping - Occupant participation
- Careful smoking
- Careful use of Hazardous product like LPG & SKO by occupants
- Use of BIS make Electrical appliance & Electrical fittings
- Keeping means of Escape hindrance free
- Evacuation Drill on regular Interval
- Regular Training of fire & Safety to occupant
- Regular Maintenance of Fire Safety Equipment
- Display of Important Telephone Numbers



Conclusion

Urban Fire Hazards demands a shift from Fire Fighting to Fire prevention by ensuring enrollment of all partners (Community, Administration, Occupant, Fire Department) & to identify Vulnerable areas/activities , assessing Fire Risk & making Fire Safety an integral part of Town Planning & Building Design to avoid heavy Human & Financial Losses

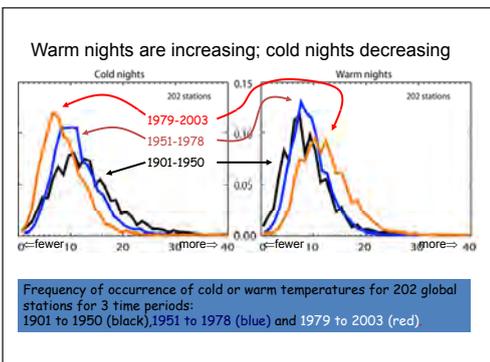
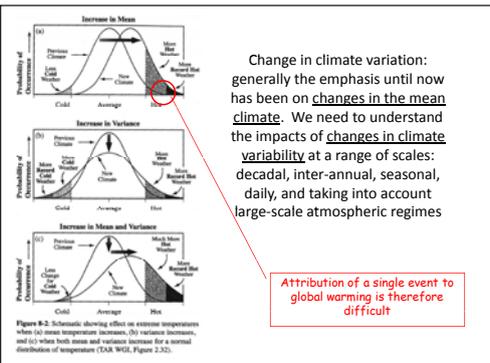
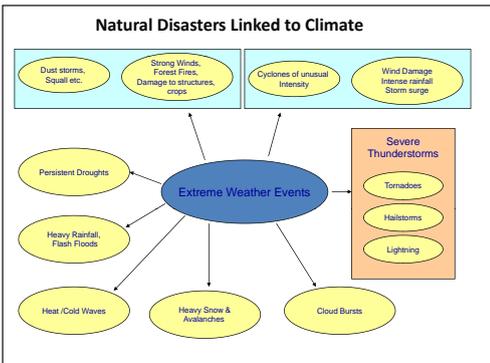
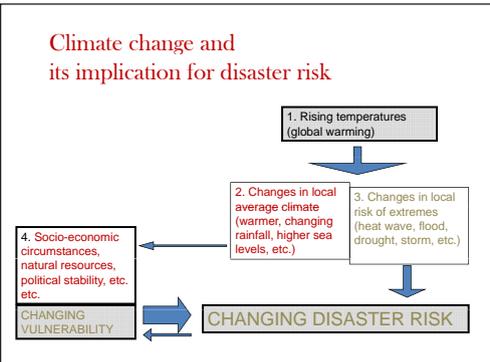
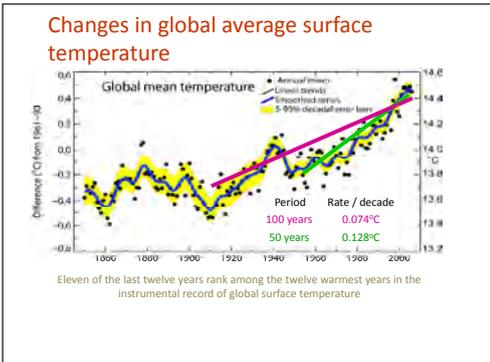
Climate Resilient Cities

