



## **DEVELOPING AN EFFECTIVE DISASTER MANAGEMENT SYSTEM IN MUMBAI**

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### **SUMMARY**

With a population of over 12 million, Mumbai is one of megacities of the world and is the commercial and financial capital of India. The city is vulnerable to a multitude of natural disasters such as earthquakes, cyclones, and floods and manmade disasters such as terrorism and urban unrest. The large and diversified population, high population density and unique geographical constraints make the city extremely vulnerable to devastating consequences of disasters. The Municipal Corporation of Greater Mumbai, in cooperation with the state government, expert organizations and other stakeholders has developed a comprehensive disaster management system for the city. This paper describes the salient features of the system and gives brief details of some other initiatives taken for improving the resilience of the city to different disasters.

### **INTRODUCTION**

Mumbai is the capital city of Maharashtra and is considered to be the financial and entertainment capital of India. Since historical times, it has been known as an excellent natural port and is today one of the busiest seaport. Mumbai also features the country's important domestic and international airports. It is a major hub in the South East Asian region and is also home to India's new economy industries.

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Being among the important cities of the world, Mumbai is a prime target in situations of war, terrorism and other subversive activities. Mumbai's geographical conditions are such that it is vulnerable to natural disasters like cyclones, floods, landslides, earthquakes etc. According to the seismic map of India, Mumbai falls in Zone III, which translates to a threat of an earthquake measuring in the range of 6 to 6.5 on the Richter scale. Further, Mumbai is very close to seismic Zone IV areas that can face even larger earthquakes. Mumbai also houses industries dealing with hazardous materials, giving rise to probabilities of manmade Hazmat disasters.

The Killari earthquake of September 1993 in the Marathwada region of the state measured 6.4 on Richter scale and caused loss of 7,928 lives and 16,000 injuries with some 15,847 livestock killed. This disaster caught everyone unaware and led to the Government of Maharashtra to initiate the development of Comprehensive Disaster Management Plans for all districts of the state including Mumbai. The Bhuj earthquake of January 2001 further underscored the importance of such an emergency response plan.

Mumbai has a population of about 12.6 million (Census of India 2001) housed within some 437.72 square kilometers, which translates to a population density of some 21,000 persons per square kilometer. Any disaster event in such a populous and important city could translate to unimaginable loss of life and property.

### **OBJECTIVES**

Though disasters cannot be avoided, a planned approach covering all phases like mitigation, response and rehabilitation can minimize the impact of the disaster. With this goal in mind, the MCGM has undertaken certain projects over the past few years to evolve a proper Disaster Management setup. These projects involve coordination with various agencies like State and Central Government authorities, Police, Armed Forces and Paramilitary units, NGOs, private resources, hospitals pharmacies, volunteers etc. The aims of these projects are to bring together all stakeholders in disaster management and rescue operations, to develop good coordination among them and to achieve perfection in collaborative efforts through knowledge sharing and rehearsals. Due to such projects, each agency today has a better understanding of other agencies and there is a sense of partnership and respect for the skill sets of others that has evolved among these agencies. Some of these projects are discussed herewith.

### **DISASTER MANAGEMENT PLAN**

An effective Disaster Management Plan documents *the standardized methods of activation of predetermined functional components to respond to an extraordinary event that disrupts normalcy*. This plan forms the blueprint for the response that all agencies will deliver in times of a disaster. The Government of Maharashtra and the Municipal Corporation of Greater Mumbai (MCGM) have developed a multi-hazard response plan to respond to various types of disasters. The objectives of the plan are:

- To assess the vulnerability of Mumbai to various kinds of disasters
- To assess the existing resources and facilities available with various departments and agencies to respond to a disaster
- To assess inadequacies in the existing resources and facilities
- To identify requirement of institutional strengthening and reforms
- To document an effective response policy and mechanism to respond to disasters

The plan provides for coordinated response from various agencies right from the field level to the Central Government. This ensures efficiency of response, adherence to accepted response standards and optimal utilization of resources to minimize loss of life and property and restoring normalcy.

