

## **Chapter XI**

### **DISASTER MANAGEMENT**

Natural disasters will occur. It can neither be predicted nor prevented. The problem before us is how to cope with them, minimizing their impact. Tamil Nadu has witnessed havoc caused by cyclones and storm surge in the coastal regions, earthquakes, monsoon floods, landslides, and recently the Tsunami hit. Increase in urban population coupled with the construction of man-made structures often poorly built and maintained subject cities to greater levels of risk to life and property in event earthquakes and other natural hazards. One of the main objectives is to reduce the risk of loss of human life and property and to reduce costs to the society. We have to recognize that in such cases of natural disasters, we deal with phenomena of enormous magnitude that cannot be controlled by any direct means of human intervention. But what we try to do is to reduce the impact on the human beings and property.

11.02 People have continued to live/settle in the disaster-prone areas, inspite of knowing about the risk and occurrence in the past may be due to certain cultural and historical reasons coupled with advantages of living in these areas. The risk gets amplified when the population increases, the area gets densified and activities increase thereby aggravating the situation and putting a large number of lives at risk. To cope with the disasters, preparedness and planning are the only ways. There is an urgent need and ample justification for bringing in the required regulations for construction of buildings in the disaster/hazard-prone areas. Apart from improving building safety through better design and construction, it is very important to improve the quality of urban planning including provision of well-designed road networks and open spaces to facilitate disaster management. Finance for disaster management/mitigation should be treated as an investment and not expenditure. Local governments should see disaster management as a key issue and should be well-prepared to handle disasters when they occur and they should strengthen their technical and financial capacity for adequate pre-disaster planning and mitigation. By virtue of being closest to the events the local bodies are most likely to be given the responsibilities for coping with disasters.

11.03 Natural hazard means the probability of occurrence, within a specific period of time in a given area, of a potentially damaging natural phenomenon. Natural hazard prone areas mean the areas likely to have (i) moderate to very high damage risk zone of earth quakes, OR (ii) moderate to very high damage risk of cyclones OR (iii) significant flood flow or inundation, OR (iv) Tsunami proneness (v) landslide proneness or potential, OR (vi) one or more of these hazards. Natural disaster means a serious disruption of the functioning of a society, causing widespread human, material or

environmental losses caused due to earthquake, cyclone, flood, Tsunami or landslide which exceeds the ability of the affected society to cope using only its own resources.

11.04 Earthquake-prone areas mean the areas under seismic zones III, IV & V (as specified in IS: 1893), which are likely to have moderate to high damage, risk due to earthquake. "Cyclone-prone areas" mean the areas close to the coast where the cyclonic wind velocities exceed 39 m/sec. (specified in the wind velocity map given in I.S. 875) and prone to cyclonic storms. In this State of Tamil Nadu, it normally extends to a distance of 20 km. from the coast in all the coastal districts. "Flood-prone areas," mean areas likely to have significant flood flow/ inundation. "Tsunami-prone areas" means the areas affected in the past and the areas likely to be affected by Tsunami, as identified and notified by City Corporation of Chennai as Tsunami-prone areas.

11.05 Hazard-prone Areas in Chennai Metropolitan Area may be classified as follows:

(i) Earth quake-prone Areas:

Chennai Metropolitan Area falls under Seismic Zone – III. The whole of Chennai Metropolitan Area falls in this zone.

(ii) Cyclone-prone Areas:

In this Chennai Metropolitan Area, it extends to a distance of 20 km. from the coast in all the coastal districts. In these areas, the risk is due to (a) cyclonic wind velocities combined with heavy storm, (b) flooding by seawater due to high waves and (c) flooding due to heavy storm. The map showing the cyclone-prone areas in Chennai Metropolitan Area is annexed.

(iii) Landslide-prone Areas

Unstable geological conditions, indiscriminate construction activity, heavy rainfall and flash floods coupled with poor drainage due to urbanisation are the main factors causing landslides in hilly regions; earthquakes also trigger landslides. No area in Chennai Metropolitan Area qualifies for zoning as landslide-prone area.

