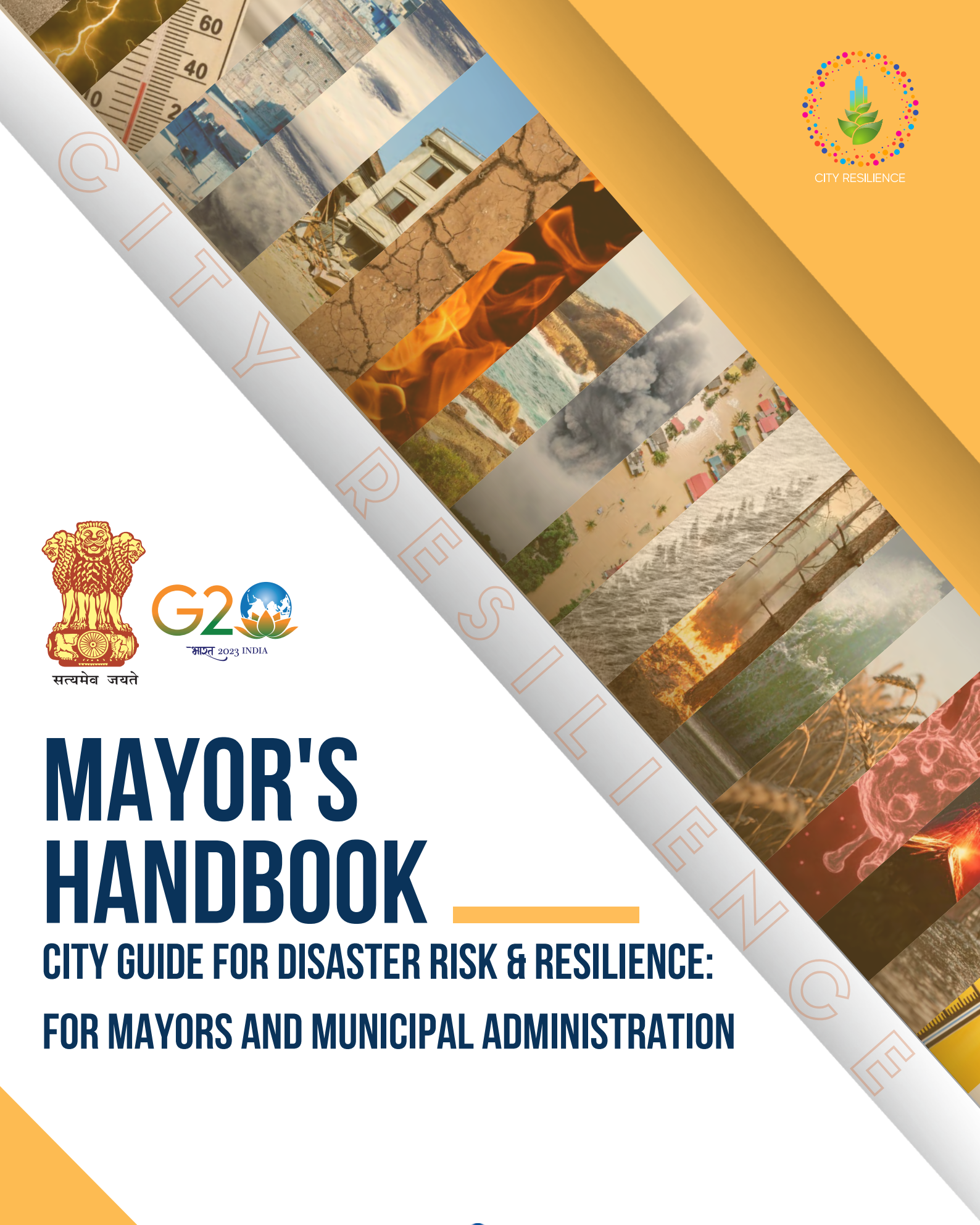

CITY RESILIENCE

सत्यमेव जयते

G20 भारत 2023 INDIA

MAYOR'S HANDBOOK

CITY GUIDE FOR DISASTER RISK & RESILIENCE:

FOR MAYORS AND MUNICIPAL ADMINISTRATION

IIT Indore
Indian Institute of Technology Indore
॥ ज्ञानम् सर्वजनहिताय ॥

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Resilient India - Disaster Free India

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National Institute of Disaster Management
(Ministry of Home Affairs, Government of India)

Mayor's Handbook: City Guide for Disaster Risk & Resilience: For Mayors and Municipal Administration

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Disclaimer:

This publication is based on the research study carried out under the project entitled "Multi-Hazard Disaster Risk & Resilience: Practical Learning and Step-by-Step Guide to Improve Disaster Resilience at City Levels" from 2021 to 2022. This study includes various sets of Information from research work undertaken in joint collaboration with National Institute for Disaster Management (NIDM), New Delhi and Indian Institute of Technology (IIT), Indore. Authors acknowledge all the contributions from original sources i.e., published, unpublished literature, reports, documents, and web resources. This report in full or in parts can be freely referred, cited, translated and reproduced for any academic and noncommercial purpose with appropriate citation of authors and publishers.

FOREWORD

RAJENDRA RATNOO
EXECUTIVE DIRECTOR

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Disasters are highly unpredictable and instantaneous in nature and thus demand an immediate action. India has adopted a strategic approach towards disaster management which is focused on preparedness and mitigation so the rising numbers of disasters can be brought down significantly.

A significant reduction in losses and damages due to disasters in the country has been achieved with the enactment of the Disaster Management Act, 2005 and the implementation of the National Disaster Management Policy, 2009 and National Disaster Management Plan, 2016.

A study on "Disaster Risk and Resilience in States and Union Territories – An Analytical Study" was conducted in 2019 which analyzed and measured the disaster risk and resilience level of the States/UTs of India. The present study titled "Multi-hazard Disaster Risk & Resilience: Practical Learning and Step-by-Step Guide to Improve Disaster Resilience at City Levels" is a propagation of the aforementioned study to the next step i.e. at the level of cities. This study has been conducted by the Indian Institute of Technology, Indore, Madhya Pradesh under the aegis of National Institute of Disaster Management, Ministry of Home Affairs, Government of India in order to improve the overall resilience level of the cities/urban local bodies towards disaster risks.

The impacts and effects of disaster are more immediate and intense at the level of the cities/urban local bodies. Hence, this study will prove to be remarkable in providing a more localized approach to the cities for understanding internal disaster risks and improve their preparedness and resilience thereby making them a self-sufficient paragon to deal with disasters.

(Rajendra Ratnoo)

PREFACE

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Resilient India - Disaster Free India

सत्यमेव जयते

Prof. Anil Kumar Gupta

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It's a matter of immense pleasure for me to present this study on Mayor's Handbook: City Guide for Disaster Risk & Resilience: For Mayors and Municipal Administration developed in collaboration with Indian Institute of Technology, Indore which presents a scorecard to measure the level of disaster risks and resilience for a city. This study was conducted as a pilot for the four cities of India viz. Guwahati, Jaipur, Srinagar and Vishakhapatnam representing a diverse range of geophysical characteristics. I strongly believe that this study is going to assist various line department officials in taking well-informed and precise decisions in case of the emergence of a disaster.

Climate-related extremes have more pronounced effects in cities because of the more complex urban infrastructure systems, rapid increase in urban populations and intensive economic activities. Cities are currently facing an over-burden due to increased migration and thus are becoming sensitive and vulnerable to disasters and even unanticipated incidents like the sudden heat wave intensification in the United Kingdom in 2022. Thus, cities specifically should be more and more focused on increasing their understanding of localized risks and developing resilience. A bottom up approach may prove to be exceptional wherein the resilience at city levels can altogether build resilience at state and national levels.