The Mumbai Disaster Management Plan comprises of three parts:

- Volume 1: The Plan
- Volume 2: The Inventory
- Addendum: Micro Plans at Ward Level

The plan describes the institutional mechanism like the MCGM Disaster Response Committee and the Mumbai Disaster Management Committee along with its consultants. The plan lists all the control rooms of concerned agencies with their contact details as well as diagrammatically describes the Response Strategies in both the Warning as well as Occurrence stages. Well-defined report formats for effective communication between various agencies have also been illustrated in the Plan. Importantly, the plan also spells out the role of the media and NGOs in assisting the civic machinery in disaster response. It also marks a change in the mindset in recognizing the community as the first responder in disaster situations.

#### **Volume 1 – The Plan**

This details the physical, geographical and administrative layout of Greater Mumbai comprising of the island city and the extended suburbs. This includes the geology and geomorphology, land use details, historical, tourist, religious centers and other places of mass congregation, industries and areas with presence of hazardous materials, vulnerable and informal settlements, etc. It also has a specific chapter on Risk Assessment and Vulnerability Analysis covering various natural and manmade disasters and the mitigation plans for each of them.

#### **Volume 2 – The Resources**

This lists the entire inventory available and its ownership. It covers all concerned agencies listing their contact details and their resources. Volume 2 also describes the requirement of specific inventory in response to particular types of disasters. Here, one can find exhaustive details of public and private resources like earth moving equipment, transport mechanisms, hospitals, ambulances, crematoria, water supply mechanisms, food and clothing manufacturers, etc. These would doubtlessly prove invaluable in times of disasters when marshalling resources efficiently is the key. The volume also recognizes the importance of HAM radio communication systems that were hitherto denied importance. These would prove crucial in times when standard communications systems have failed. Currently, a project has been undertaken to assess the structural stability of Municipal schools. These are being studied with the intent of using their large area as relief shelters in disaster times.

#### **Addendum – Micro Plans at Ward Level**

The MCGM has developed micro plans for all 24 wards. Potential hazards, high-risk areas, rescue resources, etc. have been mapped out at the ward level. This mapping will assist in the speedy deployment of resources to enable a swift and efficient response to various types of disasters. These plans are constantly updated in an effort to maximize the preparedness and to

lay out a researched response strategy. It is envisioned that this data will be incorporated in dynamic database management systems and intelligent software will enable the speedy updating and retrieval of sorted and relevant information at the touch of a button.

### **WORKSHOPS AND SEMINARS**

The MCGM's Department of Disaster Management has conducted quite a few workshops and seminars on disaster management. Prime among these are:

- A 3-day (December 4-6, 2003) workshop on Disaster Management was jointly organized with the State Government and Earthquakes and Megacities Initiative. This workshop focused on the disaster management issues of very large cities, and international cooperation between large cities.
- A 4-day (September 9-12, 2001) workshop on Mass Disaster Management conducted jointly with the State Government, Consulate General of Israel and MASHAV – Israel's disaster management authority.
- A seminar on Disaster Management attended by Honorable Shri Sharad Pawar, Vice Chairman of the National Committee on Disaster Management, and other high officials from National Center for Disaster Management and other such institutional agencies (December 5, 2001).
- A series of joint workshops with authorities like Mumbai Police, Mumbai Fire Brigade, IIT Bombay, Home Guards, Civil Defense, BARC, NGOs, major industries, etc. The focus of these workshops was to familiarize every agency with each other's disaster management plans and to improve coordination among these agencies in responding to disasters.
- A series of workshops in MCGM hospitals to develop hospital response plans for responding to mass casualties. This led to the development of Emergency Medical Services in the Nair and Sion hospitals.
- A workshop was held on May 8, 2003 jointly organized by MCGM and IIT Bombay. It was attended by officials from various agencies like Government of Maharashtra, IIT Bombay, BARC, Mumbai Police, the International Red Cross, Home Guards and Civil Defense, Bart Petroleum, ONGC, Mahanagar Gas, NGOs as well as representatives of media agencies like All India Radio, print and electronic media, etc. The objective of this meeting was to share and update the work done by each agency in the field of disaster management. A training video on disaster management, prepared by IIT Bombay, was also released during the workshop and is being used for training of civic officers in disaster management.

These workshops have been instrumental in introducing various agencies to each other and developing effective coordination amongst them. These workshops have provided an effective platform for all concerned agencies to share their knowledge and expertise.

### **PUBLIC AWARENESS CAMPAIGNS**

The MCGM has conducted various campaigns that have spread awareness about disaster management and safety measures amongst thousands of school children, teachers, civic officials and the general citizenry.