(iv) Flood-prone Areas:

From the flood hazard map of India (mapped by meteorological department, New Delhi), it is seen that no area in Tamil Nadu falls in the risk zone. But within a local body area, particularly with reference to an area's proximity to a major drainage system like rivers, canals and also water bodies like lakes, and further with reference to contour levels/low-lying areas, flood-prone area mapping has to be done.

In Chennai Metropolitan Area, there are a few areas along the rivers and canals and low-lying areas which are susceptible to flooding/inundation during heavy storms. Map showing the floodable areas [macro level] identified in the Madras Metro Flood Relief / Storm Water Drainage Master plan is annexed. Existence of macro and micro drainage networks in Chennai Metropolitan Area facilitate draining of these areas within a reasonable time. Developments in such low-lying areas are allowed only when a proposed development conforms to standards and after getting clearance from PWD on the measures to be taken to make it free from inundation.

(vi) Tsunami-affected Areas:

Mapping has to be done on the areas wherein Tsunami had directly hit and flooded the coastal areas in Chennai Metropolitan Area. These areas may have to be zoned as Tsunami-affected areas. However this area within Chennai Metropolitan Area is concerned will fall within the CRZ area 500 m from HTL along the coast.

11.06 Development Control Rules for CMA provide for regulating the constructions with reference to zone, location, height, number of floors, size of buildings, set back spaces to be left around and the use of the building and land. Building Rules under the Local Bodies Acts are concerned they provide for regulation of location of buildings, foundations, plinths, superstructures-walls, floors and rooms, licensing of surveyors and inspection of municipal engineers at various stages of constructions, regulations on dead and superimposed loads, wind load/pressure, reinforced cement concrete and framed structures, construction materials, etc. Structural safety and soundness are regulated under the Building Rules under the Local Body Acts. Hence early action should be taken to include Special Rules for Hazard Prone Areas in the Building Rules of the Local Bodies.

**Mitigation**

11.07 Mitigation means the measures taken in advance of a disaster aimed at decreasing or eliminating its impact on society and on environment including preparedness and prevention. The Government of India-UNDP Disaster Risk Management Programme (2002-2007) is a national initiative to reduce vulnerability of communities in some of the most hazard-prone area in our country; 38 cities urban earthquakes vulnerability reduction programme is a sub-programme. The main objectives of the programme are:

- (i). Awareness Generation - at national level by conducting meetings of municipal authorities and placement of National UN Volunteers, at state

level consideration and approval of nodal department's plans. Its agenda includes arranging for regular consultations of city-specific strategies, awareness generation campaign, use of mass media in awareness and sensitization, adoption and dissemination of information, education and communication materials and manuals, dissemination of appropriate construction technologies including retrofitting and seismic strengthening techniques.

- (ii). Development of techno-legal regime - including identification of apex body, nodal agency in the state for co-coordinating development of techno-legal regime, need for sensitization of policy makers, orientation of officials in urban local bodies, review of existing bye-laws, other technological aspects and recommendations, orientation of engineers, architects, planners and city managers on the salient features of bye-laws and codal provisions, compulsory certification of engineers and architects, developing a city-specific safety audit of building practices and institution of a state ombudsman for safe building practices, developing of partnerships with financial institutions and insurance agencies for ensuing seismic safety in new/old constructions through loans and legislation for certification of seismic safety of existing buildings within a time frame.
- (iii). Earthquake preparedness and response plans - including sensitisation meetings with communities, residential welfare associations, identification and training of volunteer trainers, hazard mapping and vulnerability mapping, preparation of ward/zone preparedness and response plan, formation of Disaster Management Committees (DMC) and task force training (Disaster Management Teams), training DMCs and DMTs, compilation of ward plans to city plans, review of city preparedness and response plans, conversion of city fire services to emergency rescue and fire services, and training of the trainers.
- (iv). Training capacity building - including the development and implementation of the training calendar and models with training/response institution, training of practicing engineers and architects from government departments having programme modules of retrofitting and capacity building of government functionaries and technical institutions in the formulation and review of earthquake preparedness and response plans.

11.08 In the state of Tamil Nadu, the Revenue Administration, Disaster Management and Mitigation Department is the nodal agency for the UNDP-Government of India sponsored Disaster Risk Management programme and it is effectively implemented in

Tamil Nadu including Chennai Metropolitan Area. A note on the programme is given in Annexure-I.