This study is very detailed and is in the form of seven reports viz. a technical report which encompasses the development of risk and resilience scorecard for all four cities, four city-specific technical reports, a step-by-step disaster management guide to improve disaster resilience of Indian cities and a mayor's handbook – a ready reckoner to assist Urban Local Bodies in planning and implementing disaster risk reduction strategies effectively.

(Anil K Gupta)

ACKNOWLEDGEMENT

This study on "Multi-hazard Disaster Risk & Resilience: Practical Learning and Step-by-Step Guide to Improve Disaster Resilience at City Levels" has been carried out with a collaborative effort from the National Institute of Disaster Management (NIDM), New Delhi and the Indian Institute of Technology (IIT), Indore research teams.

Special thanks to the government authorities from the four cities i.e., Guwahati, Jaipur, Srinagar, and Visakhapatnam for providing valuable suggestions, feedback, and timely response to the required datasets in preparing disaster scorecards for risk and resilience of the selected cities. The project team is grateful to Major General Manoj Kumar Bindal, then Executive Director, and also to Shri Rajendra Ratnoo, IAS, present Executive Director NIDM for their constant support and encouragement in performing this study and ensuring the effective functioning of the project. A number of consultation workshops were hosted which saw participation and suggestions from regional experts, scientific community, government organizations, and National Disaster Response Force (NDRF).

The contribution of principal investigator Professor Manish Kumar Goyal and his research team comprising Dr. Vikas Poonia (Post-Doctoral Fellow, IISC Bangalore), Mr. Vijay Jain, Mr. Shivukumar Rakkasagi, and Mr. Shivam Singh (Research Scholars, IIT Indore) are acknowledged for joining hands with us in completion of this study for providing a technical assessment of natural and man-made hazards in the cities through collected data and in a compilation of the report. The study was supported with continuous support of the team from NIDM am comprising of Dr. Kopal Verma (also acknowledged for the special efforts in designing the report), Dr. Uzma Parveen, Ms. Fatima Binte Amin, and Mr. Michael Islary for their overall coordination with all the cities authorities and collection of the datasets. The project team extends thanks to the library and the entire publication cell of NIDM for their support and publication of this report.

(Anil K Gupta)

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- 35.4% Indian Population is living in urban areas

- Major Indian Cities are becoming hotspots of disasters like urban flood, heat wave, water stress, etc.

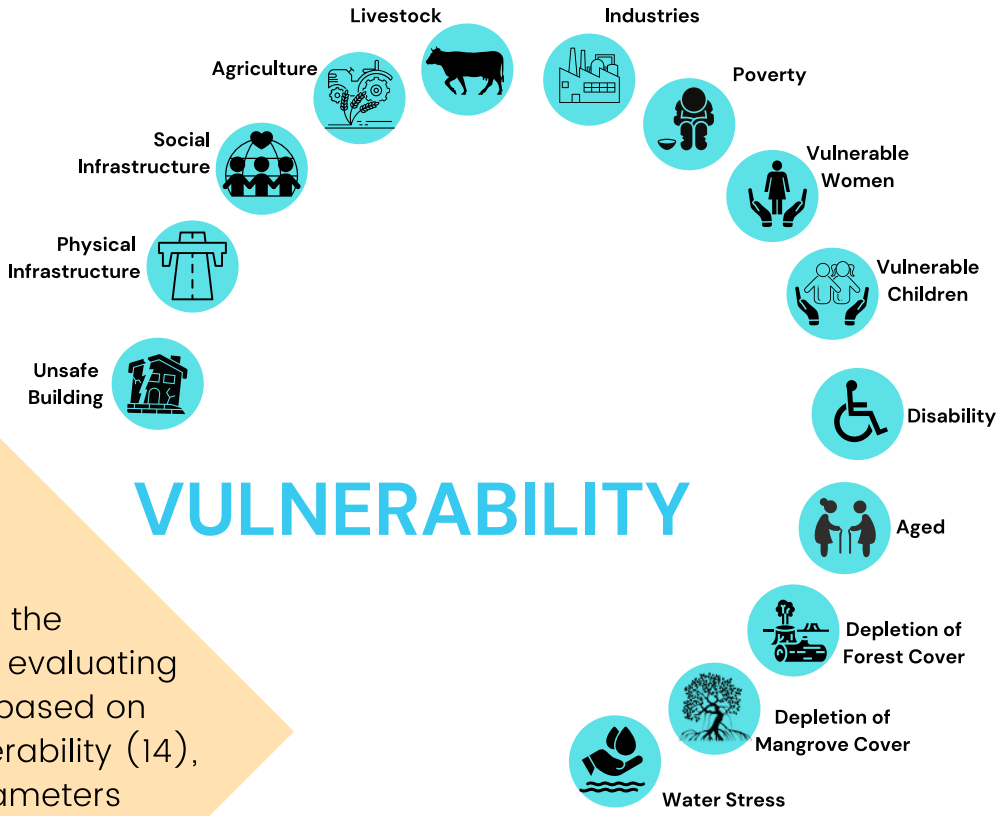
- Built areas per household has increased manifolds in cities

- Rising Rural to urban migration

- Urban poor is increasing

INTRODUCTION

The disaster risk and resilience for cities will be based on the planning for disaster risk reduction (DRR) and climate change adaptation. This guideline provides the systematized steps for evaluating the risk and resilience based on the hazards (14), vulnerability (14), and exposure (2) parameters assessment for Indian cities. In each step, this guide presents, the core principles for crucial action points, core issues, and checklists of action that will help authorities to take appropriate measures to minimize disaster consequences and their associated risks for vulnerable populations. The National acts and policies presented for guidance in these regards include National Disaster Management Act (2005), National Policy for Disaster Management (2009), National Disaster Management Plan (2019), and National Disaster Management Guidelines (2007–19), which provide Legal, Institutional, Technological, and Development framework for DRR. Worldwide, the policy frameworks provide global targets for making cities risk resilient and sustainable, which includes the Sendai Framework for Disaster Risk Reduction 2015 (SFDRR), Sustainable Development Goals 2030 (SDGs), and the New Urban Agenda, 2016, based on the present and future projected disaster risks.



This guideline provides the systematized steps for evaluating the risk and resilience based on the hazards (14), vulnerability (14), and exposure (2) parameters assessment for Indian cities.

This study evaluates the numerous risks associated with several disasters (natural and man-made) with their quantification.

This study was performed in collaboration of the National Institute of Disaster Management (NIDM) and the Indian Institute of Technology, Indore (IITI) and in consultation with concerned state governments and urban local body authorities.

WHY THIS HANDBOOK?

This study provides actions required by the Urban Local Bodies (ULBs) for increasing disaster management performance during the pre-disaster (Prevention, Mitigation, and Preparedness) and post-disaster phases (Response, Rehabilitation, and Reconstruction).

WHY URBAN LOCAL BODIES?

- ULBs play an essential role in making cities risk resilient to disasters (both natural and man-made).
- The role of ULBs in natural disasters is to implement risk reduction and mitigation strategies, planning for integrated command, control, rescue, and relief centers with prior approval for building planning based on permissions and codes required for disaster-prone regions.
- The ULBs can implement efficient land use, waste management, drainage system, reduce informal settlements, and unorganized development to minimize the risks of man-made disasters.
- The ULBs can take support from the Resident Welfare Associations (RWAs) and Non-governmental Organizations (NGOs) in making cities risk resilient.