Dr Sanjay Srivastava

NIDM Training Programme on Urban Risk Mitigation

Warming of the climate system is unequivocal

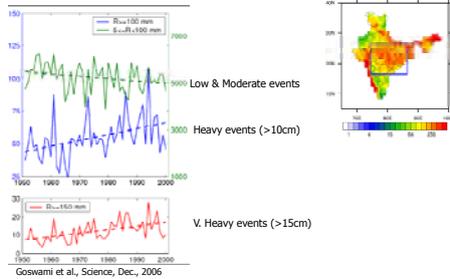
- IPCC Report 2007



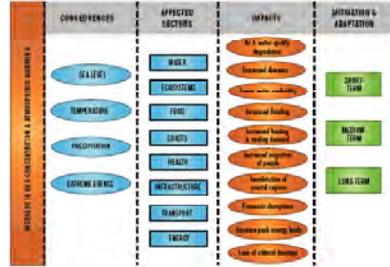
Mumbai, 26th July 2005

Mumbai (Santacruz) received a record rainfall of 94.4 cm on 26 July. A nearby station "Vihar lake" received 104.5 cm of rainfall on same day.

Changes in the Frequency Distribution of Extremes



Impacts of climate change and extreme events



Impacts of CC on Urban Areas

Urban ecology (Direct), food supply and price (Indirect impact of shifting rainfall pattern)

Increased number and intensity of extreme weather events such as heavy rainstorms (flooding), cyclones and typhoons: visible disasters

Increased number of dry days, and having continuous stress on the water system: invisible creeping disaster like urban drought

Significant impacts in terms of health in urban areas (due to heat waves, vector borne diseases etc.)

Ultimately leading to impacts on urban economy

Impacts of CC on Urbanized Coastal Areas

Less than 10 m. above sea level is 2% of world's land, but contains 10% of world population (600 million)

- Continuous migration crates further pressure in the already congested coastal areas
- Urban Population and its % in the LECZ (Low Elevation Coastal Zone)

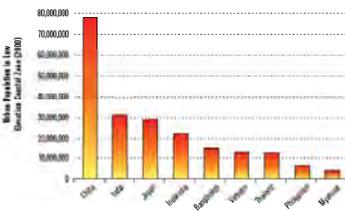
(Source: Haq et al. 2007)

Composite Multi-hazard Risk Adaptation

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

Potential Climate Change impacts in coastal areas of Asian countries

Coastal population of select countries that are highly vulnerable to sea-level rise



Source: C. McGlashan, D. Balk, and B. Anderson, Low Elevation Coastal Zone (LECZ) Urban-Rural Population Estimates, Global Rural-Urban Mapping Project (GRUMP), Alpha Version, Palisades, NY: Socioeconomic Data and Applications Center (SEDAC), Columbia University, 2007.

Climate 'Proofing' of Cities

The "proof" of CC is difficult to identify and recognize: Recent disasters may be more due to inherent and increasing vulnerability of the urban areas

Time and space issue of climate modelling

- Long term prediction versus short term scenario
- Regional versus local (city based) scenario and its uncertainties

So far we have climate changes, increased urbanization, and related pressures in cities

- These together affect 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.

Knowledge gaps in the area of climate change & disasters

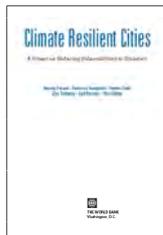
Adequate evidence

- Climate change and man-made causes
- Global temperature increase
- Urbanization in cities
- Impacts of climate change on urban and rural areas
- Climate change - disaster - development
- Economic rationale for mitigation
- Future forecasts of temperature increases and associated impacts

Knowledge gaps

- Are we really prepared for climate change impacts?
- How to really deal with climate change impacts and sound practices **
- Tools for assessing how much climate change is impacting specific cities and their sectors
- Processes for prioritizing interventions
- \$\$ required for mitigation
- Scalability of interventions
- Replicability in and across regions
- Interventions that address both climate change and disasters
- Who's going to do it! Roles, responsibilities, and accountability

"Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters" Report



Report by World Bank and UNISDR (2008)