11.09 A subcomponent of the DRM Programme is the Urban Earth Quake Vulnerability Reduction Programme (Annexure-II). Most of the components of the GoI-UNDP Urban Earthquake Vulnerability Reduction Programme are also applicable to other natural disasters viz. cyclones, landslides, floods and Tsunami. Hence the awareness generation, development of techno-legal regime, earthquake preparedness and response plans, training and capacity building should be done covering these natural hazards also and the State Nodal Agency may take appropriate action on these.

11.10 Even after the GoI-UNDP DRM programme period, the State Nodal Agency should continue these measures. Pre-disaster preparedness and disaster management plans should be periodically reviewed and up-dated.

11.11 Early action to amend the Building Bye-Laws of local bodies to include special provisions for hazard-prone areas and enforce the same since the whole of Chennai Metropolitan Area falls in Seismic Zone-III now and it also includes cyclone-prone areas to majority of its extent.

### **Mechanisms**

11.12 Disaster management mechanisms exist at district level in the State. The structure includes District Disaster Management Committee, Disaster Management Teams, Crisis Management Groups, Emergency Operation Centre, Site Operation Centres, Modalities of involvement of army and other defence forces, NGOs and other institutions. District Response Plans focus on operational direction and coordination, emergency warning and dissemination, rapid damage assessment and reporting, search and rescue, medical response, logistic arrangements, communication, temporary shelter management (including free food/kitchen management), law and order, missing persons search/media management, animal care, involvement of NGOs and voluntary organisations. Depending on the disaster and damage caused Relief Management Plan need to be prepared identifying the relief needs, mobilization points, transportation and co-ordination with relief teams.

11.13 To restore normalcy to lives and livelihoods of the affected population, recovery and reconstruction plan has to be prepared, both for short term and long term, taking into account restoration of basic infrastructure, reconstruction / repair of life-line buildings / social infrastructure / damaged buildings, medical rehabilitation (both

physiological and psycho-social interventions) and restoration of livelihoods through assistance /aid / grants.

11.14 Every year a pre-monsoon preparedness review meeting under the Chairmanship of Chief Secretary to Government is conducted to make assessment of the probabilities of monsoon floods and cyclone well in advance and to co-ordinate and prepare detailed plans to tackle real life situations. The Disaster Management Plan is also prepared. The collectors are instructed to prepare a hand-book containing information about the warning system given by the Indian Meteorological Department in flood and cyclone to the line departments/agencies, dissemination of information to line departments/agencies and general public, the level of preparedness and planning in the district administration, identification of vulnerable areas prone to flood and cyclone, contact telephone numbers of departments concerned / voluntary organisations/ NGOs/ CBOs, SHGs etc. Copies of handbook are distributed to all the line departments, educational institutions, and offices of the elected representatives.

11.15 District Co-ordination Committee conducts meetings with various organisations, local bodies etc. to review the preparedness and to take effective action.

11.16 Mock drills by the Police, Fire Department, NCC, and Home guards are conducted to create awareness for search and rescue purposes in the event of any emergency.

11.18 A control room has been established in the districts to monitor the activities during the monsoon period. Two-way communication system of VHF / HF system has been installed in all the 13 coastal districts and in the office of the State Relief Commissioner. Toll-free public utility service telephone is put into service at the district head quarters. A permanent control room is functioning round the clock at the Ezhiligam in the Office of the State Relief Commission.

11.18 In order to avoid flooding on account of torrential rains, the following steps are taken before the monsoon begins:

- a. The PWD is directed to keep a constant watch over all the dams and major anaicuts and take necessary measure to plug the breaches and to ensure advance intimation to public before release of excess water. Cyclone shelters and buildings identified for accommodating the displaced persons are inspected for keeping them in all readiness.
- b. The Highways Department is directed to keep all machineries like bulldozers, power-saws etc. in adequate quantity and in good condition for the purpose of clearing obstructions / road blocks caused by uprooted trees, electric posts etc. during the time of cyclone flood etc.