Urban Local Bodies

Urban Local Bodies (ULBs) are the small regional bodies, that manage the city development, headed by the city's Mayor. Several responsibilities are assigned to different ULBs (Refer Figure 1) related to infrastructure, public health, safety, population welfare, and development actions to diminish the combined risks of disasters and climate change on vulnerable population by the state government.The key stakeholders, who work closely in consultation with ULBs, are National Disaster Management Authority (NDMA), National Disaster Response Force (NDRF), National Institute for Disaster Management (NIDM), State Disaster Management Authority (SDMA) and State Institute for Disaster Management (SIDM).

The types of ULBs and their authorities are presented below:

- Municipal Corporation: These are formed for cities' local administration. The council (legislative wing of the corporation), the standing committee (to support the council's work), and the commissioner, are the three major authorities of a municipal corporation. The Mayor leads the council, consisting of councillors elected by the people. At the same time, the Commissioner is nominated by the state government and is usually an IAS officer.

- Municipality: These are recognized for the regional urban governance, specifically for small cities. They are recognized by several other titles like the municipal council, municipal board, urban municipality, etc. Their composition is equivalent to municipal corporations, however, the president or chairman heads the committee. Despite the commissioner, they have a chief municipal/executive officer.

- Notified Area Committee: It is formed for urban governance, specifically for two zones- a rapid growing city due to industrial development and a city which did not achieve all the requirements essential for a municipality's structure, however otherwise considered significant by the state government. It is so named because, unlike a municipality, it is a wholly nominated body, meaning that all members, comprising of the Chairman etc., are appointed by the state government. Effectively, it is neither a legislatively formed nor an elected body.

- Town Area Committee: It is formed by a distinct act of state legislature for the governance of small urban regions. These are semi-municipal organizations entrusted with restricted civic works. It is entirely voted/ nominated or partially selected/ nominated by the state government.

- Cantonment Board: Its purpose is to ensure urban municipal governance among people living in cantonment zones (where armed force establishments are permanently positioned). It was established by the central government under the terms of the Cantonment Act, 2006, and is administered by the central government's Defence Ministry. It is a partially elected and partially nominated body with an ex-officio President as the station's military commander. The vice president is chosen from among the board's elected members. The President of India appoints the executive officer of the cantonment board.

- Township: It was created by larger community enterprises to afford public facilities to its workforce and employees living across housing colonies constructed near the industrial or commercial plants/factories. It is not comprised of a voted body. It's all members, including the town administrator are selected by the community enterprise.

- Port Trust: These are established in the port regions of cities like Visakhapatnam, Mumbai, Chennai, etc., for following purposes: (a) to govern and safeguard the port areas; (b) to facilitate public facilities. An Act of Parliament forms the port trust and entails elected and nominated members.

- Special Purpose Agency: The states have established some agencies to take on assigned actions or tasks that legally fit into the area of municipal corporations, municipalities, or other local governments. In other words, special purpose agencies are based on the function, not the site. They are recognized as 'single purpose' or 'functional local bodies' like city/town development trusts, housing boards, pollution control boards, etc. These are constitutional bodies by the state legislature or departments through administrative decisions. They function as a self-governing body and are not subordinate agencies to local municipal bodies.

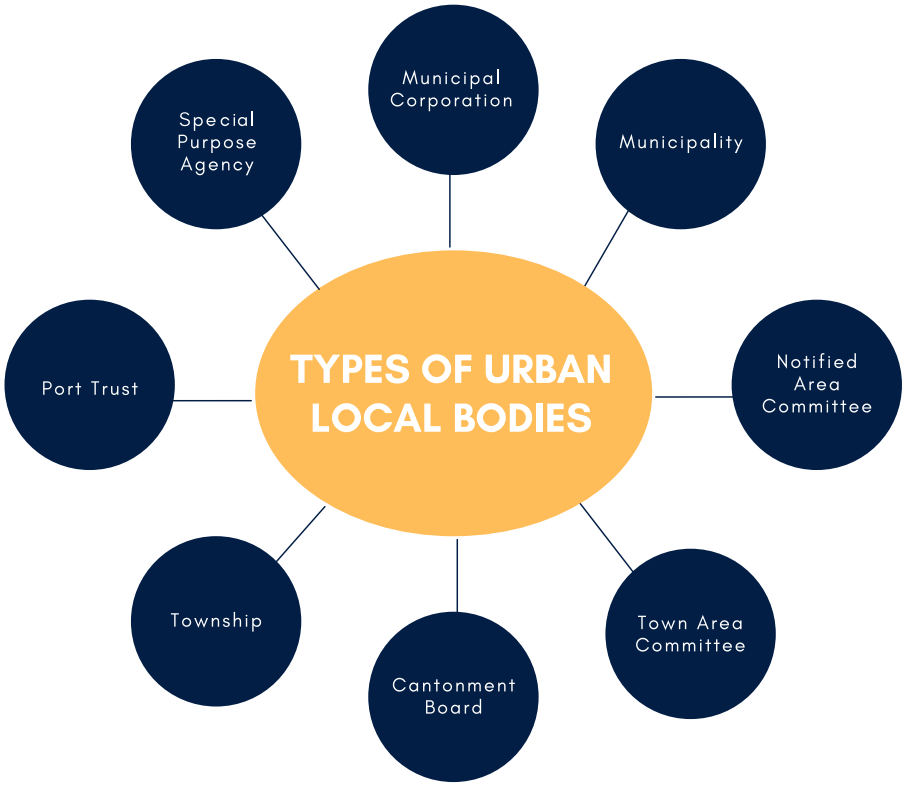


Figure 1

Types of Urban Local Bodies (ULBs)

Roles & Responsibilities of Urban Local Bodies

The role and responsibilities of all the ULBs are almost similar to municipal corporations. The differences occur in their control region, organizational structure, and the directive authorities. "In this section, we present the roles and responsibilities of city municipal corporations and their officials during different phases of disaster as shown in Figure 1.2 . The municipal corporation is headed by the city's Mayor (designated as the first person of the city). The municipal act promulgated by different states and union territories gives power and duties to the Mayor for playing his/her role in the city's overall development viz. the Guwahati (1971), Visakhapatnam (1979), Jaipur (2009), and Srinagar (2000) Municipal Act. When the Mayor is not present to perform his/her duties, the authorization of the Mayor's power is delegated to the Deputy Mayor. The Mayor is responsible for the day-to-day operations of a city disaster management authority. The authoritative person is accountable for providing leadership, coordination, and administration for all emergency actions in the city, both in the field and the control center. The person will act as the city's approved policymaker and present the crisis condition as well as the city's disaster management (DM) efforts. The Mayor ensures that all city emergency activities are coordinated with the city's line departments, the District Collectorate Office, bordering jurisdictions and higher authorities. The Mayor can direct and coordinate all municipal operations in the City Control Rooms, including final approval of each Disaster Action Plan (DAP) and giving instruction to the city's Disaster Management Organization for the DAP execution. The Mayor awards the contingency fund for emergency operations through the City Municipal Corporation's contingency plan fund. The severity of the event determines the requirement of funds allocation.

The roles and responsibilities of ULBs, like city municipal corporation (CMC) and its associated departments, are presented below, which are performed and supervised by the Mayor for efficient city disaster management.