- Focus on climate change adaptation & disaster risk reduction in East Asia region
- Tool for city level managers to develop a strategy for adaptation and mitigation
- For both cities in beginning and advanced stages in dealing with climate change and disaster risks

- Presents a "hotspot" tool for identifying city-specific priorities for action

- Presents "no regrets" endeavors

<p style="text-align: center;">Climate Resilient Cities: Potential Action</p> <p>Local and Regional (global) actions</p> <p>– Actions need to be taken at city level (by city authorities, citizen, NGOs, corporate sectors, academic institutions)</p> <p>Actions need to be taken at regional and/or global level (by national governments, international organizations)</p>	<p style="text-align: center;">Potential Action at Local Level</p> <p>Three step risk management process:</p> <p>– Assessment: Scenario</p> <p>May not be a precise scenario, but needs to apply precautionary principles</p> <p>– Identify vulnerable communities and areas</p> <p>Planning: Action Plan Municipal Adaptation Plan (MAP) AND Municipal Mitigation Plan (MMP)</p> <p>– Implementation: Actions</p> <ul style="list-style-type: none"> • Start small and gather momentum OR • Start big and scale down
<p style="text-align: center;">Case studies of CCA & DRR</p> <p>Example 1: Good organization structure</p> <p>Seattle/King City, Washington</p> <ul style="list-style-type: none"> • City developed a comprehensive sensitivity assessment, adaptation capacity assessment, vulnerability assessment, cross-sector interaction assessment • Devised a strategy for maximizing limited means by pooling resources with neighbouring local governments <p>Example 2: Sound institutional mechanism</p> <p>Singapore</p> <p>Developed the National Climate Change Strategy through a consultative, multi-stakeholder approach</p> <ul style="list-style-type: none"> • Leadership by ministerial committee on climate change chaired by the Deputy Prime Minister of Singapore • This ensures that climate change will have strong institutional support 	<p>Example 3: Sound institutional mechanism</p> <p>Makati City, Philippines</p> <ul style="list-style-type: none"> • Strong institutional mechanisms for facilitating action on climate change and disaster risk management with the Makati City Disaster Coordination Council • Representation of all relevant departments of the national and city government <p>Example 4: Ownership by line departments</p> <p>Tokyo</p> <ul style="list-style-type: none"> • Ownership by line departments with capacity and authority to ensure proper coordination between various agencies • Programs report to and are monitored by high-level institutional mechanisms 
<p>Example 5: Preparing a climate change strategy</p> <p>Tokyo</p> <ul style="list-style-type: none"> • The Tokyo Climate Change Strategy defines a policy for the 10-year project for a carbon-minus Tokyo • Encompasses measures the government intends to carry out over the next 10 years <p>Example 6: Generating public awareness</p> <p>Rockville, Maryland</p> <ul style="list-style-type: none"> • Rockville sponsors and facilitates dialogue and discussion on sustainability and environmental issues • Publishes yearly reports on progress, recommendations, and goals • Engages community in all aspects <p>Example 7: Accounting and reporting for mitigation</p> <p>Singapore</p> <ul style="list-style-type: none"> • City Developments issue environmental reports on GHG emissions 	<p>Example 8: Catastrophic risk financing and transfer</p> <p>Bogota, Colombia</p> <ul style="list-style-type: none"> • Developing a risk financing strategy for losses arising from natural disasters which will provide the city with a financial strategy that guarantees appropriate resources needed for disaster reconstruction or rehabilitation <p>Example 9: Climate change mitigation – energy sector</p> <p>Albuquerque, New Mexico</p> <ul style="list-style-type: none"> • Developing public-private partnerships for the promotion of alternative fuels and vehicles, fuel blends, fuel economy, hybrid vehicles, etc • Also energy audits, conversion of outdated lighting • Dedicated budget and resources
<p>Example 11: Climate change mitigation – built environment</p> <p>Albuquerque, New Mexico</p> <ul style="list-style-type: none"> • Energy Conservation Code calls for commercial and multifamily residential buildings to be 30 percent more efficient than previously • Single-family homes to be insulated and more heat efficient <p>Example 12: Climate change mitigation – forestry/greenery</p> <p>Hanoi, Vietnam</p> <ul style="list-style-type: none"> • Planting and upkeep of upstream protection forests • Afforestation program targeting 5 million hectares <p>Example 13: Climate change mitigation – finance</p> <p>Albuquerque, New Mexico</p> <ul style="list-style-type: none"> • Using bonds for financing programmes • Also, water rebates for home owners to switch to efficient systems 	<p>Example 14: Adaptation – infrastructure sector</p> <p>Nam Dinh Province, Vietnam.</p> <ul style="list-style-type: none"> • Building large and medium scale reservoirs to retain flood waters • Strengthen dike management and protection works <p>Example 15: Adaptation – water conservation and flooding</p> <p>Singapore</p> <ul style="list-style-type: none"> • Diversifying water supply sources • Creating new catchment areas <p>Example 16: Adaptation – public health</p> <p>Singapore</p> <ul style="list-style-type: none"> • Comprehensive vector surveillance program • Also, water rebates for home owners to switch to efficient systems