- c. The collectors are directed to check the stock position of essential commodities like rice, kerosene in the godown and make available adequate number of lorries in good running condition to move the commodities like rice, kerosene to the affected people.
- d. The Public Health Department ensures the availability of disinfectants and essential measures.
- e. In times of emergencies, the assistance of navy and coast guard authorities, Army and Air force is taken to tackle the problem of evacuation, dropping of food to the affected people etc.
- f. All oil corporation are required to keep adequate stock of fuel at the vulnerable points in the State and to provide refueling centres for helicopters that are pressed into service.
- g. The medium of TV and Radio are utilised to caution the public to take precautionary measures and to move to safer places and
- h. All the line departments including EB are instructed to have an effective coordination at the district level under the leadership of collectors. Hill Districts are instructed to be alert to deal with landslides.

11.19 Chennai City and its environs are very flat, and traversed by three river viz. Adyar, Cooum and Kosasthalaiyar. Mean annual rainfall is about 120 cm, and mean rainy days are 52 days. Records have shown that there were several catastrophic floods in Chennai in the last century in 1943, 1976, 1985, 2002 and 2005 caused by heavy rain associated with cyclonic activity. Flooding of less catastrophic nature occurs regularly in low-lying areas of the City and its suburbs because of inadequacy or inoperativeness of local drainage infrastructure. In the year 2005 total rainfall was 240.8 cm and in the month of October it was 107.7 cm causing flooding of many parts of the City and to suburbs.

11.20 A disaster management cell functions in the City Corporation of Chennai to tackle flooding problem. Before the monsoon in October-December every year as a precautionary measure, drains are desilted and obstructions if any, are removed. Nodal officer and zonal officers are identified and vested with adequate powers to tackle such emergencies. Relief centres are identified and notified and responsibilities fixed for ensuring shifting of affected people to the relief centres, supply of food and other relief measures. Equipments to take out flood water from low-lying / submerged areas are kept ready. Arrangements are made for flood relief and details about whom should be contacted in such emergencies notified, published in news papers and announced over radio and television. All the agencies required to be involved such as Police, Fire and Rescue services, Metropolitan Transport Corporation, District administration, Health,

Army and Navy are alerted / kept informed to be ready. Readiness to tackle the flooding situation is reviewed at the Government level and ensured before monsoon every year.

### **Cyclone Risk Mitigation Project**

11.21 The Ministry of Home Affairs in consultation with the States prone to cyclone risks has drawn up a National Cyclone Risk Mitigation Project to be implemented with the assistance of World Bank. Under this project Cyclone Risk Mitigation investments will be undertaken in the States and Union Territories and it involves construction of cyclone shelters, shelter belt plantations, mangrove regeneration and construction of embankments to stop sea water inundation, construction of missing road links and commissioning of technical assistance / studies to sustain these initiatives in the States.

11.22 The World Bank has offered to support this project covering all 13 cyclone prone States and the State of Tamil Nadu is one among them. The State of Tamil Nadu which was placed in the Category II (Low Vulnerability) with the Project outlay of Rs. 26 crores has subsequently been placed under Category I (Higher Vulnerability) with a project outlay of Rs. 176 crores. The project cost has to be shared by the Centre and State Government as grant to State and 25% matching resources will have to be provided by the State in the Budget.

## **Annexure – I**

### **Disaster Risk Management Programme (2002-2007)**

Government of India (GoI) and United Nations Development Programme (UNDP) have signed an agreement in August 2002, for implementation of Disaster Risk Management programme to reduce the vulnerability of the communities to natural disasters in identified multi-hazard prone areas.

Tamil Nadu State is one of the States selected for this project and a Memorandum of Understanding has been signed between the UNDP and the Government of Tamil Nadu on 30.10.2003 in the presence of the Hon'ble Chief Minister of Tamil Nadu. This project will be implemented in the districts of Tiruvallur, Kancheepuram, Cuddalore, Nagapattinam, Kanniyakumari, and The Nilgiris and in the cities of Chennai and Coimbatore.

#### **Goal:**

“Sustainable Reduction in Natural Disaster Risk” in some of the most hazard prone districts in selected states of India.