1. City Municipal Corporation (CMC)

The CMC is accountable for the city disaster management body and offers leadership, coordination, and supervision of all emergency actions that must be executed for the city. The roles and responsibilities carried out by CMC are as follows:

- To establish an Emergency Operations Center (EOC).
- Lead management discussions with legislatures of all line sectors and NGOs.
- Revise the list of contact & inventories of all line sectors on the CMC website.
- Keep the communication facilities that can be moved to disaster-impacted locations for efficient communication. Providing superior-frequency functioning radio communication.
- Identification and restoration of damaged communication services.
- Coordinate with telecommunication facilitators to launch bulk SMS and email services with people to communicate warnings.
- Establish completely equipped rescue groups with untrained and trained officers.
- Establish Quick Response Teams (QRT) and Disaster Response Teams (DRT).
- Detect, acquire, and provide assets to associated backing organizations for immediate steps and procedures required to give the emergency response or endorse community safety.
- Identify all the resources which are accessible in the vicinity and locate their nearest site.
- Coordinate all the actions and associated groups to ensure an organized and efficient distribution of resources.

2. Engineering Department

- Support in evolving alternative planning of housing for people living in constructions that might be impacted during disasters.
- Assigning contractual labor, based on the requirements.
- Identify the gaps and operational problems in pre-disaster equipment support.
- Sustain the inventories of resources and equipment.
- Capacity building of engineers for damage evaluation and renovation.
- Keep pre-disaster maps, photographs, videos, and other essential documents.
- Preserve machinery in operational conditions.
- Engineering works should be carried out efficiently during and post-disaster to relocate the people to their places once the risk of the disaster reduces.

3. Urban Community Department

- Rescue groups for vacating vulnerable population from slum regions.
- Coordinate with SHGs (Self Help Groups), NGOs, etc., to support rescue operations.
- In consultation with Revenue Department, locate and operationalize the rescue and rehabilitation centers for offering shelter facilities to the evacuated people.
- Hiring employees or institutions for damage assessment.
- Support revenue in the direction of actions associated with emergency necessities of temporary shields, emergency mass serving, and aid allocations to the disaster casualties, disaster administrators, and support personnel.

4. Town Planning Department

- Locating open areas nearby traffic and transportation locations for establishing/setting up relief sites.
- Keeping a record of the safety of constructions and buildings.

- Identify and give notices to the owners of structures prone to failure.
- Establish procedures for demolishing hazardous structures.
- Identify flood deviation extents to protect inhabited city areas.
- Locate and send an alert at evacuation routes to the engineering sector.
- Inspection and authorization of structure strength/liveability situations after flooding.
- Planning of new buildings and housing, post disaster, to be carried out as per disaster risk, with less or no impact chances for the people in the future.

5. Revenue Department

Pre-Disaster

- Identifying low-lying zones, tolerable and suitable restoration housing, and vulnerable population in each ward and coordinating procurement and distribution of relief sources.
- Making sure functionality & strength of shields.
- Making a list of providers of relief materials and agreement with the municipal services for instant providing of the nutrition and relief resources during a disaster.
- Making sure management of actions associated with emergency requirements of temporary accommodation, emergency bulk feeding, and allocation of relief materials to the disaster casualties, disaster administrators, and support workforces.
- Advance alternative housing preparation for people living in constructions that might be impacted by disasters. The safety barrier frameworks of necessary services/commodities, must be arranged and acquired to establish the relief sites/rehabilitation centers.

Response and Post-Disaster

- It must coordinate with the concerned sectors for relief actions during a bomb blast or terror attack.

- The list of safety barrier stocks of essential supplies like rice, grains, etc., must be arranged and procured accordingly to organize the relief camps/rehabilitation centers.
- Post-disaster assessment of impact and damage must be done.
- In coordination with CMC, spread economic support to organize the relief camps and release funds to the injured population and properties.

6. Quick Response and Disaster Response Teams (QRTs & DRTs)

Pre-Disaster

- To construct the Incident Management Team.
- To form the Damage Assessment Team.
- Establish alignment with respondents' drill with the public in DM.
- To follow up with respective agencies to put up break gap bonds on an emergency basis & create and train the squad to develop temporary connections.
- Make a strategy to use human, tools, and materials resources efficiently.
- Preparation and collecting all the possible rescue equipment.
- To perform exercise and model programs for rescue and search authorities.
- Fire prevention stations and local command centers to be wholly equipped through workforce and equipment for searching and saving operations.
- Maintain communication gadgets in a condition of quick deployment.
- Rescuing disaster-prone regions in consultation with associated authorities.
- Perform mock drills, awareness campaigns, etc.

Response

- Managing disaster response actions.
- Initiating emergency support functions in line with the requirements.

- Notify the armed services (military and CAPFs) to be ready for emergency response.
- Providing renovation in communication, transport and coordinate relief allocation.
- Communicating with the health and sanitation authorities and departments, about amenities accessible through private and government sectors for medical facilities in disasters, in susceptible regional areas.
- Communicating with the power/electricity supply department about planning for the re-establishment and delivery of power supply through alternative energy sources.
- Instantly disposing off human and animal dead bodies to avoid epidemic situations.

Post-Disaster

- Completing and minimizing the response actions alongwith continuing the relief and other support amenity actions with the prepared relocation plan.
- Identifying and locating all the associated action and contact positions.
- Conducting the interrogation and consultation meetings among associated organizations.
- Preparing Post-Action Report to present learnings and development protocol.
- Communicating with the military, CAPFs and National Disaster Response Force (NDRF) groups about the emergency support amenities accessible to them.

7. National Disaster Response Force (NDRF)

- The NDRF, will form actions at the Emergency Operations Center (EOC), post-warning of disaster and execute present Standard Operating Procedures (SOPs).
- Initiating the operations based on the nature and severity of events.
- Assessing the requirements of accessible resources.

- Locate event command post and staging areas properly.
- Guide actions from a safe location, with an evacuation facility.
- Enhancing essential human resources and machinery power.
- Establish communications from the event place with strategic operations and Emergency Operations Center (EOC).
- Supervise actions and inform associated administration workers.
- Transportation of wounded people to hospitals.
- Move sufferers to temporary accommodation as per requirement.
- NDRF should work in coordination with State Disaster Response Force (SDRF) authorities.

8. Health & Sanitation Department

Pre-Disaster

- Assemble training programs for Doctors, Paramedical Staff to manage bulk casualties.
- Consulting with private & government hospitals, medical associations, blood banks, dispensaries, ambulance transportation, etc.
- Assess essentialities for further medical services and staff.
- Communication with the state medical department to store and supply the emergency medicines, drinkable water, surgical instruments, food packages, pesticides, reserve beds etc.,

Response and Post-Disaster

- Arrange emergency medical groups for places, where the public cannot be moved from the location. Afford drugs, water, and food in temporary shelters.
- Consult medical organizations and associations for taking care of the seriously injured people.
- Consult local blood banks and ambulance facilities.
- Plan for dead body disposal, victim identification, bulk casualty management and cleaning of the remains. Ensure protection and safety of medicines and medical gadgets.

- Form temporary mortuary services & manage with police to initiate the dead body disposal activities.

9. Civil Police Department

Pre-Disaster

- Create a task force to control the terror financing.
- Give warning messages and display Light-emitting diodes (LED) boards at traffic junctions that are generally observed by the community.
- Use recent communication technologies such as mobile applications, FM Radio, WhatsApp, Twitter, Facebook, etc., to give awareness to the local public.

Response

- Make sure law and order conditions in disaster-affected areas.
- Arrange additional police force at traffic junctions.
- Safeguard life and assets, monitor traffic, and monitor anti-social aspects.
- Arrange info or data about traffic movement to the community through media, public announcements, signboards, and display boards.
- Relocate stuck or impacted people through Forces and other means of transportation.
- Keep a record of activities initiated for supplies and competencies.
- Carry out any other actions as per local situation.

Post-Disaster

- Supporting the relief groups to vacate stuck people into temporary housing.
- Maintain records comprising of all applicable information of action and contact locations.
- Formulate a Post-Action Report to classify lessons learned and developments required.