The Road Ahead - ideas to think about ...

- 1 Case evidence is strong enough for action:
Asian urban growth Local decentralization
Capacity gaps in cities Financial pressures
↑ Vulnerabilities
- 2 Climate change adaptation and disaster risk reduction - main crux now for the development of Asian cities
- 3 Key is the local level to build resilient cities
- 4 CCA and DRR are complex problems involving all sectors
- require innovation and ingenuity
- takes time and need to start now
- 5 Paradigm shift
- takes time and needs to start now

The Road Ahead - ideas to think about ...

- 6 Cities need to know how much they are really affected by climate change
- Hotspot analysis
- Intellectual capital to deal with these complex problems
- 7 Once we know, what do we do?
- Prioritize actions - there are both urgent and important areas that need to be looked at
- "No regret" interventions recognizing opportunity costs associated with interventions
- 8 Leveraging experiences of others but not following a "one size fits all" approach
- 9 Need to go beyond "token" and "pilot" projects - taking good projects and replicating & scaling

About Author

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Chandrani Bandyopadhyay is an Assistant Professor in the Policy, Planning & Cross Cutting Issues Division of NIDM. With over fifteen years of experience in the field of disaster management, she has been associated with various significant activities of the Institute. A town and country planner by profession, her main areas of interest include Urban Risk Reduction, planning for urban inner cores, DRR mainstreaming, media in disaster management, public-private partnerships in disaster risk reduction and risk mitigation planning for cultural heritage. Some of her publications include *Disaster Preparedness for Natural Hazards Current Status in India* (ICIMOD, 2007) and *Disaster Risk Reduction for Safe Development A Study of Corporate Practices in India* (NIDM, 2009) in addition to research papers.

About Module

The training module on Urban Risk Mitigation is an attempt to discuss the multi-sectoral and multi-dimensional issues of urban disaster risks. The risk profile of urban areas is complex and dynamic, intrinsically linked to human activities and natural systems. Mitigation of urban risk therefore requires a holistic approach that addresses the issues and concerns for mitigation of urban risk. This module, thus, includes, within its ambit, urban issues ranging from policy and governance to risk sensitive planning, safe construction practices, public health and mass casualty management, urban climate change and resilient communities. While most of these issues form parts of separate disciplines, in this module they are considered with respect to disaster risk mitigation.

The module was designed to incorporate disaster risk management issues in the context of urban development, with the aim of ensuring safe and sustainable future for cities. The module is targeted to an interdisciplinary and cross-sectoral readership. Efforts have been made to present the material in a lucid and easy-to-understand format for new readers. Disaster Management Centres and Urban Management Centres in Administrative Training Institutes (ATI), State Institutes of Urban Development (SIUD) and all organizations and professionals engaged in urban development or disaster management in an urban context are expected to be the potential users of this module.



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ISBN 978-93-82571-09-0



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