#### **Objectives:**

1. National capacity building support to the Ministry of Home Affairs.
2. Environment building, education, awareness programmes and strengthening the capacity at all levels in natural disaster risk management and sustainable recovery.
3. Multi-hazard preparedness, response and mitigation plans for the programmes at state, district, block, village panchayat and ward level in select programme states and districts.
4. Networking knowledge on effective approaches, methods and tools for natural disaster risk management, developing and promoting policy frameworks.

#### **Urban Earthquake Vulnerability Risk:**

##### **Reduction Programme:**

It is proposed to take up urban earthquake vulnerability risk reduction measures in 166 districts under this programme. In the first phase 38 earthquake prone cities all over the country having a population of more than 5 lakhs including Chennai and Coimbatore Cities in Tamil Nadu falling in zones with moderate to very high risk to earthquake have been identified. The goal of the programme is sustainable reduction in earthquake risk in the most earthquake-prone urban areas across the

country. Chennai and Coimbatore cities have been identified as earthquake-prone cities in Tamil Nadu.

### **Institutional Arrangements**

Village	Village Disaster Management Committee
Panchayat	V P Disaster Management Committee
Block	Block Disaster Management Committee
District	District Disaster Management Committee
State	State Steering Committee (State Nodal Agency)
National	Project Management Board (MHA-DM Division)

### **Implementation Process:**

The disaster risk management plan would start at the village level and would be consolidated through similar planning at the Panchayat, Block, District and Urban Local Body levels in the selected districts. At village level volunteers will prepare the plan and at other levels concerned Disaster Management Committees (DMCs) will prepare it. The plans would focus on disaster risk prevention and early recovery through community based preparedness and response plans, skill development for construction of hazard resistant housing and enhanced access to information as per the need of the community. Disaster Management Teams (DMTs) would be formed at various levels to implement the plans.

### **Awareness Campaign Strategy:**

An effective disaster, risk management campaign strategy will be developed by the State Nodal Agency and will include:

- Rallies
- Mass meeting
- Wall paintings
- Posters

Competitions like essay, debate and painting competitions among school and college students.

### **Training / Capacity Building:**

- Training of Trainers at the State, district and block levels to enhance the capacity of the DMC
- Specialised training to DMTs
- Exposure visit of Government officials, PRIs and DMTs
- Studies, research and workshops to be conducted at the national and state level
- Training manuals, standard operating procedures and documentation on best pictures.

**Development of Disaster Risk Management Plan:**

Multi-hazard risk management plans to be prepared by trained volunteers at the Village Panchayat, Block, District, State and National levels. **Mock Drills** to be carried out before the disaster seasons, by the key players, to find out the feasibility of the plan and to ensure greater role clarity.

**Other activities to be taken up under the programme to reduce vulnerability:**

- Construction of disaster resistant and cost effective demonstration units and retrofitting of non-engineered buildings
- Training of masons and engineers for wider dissemination and adoption of technology
- Advocacy for standard building codes and bye-laws
- Emergency rescue kits to be provided to the vulnerable districts
- Strengthening of the State and District Disaster Management Information Centres
- Resource Inventory database
- Urban earthquake vulnerability preparedness programme
- Strengthening training institutes
- Vulnerability and risk indexing

**Sustainability of the programme:**

- All disaster preparedness and mitigation plans to be approved by Village Panchayat, Block and Urban Local Bodies
- Disaster preparedness and mitigation plans to be an integral part of all developmental planning process
- DMCs and DMTs to conduct mock drill regularly to enhance preparedness
- Well-equipped and functional disaster management information system
- Adequate human resources capacity building
- Manuals and guidelines will be available for all emergency operations
- Availability of local trained masons in appropriate disaster-resistant housing technology.