10. Transport Department

- Determine transport requirements and accessible resources.
- Form and maintain public transport and resources.
- Distribute efficient information for travellers through Public Address System.
- Establish transport of injured people with the provision of medical attention.
- Keep a record of actions taken, reports, transport resources required, and the capacity and competencies.
- Establishing a temporary transport system in disaster-impacted locations.
- Re-establishing a permanent transport system as soon as the situation in disaster-impacted locations are normalized.

Fig. 1.2: **The Disaster Management Actions by Urban Local Bodies (ULBs)**

Capacity Building of ULBs

The capacity building of ULBs is the primary responsibility of the Mayor or the urban local body's chairperson for promptly working to diminish the risks of disasters (natural and man-made) and phenomena of climate change over the vulnerable city's population. Under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), the Ministry of Housing and Urban Affairs, provides the funds to the ULBs for their capacity building and training. Several reports state that capacity building and training programs are required for ULBs to effectively implement government policies of city development to provide better living conditions and reduce risks of climate change. The capacity-building program is planned at the Individual and Institutional levels. Individual training will be utilized for enhancing knowledge, improving working skills, and changing the working approach of ULBs. Institutional training will enhance the ULBs outcomes for city development as per the AMRUT policy. The training will be focused on the following departments of ULBs, i.e., Revenue (Finance Planning, Management, and Mobilization), Town Planning (Urban planning and renovations), Administration (e-Governance, Computer, and soft skills), Engineering, and Public health (Sanitation, Water, Drainage and Waste management).

Joint Role of ULBs & Media in Disaster Management

The ULBs have to provide updates of different phases of disaster for prior reporting of risks and minimizing its associated impacts. The ULBs have to give information to journalists, who are familiar with terminologies and severity measurements of disasters and their related hazards. The media person should be able to present the existing policies and programs implemented by ULBs for vulnerable populations.

ULBs should take advantage of large media networks for providing early warnings, direct pathways/transportation services for leaving their places, response activities, and spreading mitigation and preparedness measures. Thus, media can provide greater resilience for communities through the information updates by the ULBs. The media can assist ULBs in fulfilling their financial and resource requirements by showing the severity of events to higher government authorities.

ULBs can provide or use social media and smartphones to transmit and receive regular updates on severity of disasters, risk-prone zones, locate people stuck at different places, and monitor the different phases of disaster management. ULBs should identify geographical region and impacted population in various stages of disaster reporting. In remote locations, where ULBs cannot reach or establish contacts, they should establish a communication system and provide an immediate response to the people stuck there.

The media and ULBs jointly gather the information and problems faced by the vulnerable groups like women, children, disabled persons, older people, and excluded or marginalized groups. The coverage of regional innovations and positive actions should be reported for generating hope and setting good examples as validations of their efforts.

Reporting of the disaster should not be limited to disaster-impacted regions. It should be transmitted to other surrounding or nearby places. Media should report in a balanced manner in post-disaster situations. Media can play a significant role for ULBs by reporting the difficulties faced by the workforce in helping the community. The joint effort by the different media groups, ULBs, NGOs, RWAs, State and Central government officials can increase the value of disaster reporting and strengthen community resilience in the Indian cities. This joint effort can circulate the critical information to the desired people and impacted groups to improve efficiency in humanity works and rapid government response.

Restoring the impacted community's dignity will increase the rapidness and success of recovery. The media should avoid insensitive reporting as it may negatively impact the suffering of the community. It can change the way they are recognized nationwide and by themselves. Thus, editing, anchoring, and reporting documentation should preserve the community's dignity. ULBs and media should assess and present the impact of climate change and small-scale disasters on local hydro-meteorological conditions, evaluate the DRR, and development activities, whether they can handle disaster risk in the region, and their effects on initiating disasters.

This will provide a holistic approach for bringing disaster issues accessible in everyday life and covering disaster stories across different phases of disasters. The follow-up stories after disaster events by media and ULBs jointly can increase aid delivery to the impacted community; otherwise, impacted inhabitants will have to recover all alone. It will be helpful in the long-term recovery and getting insightful lessons and excellent practices. The media and ULBs should ensure the safety of the community and help them in dealing with a stressful situation.

Role of ULBs in Urban Risk Assessment

Risk assessment helps the ULBs to choose efficient DRR. Risk assessments are vital components for disaster mitigation, preparedness and emergency action planning activities (Refer Figure 1.3). Risk assessment outcomes allow emergency administration to create early response mechanisms by recognizing potential hazards, vulnerable populations and infrastructures, and the capacities of natural and artificial resources that might be required for use during emergencies. Risk assessment is used for training, education programs, and knowledge campaigns in the 'predisaster' stages. It provides a step-by-step process to assess the risks faced by the urban population and locate disaster-prone zones by considering those communities and amenities, which are vulnerable to hazards and further through evaluating the severity of losses. The hazard, vulnerability and exposure assessment for cities is used to estimate the risk and identification of threats due to different disasters.

Risk assessment play a vital role in defining cities' future development and land-use designs. The unification of risk estimates, with the development planning process, is used to recognize actions that result in development needs, minimize risk, and participate in better development decisions. ULBs should adopt climate risk evaluations in their planning and presents a risk management plan that can take the suitable stages against upcoming climate patterns, water shortage, and added ecological variations associated with changing climate.

The challenges faced by the ULBs in conducting the risk assessment are as follows:

- Increase in demand for assessments for risk-based city planning.
- Insufficient capacity of stakeholders for conducting risk evaluations.
- Less flexible methods for risk evaluations with a lack of precision and reliable information.
- Fewer fund allocation for risk evaluation.
- Problems in the identification of managing mechanisms to diminish the risk.
- Issues in evaluating complications in vulnerabilities and primary causes.
- Requirement for cost-effective methods.
- Requirement of risk evaluation standards that produce comparable maps and easily interpreted systems.
- Requirement of ease in data demonstration or representation.
- Collecting Hazard-specific inputs for identifying, monitoring, and implementing structural and non-structural measures required to reduce the risk in disaster-prone zones.