**Outcomes:**

- Administrative and institutional framework at State level
- Enhanced capacity of all stakeholders
- Aware and informed community
- Comprehensive disaster risk management and mitigation plans in the programme states based on vulnerability and risk assessment of women and children towards natural disasters

- Enhanced capacity of DMTs in first aid, shelter management, water and sanitation and rescue evacuation
- Capacity building in earthquake risk management at national, state and city (Ward / Community) level, including strengthening of key resources institutions and establishing of linkages
- Earthquake preparedness and response plan for all the 38 cities across the country
- Well-equipped disaster risk management information centers at State and District Headquarters
- Manuals, training modules and awareness strategies
- Emergency kits at all selected districts
- Enhanced capacity of the training institutions
- Trained, skilled masons engineers for hazard-resistant housing
- Technology demonstration units for dissemination
- Knowledge network for enhanced involvement of stakeholders
- National and State database on natural disaster risk management
- Vulnerability and risk reduction reports.

## **Annexure – II**

### **A step towards Urban Earthquake Vulnerability Reduction**

#### **National Disaster Risk Management Programme**

The GOI – UNDP National Disaster Risk Management Programme (NDRM) is a national initiative aimed to reduce vulnerabilities of communities in some of the most hazard-prone districts (169 districts in 17 states) of India. The programme (2002-2007) aims to contribute to the social and economic development goals of the National & State Governments, enable them to minimize losses of development gains by reducing their vulnerability to natural disasters.

Six districts namely Cuddalore, Tiruvallur, Nagapattinam, Kanniyakumari, Kancheepuram, The Nilgiris, and two cities of Chennai and Coimbatore in Tamil Nadu have been taken under this NDRM initiative. Revenue Administration, Disaster Management & Mitigation Department will implement the Programme in Tamil Nadu.

#### **UEVR Project – Background**

The Urban Earthquake Vulnerability Reduction Project is a sub-component of the NDRM. Earthquake is a natural event which may cause tremendous loss of life and property damage. One of the major challenges facing our country is to reduce the vulnerability to this uncontrollable and unpredictable hazard by having a greater understanding about its causes and effects and also by adopting suitable preparedness and mitigation measures.

#### **Seismic Map of Tamil Nadu (Zone II & III)**

As per the latest seismic zoning map of India brought out by the Bureau of Indian Standards, 59% of land area of the country is prone to seismic intensity of MSK VII or more during earthquakes. Some of the most intense earthquakes of the world have occurred in India, but fortunately, none of these have occurred in the vicinity of the major cities. India has highly populous cities including the national capital of New Delhi, located in zones of high seismic risk. Majority of the constructions in these cities are not earthquake-resistant. Thus any earthquake striking one of these cities would turn into a major disaster.

It is most important in the medium and long term to formulate strategies to reduce the vulnerability to and losses arising from a possible earthquake striking any of these cities. Six significant earthquakes have struck different parts of India over a span of the last 15 years. Five of them occurred in rural or semi-urban areas and hence the damage in terms of human lives and property were relatively small. On the other hand, the 2001 Bhuj earthquake struck both rural and urban areas and reiterated the scale of

vulnerability. If any of these earthquakes strike the populous urban centres, the damages would be colossal.

### **The Programme**

The programme envisages strengthening capacities of communities, urban local bodies & the administration in mitigation, preparedness and response across 38 cities in the country having population above half a million and falling under seismic zone III, IV and V. Chennai & Coimbatore Cities (Seismic Zone III) are among the 38 cities taken under the UEVRP initiative. City Disaster Management Committee has been formed in these two cities with Commissioner, Corporation of Chennai & The District Collector, Coimbatore as the Chairman of the CDMC. The programme would demonstrate a suitable model for mainstreaming of earthquake risk management initiatives at all levels and help reduce seismic risk in the most earthquake-prone urban areas in India.

#### **Past Seismic Events in Tamil Nadu**

<b>Date</b>	<b>Intensity</b>	<b>Location</b>
28.01.1679	IV	Felt at Chennai
16.09.1816	IV	Felt at Chennai
29.01.1822	V-VII	Felt at Chennai, Vellore area
03.01.1859	VI	Felt at North Arcot Coimbatore District
03.07.1867	V	Felt at Villupuram
08.02.1900	VI-VII	Coimbatore, felt all over South India
07.01.1916	VI	Felt at Nilgris area
26.06.1941	VIII	Felt almost Coromandal Coast
29.02.1944	VI	Felt at Madurai, Coonoor area
07.02.1962	VI-VII	Coonoor area
29.07.1972	VI	Coimbatore area
07.07.1988	VII	Kambam, Madurai area
26.09.2001	VI	Chennai area

### **Goal**

Sustainable reduction in earthquake risk in the most earthquake-prone urban areas across the country

### **Objectives**

- Create awareness among government functionaries, technical institutions, NGOs, CBO's and communities about earthquake vulnerability and possible preventive actions.

- Development and institutionalizing of earthquake-preparedness and response plans and practicing these through mock drills.
- Development of regulatory framework (techno-legal regime) to promote safe construction and systems to ensure compliance.
- Capacity building for practicing engineers, architect, builders, contractors & other professionals dealing with emergency response.
- Networking knowledge on best practices and tools for effective earthquake risk management, including creation of information systems containing inventory of resources for emergency operations.

### **Outcomes**

- Capacity building in earthquake risk management at national, state and city (ward / community) level, including strengthening of key resource institutions and establishing of linkages.
- Disaster management team formed at the city level along with sectoral preparedness plan for all nodal agencies in the Urban Local Body.
- An aware and informed community.
- Integration of seismic risk management into development programmes.
- Enhanced capacity of the practicing engineers / architects & the training / academic / resource institutions.
- Review of enforcement mechanisms for the byelaws etc.
- Replication of the programme to other urban centres across the state.

### ***Earthquakes don't kill people. Unsafe buildings do.***

#### **Three points to remember**

- If you are building a house you can build for safety
- If you are living in a house / flat you can improve its safety
- If you are looking for a place to stay you can look for safety

#### **Before**

- Insist upon earthquake resistant features while constructing / buying a house / flat. Ensure construction complies with building byelaws and BIS Codes.
- Consult an engineer / architect for retrofitting your house to make it earthquake resistant.
- A common meeting point inside the city and a contact outside the city should be identified and known to all members of the family.
- Keep a list of important telephone numbers, torch, transistor, first-aid kit, water and non-perishable food at a designated place as a family emergency kit always ready.

- Train yourself in basic first aid. Form teams for First-aid, Search & Rescue etc. in your area and conduct preparedness drills for what to do in case of an earthquake.

### **During**

- Keep calm and help others to keep calm. Do not panic.
- If you are at home or inside a building:
  - don't try to run out of the building, protect yourself by ducking under a sturdy table or a bed and stay there until the shaking stops.
  - Turn off electricity and gas.
- If you are on the road in a built up area:
  - immediately move away from buildings, slopes, streetlights, power lines, hoardings, fly-over etc. towards open spaces.
  - Do not run or wander haphazardly.
  - Keep the roads free for movement.
- If you are driving:
  - stop the vehicle away from the slopes, buildings and electric cables; come out of the vehicle, hold it and stay by its side.

### **After**

- Keep calm and expect aftershocks. Check if you or anyone else is hurt.
- Use first aid and wait for medical help.
- Do not move seriously injured people.
- Do not turn-on electrical appliances and gas.
- Do not spread rumors and don't panic.
- Do not waste water and do not block telephone lines.
- Keep the streets clear for emergency services.
- Volunteer to help.

**Bureau of Indian Standards (BIS)** has the following seismic codes:

**IS 456, 2000**, Indian Standard Code of Practice for Plain and Reinforced Concrete (4<sup>th</sup> Revision)

**IS 800, 1984**, Indian Standard Code of Practice for General Construction in Steel (2<sup>nd</sup> Revision)

**IS 875**, Code of Practice for Design Loads (Other than earthquake) for Buildings and Structures.

**IS 1893 (Part I), 2002**, Indian Standard Criteria for Earthquake Resistant Design of Structures (5<sup>th</sup> Revision)

**IS 4326, 1993**, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings ( 2<sup>nd</sup> Revision)

**IS 13827, 1993**, Indian Standard Guidelines for Improving Earthquake Resistance of Earthen Buildings.

**IS 13828, 1993**, Indian Standard Guidelines for Improving Earthquake Resistance of Low Strength Masonry Buildings.

**IS 13920, 1993**, Indian Standard Code of Practice for Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces.

**IS 13935, 1993**, Indian Standard Guidelines for Repair and Seismic Strengthening of Buildings.