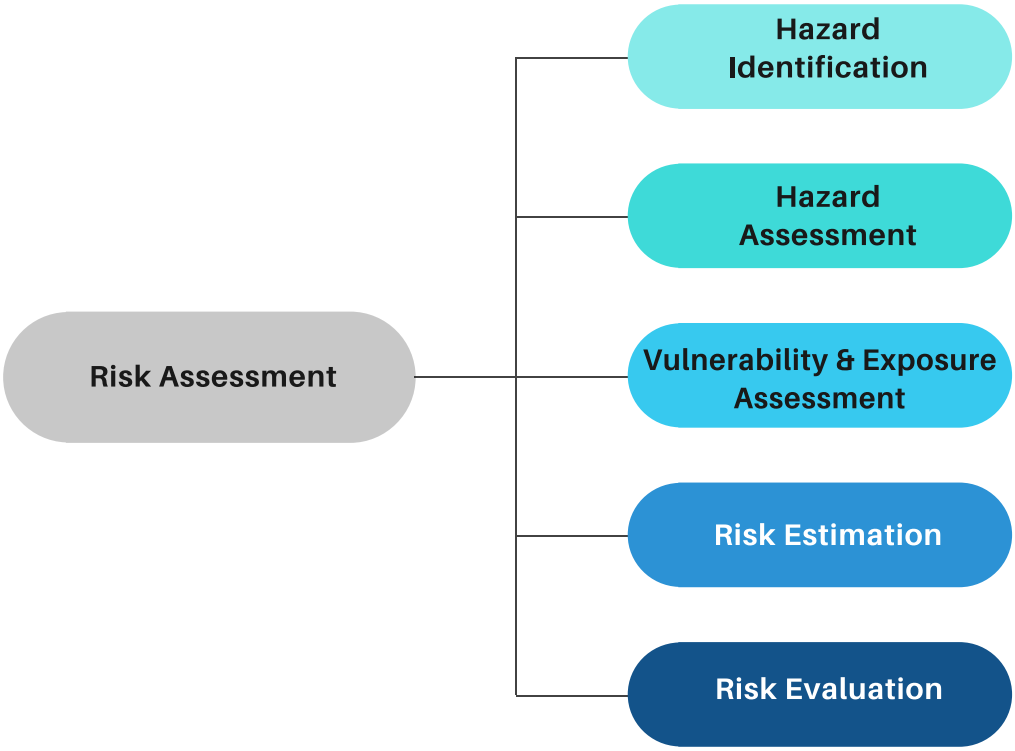


Fig. 1.3: **Components of Risk Estimation**

Role of ULBs in Technology Implementation

The technical implementation will ease the determination of disaster triggers, improve early warning systems, evaluate pre and post disaster damages, guarantee precise and prompt response plans and data distribution, and raise knowledge of the financial effect and post disaster social behaviours.These DRR technical developments, as shown in Figure 1.4, assist planned interventions in all phases of disaster response. Technologies can potentially change disaster management, mainly if emergent technology can be appropriately integrated with existing infrastructure. As Artificial Intelligence (AI), the Internet of Things (IoT), Big Data, and Blockchain grow more advanced, they will be able to improve Indian cities' disaster risk response and relief capacities.

The Technical implementation can be carried out by ULBs through following ways:

- For instance, during the Post-2015 earthquake in Nepal, drones provided 3D maps of impacted areas, which aided in determining the quantum of injured people and identifying the need for relief and rehabilitation.

- Regarding disaster management, the industrial market for drone applications, is expected to grow at a 25% annual pace. This is because of the rising use of drones for disaster management. Commercially, it is utilized for rescue and relief activities in recent years with the increase in the frequency and severity of disasters. Drones are predicted to become more prevalent in DRR to make response tactics more effective.

- Artificial intelligence and satellite photography, detect damaged infrastructure, flooded areas, and roadblocks. For hazard and vulnerability mapping, machine learning is commonly employed. It can combine many data sets observing disaster impact zones and overlaying them with thematic maps (natural resources, heat, topography etc.). Predictive machine learning is also possible with it. It can be used to create earthquake detection models by analyzing seismometer data. This can aid in the rapid recovery and reaction to disasters.

- Big data analytics examines massive historical data sets to forecast the possibility of catastrophic events and their consequences. Machine learning combined with geospatial analysis is frequently employed in India for predictive weather analytics and notifications of extreme events. Its data is used to build real-time EWS dashboards that allow authorities to respond quickly to disasters. AI-driven algorithms examine the resulting queries. These prioritized tasks are determined by terms like 'urgent,' 'elderly,' and 'pregnancy.' This enables geo-tagging of text posts and a faster response.

- Furthermore, a mobile app was developed for ground surveys to authenticate flood damage and enable timely help. Improved warning system accuracy and lead time have helped save lives and decrease economic losses by supporting focused evacuation operations in recent years.

- As sensors provide alerts for potentially hazardous situations, the Internet of Things (IoT) makes DM efficient. It is integrated with real-time systems through developing digital infrastructure and technology software. Its devices may be used in all crisis circumstances and can be built to improve DRR. It uses sensors to detect threats, provide EWS, and aid in rescuing and protecting life-threatening structures. It provides GIS-enabled tracking, supervises life-saving actions, and eases the implementation of AI and big data in DM.

- Ground sensors can detect earth movements and sensors can predict flooding by observing water levels. IoT provides a dynamic approach in making community alerts. IoT-enabled devices are battery-operated and are capable of wireless information transmission.

- Similarly, an IoT system processes data for different rivers for flood forecasting. A real-time dashboard presentation sends information and notifications directly to the authorities and citizens about the possibility of flooding. This will aid in implementing the efficient DRR.

- Wireless Mesh Networks (WMN)is used to communicate and distribute information in catastrophe risk response. This technique provides several communication routes between each nodes in the network. Each node serves as a data relay for the web. This enables automatic message routing via other paths in the event of a link breakdown.

- WMN is self-adjusting and constructing networks. Recent Indian research has focused on developing a UAV-assisted post-disaster emergency network capable of establishing Wi-Fi over an affected region to aid DM efforts. Fire Chat, which utilizes this technology, was used widely in the 2015 floods of Chennai for sending rescue information.

- Blockchain is a distributed technology that has the potential to alter the disaster management prompt delivering through various customization. It can collect precisely authorized data gathered from numerous individuals, organizations and combines data efficiently. It provides emergency aid and assistance. It can monitor drones registered on its network during disasters for a prompt response. In India, Project Purva Suchak uses this to anticipate floods.

- The World Food Programme's (WFP) provision of around 9 Million USD in relief to refugees is one of the verified cases of blockchain technology integration for humanistic reasons. For disaster relief, multiple people and organizations donate funds to assist a disturbed region. If all parties adopt blockchain technology, they can coordinate more effective responses during the disaster to ensure that the aid is sent to the most needed locations.

- Social media/networking services (SNS) like Twitter, Facebook, and Instagram have been widely used to broadcast news supporting DM. The mobile applications ease the spread of SNS. It has evolved into a critical DRR instrument that aids in DM. It allows for hazard information development, disaster data gathering, and logistic information in a crisis.

- In most situations, the public is the first responder: they help mobilize talents and assets for immediate action via SNS. Its use was observed for crowdsourcing relief resources. Researchers can analyse SNS data for making scientific decisions. By accurately classifying information, AI can further validate it for predictive analysis. 'Artificial Intelligence for Disaster Response,' an open-source software, was developed to process tweets during a disaster.

- SNS is a web-based system that relies on telecommunication networks, which may collapse in catastrophic conditions. In India, numerous complimentary technologies and developments are being used. These can be packed to identify disaster-specific mitigation solutions. This will allow government agencies to respond to disaster scenarios/phases more efficiently.

- During crisis response scenarios, SNS like Twitter is used for data transmission and management among associated authorities and departments.

- The incubators and accelerator programs for DRR innovation and technical developments can be conducted or funded by ULBs. The Himalayan Innovation Challenge 2019 was designed by IIT Mandi 'Tech Incubator Catalyst', inviting people to engage in disaster management innovation. In recent years, private sector technology corporations initiated programs to generate innovation for solving societal and environmental challenges. It has contributed in overcoming two crucial barriers of technical and financial assistance. As catastrophe management and climate change concerns grow, this industry may see a more focused shift toward new technology.

Critical Suggestions for ULBs to Promote Disaster Risk Resilient Technologies and Innovations:

- Annual platform for making dialogues between entrepreneurs and key stakeholders of the disaster management community.
- Provide financial assistance at the local level to motivate the development and implementation of technologies and innovation in DRR by entrepreneurs.
- Enable partnerships to develop and customize new technological solutions for all disaster scenarios.
- Making a digital platform for enhancing knowledge of DRR technology.

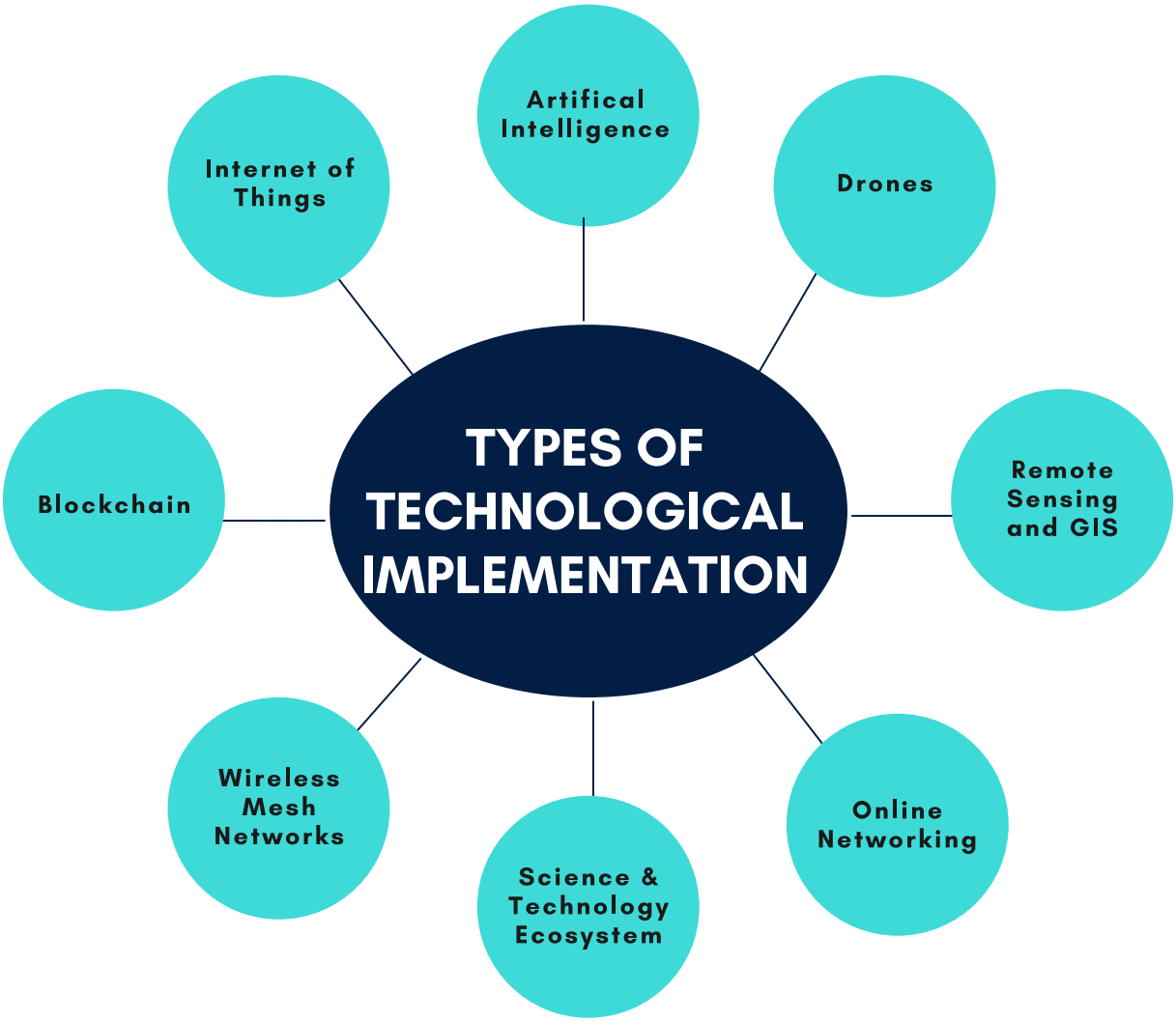


Fig. 1.4: Types of Technological Implementation

EXECUTION

The execution of a disaster management plan at the city level by the ULBs should follow the Urban local bodies Disaster Management Plan (UDMP) in consultation with all the stakeholders of city disaster management. There are six phases of the Disaster Management cycle, i.e., prediction, mitigation, preparedness, response, rehabilitation, and reconstruction, to be implemented to make city disaster resilient.

ULBs role in Prediction

- Commission separate R&D teams to study the prediction of hazards, like floods, landslides, snow avalanches, droughts, and chemical disasters.
- Seek suggestions from the above teams on measures to mitigate the effects of the negative fallout of the said disasters.
- Implement the measures suggested by the R&D teams.

ULBs role in Mitigation and Preparedness

- Each hazard poses special requirements that need specialized methods and assessment. For example, while floods require the built environment to be located at elevations above High Flood Levels, earthquake-prone zones require earthquake-resistant structures. The former requires land-use zoning, while the latter is a purely technical effort. Thus, ULBs should prepare and implement hazard-specific mitigation and preparedness measures, based on the disaster risk and severity present in the region.

ULBs role in Response

Disaster response requires two phases, namely (a) Immediate Response by the city and (b) Response assisted by other city administrations, states, and central government, if required. In an immediate response by the city, there must be proper coordination with central and state government agencies by the

city's Mayor. While in response, assisted by other cities and states, and mobilization of non-government agencies, are integral parts of this response.

The Standard Operating Procedures (SOPs), articulated before disasters, help build unison between National Disaster Management Plan (NDMP) and State Disaster Management Plan (SDMP) (and its constituent DDMP and UDMP). The city's ULBs should articulate the SOPs and rehearse (through mock drills) the following:

- Immediate response (search and rescue)
- Relief (food, shelter, clothing, and sanitation)
- Medical assistance and casualty management
- Communications (wireless radio, ham radio, cell phones)
- Assets identification and their deployment

ULBs role in Rehabilitation

Setting up temporary relief camps is the preliminary step for the rehabilitation phase. Educational institutions' premises, for establishing temporary aid or rescuing campsites, should be avoided. The ULB of cities should:

- Pre-identify locations for establishing them, primarily to address recurring disasters.
- Pre-identify agencies to supply the necessary stores.
- Ensure adequate drinking water, bathing, sanitation, and essential health care facilities.
- Constitute special task forces, wherever feasible, from amongst the disaster-impacted communities to identify the opportunities for ensuring nutrition supplies through society kitchens and providing schooling facilities by restoring educational institutes and anganwadis.
- Arrange stable and effective authorization systems (like entitlement cards and laminated identification cards) to ensure uniform humanitarian governance practices; and

- Stockpile necessary relief equipment and tools (e.g., cranes and power saws) and material (such as food, drinking water, shelter, clothing, medicines, medical supplies, masks, kerosene, and candles) at appropriate locations in the city.

Post-Disaster

- Harness the provisions available with the city on employment generation programs (e.g., MNREGA) and dovetailing them to the disaster affected cites to create suitable employment generation in the near neighbourhood of the relief camps; and
- Undertake skill development programmes before the disasters.
- Identify possible trades and required skills that can be created post-disaster.
- Develop MoUs with potential employers to dovetail the skill development to meet the potential employer's requirements.

ULBs role in Reconstruction

In the early stages of Disaster Management in the city, Reconstruction is considered as most significant effort. It essentially constitutes rebuilding the assets destroyed during the previous event and a few new items deemed necessary. The dominant set is housing and lifeline facilities (e.g., bridges, water tanks, water, and sewage treatment plants, and power stations). To reduce the implementation time, it is best to prepare prototype designs of these structures and facilities before the events and use them in the reconstruction.

The ULBs should consider the following points for reconstruction purposes:

- Identify potential sites where reconstruction is likely to take place.
- Prepare prototype designs of dominant constructions, namely houses, schools, and hospitals, by undertaking architectural and structural innovations in keeping with the regional social practices and materials available.
- Keep ready the bill of quantities and tender documents to facilitate early construction of a sample set of these constructions.

Timelines

Individuals, rather than institutions, need to drive the DM processes in the future. Mainstreaming of DM must be done at three levels, namely thought, word and deed. The subject of DM is too big to gobble in one shot; the only way is to nibble at it each day, every day, and from today! Pacing up, is crucial in the implementation of DM across the country. However, acute shortage of available needed human resources demands that a particular strategy is required to implement DM interventions and plans comprehensively across India. In this regard, decentralization of DM to UDMAs (with due supervision from SDMAs and DDMAs) is essential. Therein, Preparedness for Response, should essentially be the onus of the UDMAs.

Prioritization

The precise timeline of different DM activities will depend on the dimension and complexity of the activities and the geographical and demographical features of the city. Also, the task of mainstreaming DM in the city is gigantic. Therefore, it is necessary to sequence the DM activities into three sets based on their hierarchy in establishing and mainstreaming the DM activities i.e., vital, essential, and desirable and utilize available funds to undertake the DM activities.

In all three cases, every action starts right now!!

The ULBs should consider the following priorities:

- Short-term involves vital activities towards DM, which are immediate, for which the funds should be allocated immediately.
- Medium-term involves essential activities towards DM, which are urgent, for which the funds should be made available without fail.
- Long-term involves the remaining desirable activities towards DM, for which the funds should be made available eventually and on regular basis.

Pilot Cities' program

The ULBs should consider the following points while implementing the disaster management program:

1. Undertake all DM activities on priority basis for cities, i.e., threatened by at least three significant hazards.
2. Bring together available (but scarce) human resources of subject specialists (in each Hazard and each Cross-Cutting Theme) to implement DM in the city.
3. Undertake the following points in this model:

- Establishing all systems and processes.
- Focusing on the DM activities, especially on work related to the long-term agenda (Prevention, Mitigation, and Preparedness).
- Grooming the required number of human resources, competent in their work areas (i.e., specialists and generalists).
- Fast-tracking the implementation (say, in a limited period of 1 year).
- Documenting and showcasing the entire process of DM implementation to the other cities from the second year onwards.

Chain of Command

DM is a permanent and continuous activity, not just when events occur. Thus, there is only one chain of command in DM, which functions seamlessly before, during, and after disasters. But it can be seen in two parts, namely:

- Peacetime Command System (PCS), which is the usual system of functioning of SDMA, DDMA, and UDMA, and
- Incident Response System (IRS).

The PCS engages the entire stakeholders (namely the government, the industry, and the community) elaborately but with short timelines for meeting the deadlines towards mainstreaming and implementing DM.

In the PCS, all stakeholders of DM in the city focus on all six verticals of the DM cycle – Prevention, Mitigation, Preparedness, Response, Rehabilitation, and Reconstruction. On the other hand, in the IRS, the stakeholders focus only on the DM cycle's Response vertical. During an event, the stakeholders of the PCS are engaged in the other five verticals of the DM cycle, watch from the sidelines of the action arena, keep drawing valuable lessons from the incident, and come into action when called as soon as the emergency phase of Response is over.

IRS describes a way of managing the response activities. NDMA has issued national guidelines on IRS. The IRS must be part of pre-event planning, especially in response to disasters.

Activating Incident Response System

The Incident Response System (IRS) is the Indian version of the Incident Command System (ICS), established and followed in the United States of America. The ICS was one of the best DM Systems; the High-Powered Committee (HPC), headed by Shri J C Pant in 2001, recommended that it should be followed in India. The IRS provides an operative procedure for decreasing the ad-hoc measures during response phase. It envisions a composite team with different units to identify all the possible response conditions. The IRS assigns officials to execute numerous responsibilities and trains them in relevant tasks. Also, it emphasizes the need for proper documentation of different activities for better planning, accountability, and analysis. It helps in significantly reducing the difficulties while responding, as all the authorities and associated organizations understand their roles and responsibilities.

The NDMA Guidelines on Incident Response System (IRS) issued in 2009 elaborates on the chain of command and lines of control in the event of the onset or occurrence of a disaster. The UDMP should emphasize the urgency of establishing and rehearsing the IRS in its response planning.

Energizing Emergency Operations Center

The establishment of the Emergency Operations Centers (EOCs) at the city levels is the top priority as per the UDMP. This involves equipping them urgently with contemporary communication technologies and facilities and periodically upgrading them. For the remote connections and management of the actions in the disaster-prone areas, the accessibility of transferable platforms should be provided. The integration into the DM communication system of wireless, ham radios and other innovative facilities, is preferred because it disasters bring redundancy to the communication system during it's onset. The EOC should function with technical professionals with background and experience in meteorological, chemical, biological, geophysical, and other domains relevant to the city's hazards.

MESSAGE TO MAYOR

Mayor's responsibility for building the inclusive coordination committee as part of disaster preparedness comprises of first responders like Police authorities (like commissioner of local police), fire department, SDRF, NDRF, district collector, central ministry, and other stakeholders. Mayor should make Standard operating procedure for assuring that financing authorities should provide easy access and allocation of funds as per the requirements in different phases of disaster management. In case, city having two mayors, the allocation of funds, power distribution, urban region should be well defined during and post-disaster scenarios, between the municipal corporation authorities for making cities disaster resilient. The mayor should also identify local potential hazards like riots, stampede region and potential pandemic like covid vulnerable population, etc.

Salient Features

- ULBs should assess the risks associated with hazards based on several indices like Hazard specific vulnerability, Hazard specific exposure, Composite Hazard index, Composite Vulnerability Index, Exposure Index and Composite Disaster risk index.
- The ULBs should be prepared and updated with the UDMP as per the city requirements and by following the guidelines of NDMA and the city municipal act.
- The ULBs allocate the funds for different phases of disaster management by identifying the project's requirements for various stages based on environment, hazard assessment, exposure assessment and risk assessment.
- Several funds are allocated for disaster management through the National Disaster Risk Management Fund (NDRMF), State Disaster Risk Management Fund (SDRMF), Public Funded Schemes, Flexi-funds as part of Centrally Sponsored Schemes (CSSs), Externally Aided Projects, Corporate Social Responsibility Funds, City Disaster Response Fund, PM CARES Fund, Chief Minister and Prime Ministers' Relief fund. These funds should be suitably employed by the Mayors for disaster management and relief.
- The SDRMF includes funding for a city-wise disaster response. ULB head should allocate the funds according to disaster mitigation, response, and post-disaster requirements by appropriately identifying disaster-prone zones and vulnerable populations.
- The ULBs should make technical and legal arrangements before fund allocation for the projects to be implemented for rapid development in disaster management projects and making city disaster resilient.

About the Institute

National Institute of Disaster Management (NIDM) was constituted under an Act of Parliament with a vision to play the role of a premier institute for capacity development in India and the region. The efforts in this direction that began with the formation of the National Centre for Disaster Management (NCDM) in 1995 gained impetus with its redesignation as the National Institute of Disaster Management (NIDM) for training and capacity development. Under the Disaster Management Act 2005, NIDM has been assigned nodal responsibilities for human resource development, capacity building, training, research, documentation and policy advocacy in the field of disaster management.

NIDM is proud to have a multi-disciplinary core team of professionals working in various aspects of disaster management. In its endeavour to facilitate training and capacity development, the Institute has state-of-the-art facilities like class rooms, seminar hall and video-conferencing facilities etc. The Institute has a well-stocked library exclusively on the theme of disaster management and mitigation. The Institute provides training in face-to-face, on-line and self-learning mode as well as satellite based training. In-house and off-campus face-to-face training to the officials of the state governments is provided free of charge including modest boarding and lodging facilities.

NIDM provides Capacity Building support to various National and State level agencies in the field of Disaster Management & Disaster Risk Reduction. The Institute's vision is to create a Disaster Resilient India by building the capacity at all levels for disaster prevention and preparedness.

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