- The MCGM has collaborated with agencies like the All India Institute of Local Self Government and UNICEF to conduct a series on Trauma Management, Earthquake Simulations and Structural Analyses of Municipal School Buildings.
- The MCGM has collaborated with SARISTA Foundation, an NGO, to conduct various training programs for school children on disaster preparedness and safety measures.

Various educational lectures and presentation were conducted at various places like the Government Law College, Tata Institute of Fundamental Research, Mumbai Commerce Center, Nehru Science Center, MSEF, SNDT, etc. informing students and staff about disaster management.

### **SEARCH AND RESCUE TASK FORCE**

Rescue operations are no more limited to extracting victims from disaster sites. The MCGM has therefore instituted a Search and Rescue Task Force that comprises experts from various disciplines such as structural engineering, medicine, communications and coordination, fire fighters, etc. The team has undergone basic training on the course material employed by the Asia Disaster Preparedness Center and adhering to International Search and Rescue Advisory Group (INSARAG) guidelines. It is envisaged that this team will be imparted advanced training at top national and international locations. This comprehensive rescue system will be a member of INSARAG along with other such teams from across the world and will be prepared to respond at short notice to any kind of disaster in any part of the world.

### **RESPONSE STRATEGY**

The recent spate of bomb blasts and such subversive activities have made the MCGM develop a response plan to respond immediately and effectively to such manmade disaster situations. The plan illustrates in a lucid and concise manner the duties and responsibilities of various MCGM response units in the event of such situations. The plan also describes the coordination with non-MCGM response agencies to achieve a full-spectrum response to manmade disaster events. The plan will be shared with all concerned agencies and will be rehearsed to setup a precise mechanism to respond immediately to manmade disasters. The immediate result of this strategy was the efficient and immediate response of MCGM agencies in the recent explosion in a local train at Mulund. The citizenry, media and others have heaped praise on the MCGM for their effective and comprehensive response to this disaster, covering all aspects from extracting victims to mobilizing hospitals to handle the sudden influx of patients to the hospitals providing expert Medicare and even disseminating information to relatives of victims.

### **MOCK DRILLS**

As per the institutional guidelines for mock drills, the MCGM conducts simulations and mock drills to rehearse the activation of the Disaster Management Plan. These drills are conducted throughout the year, especially in the run up to the monsoon when major landslides and flooding are expected. Apart from the MCGM and Mumbai Fire Brigade, various other agencies like the Mumbai Police, MTNL, Railways, Home Guards, the Collectorate, local councilors and MLAs, NGOs and local community groups all participate in these drills. These drills have helped to rehearse the disaster response and shorten response times through constant evaluation. In addition to boosting the morale of all stakeholders in disaster management, mock drills also help

to evolve the Disaster Management Plan in response to the changing ground realities. Currently, the need to strengthen institutional mechanisms involving such mock drills is being researched.

### **EMERGENCY OPERATIONS CENTRE**

In disaster times, there is the excruciating need for a Command and Control Post from where all response operations can be coordinated. This post is also responsible for maintaining contact with the outside world to marshal resources as and when the need arises. An office converted to an Emergency Operations Center cannot assuredly escape the disaster itself. The National Committee on Disaster Management has done considerable amount of research into the dynamics of Emergency Operations Centers. Adhering to their guidelines and with inputs from the IIT Bombay, the MCGM is in the process of setting up an Emergency Operations Center.

This center will be constructed to withstand any foreseeable disaster. It will house some of the most modern disaster management equipment like information technology systems, all forms of communications systems and terrestrial and non-terrestrial information links with other parts of the state, country and the world. It will also feature its own power plant, water and food supply. Its dormitories will house adequate personnel long enough to outlast disasters. This facility will be a high-security installation, built to withstand and outlast long-term disasters. Armed with study facilities and libraries, this EOC will serve as a Research and Development facility as well as a training facility during normal times. During disaster situations, this emergency operations center will function as the command and control center for the entire response operations.

### **INTERNATIONAL COOPERATION**

The Municipal Corporation of Greater Mumbai has joined the Asia Cluster Cities Project (CCP) of Earthquakes and Megacities Initiative. In this project, Mumbai is working with the cities of Dhaka, Kathmandu, Beijing and Tashkent to assist each other in improving their disaster management systems. Participation in the Cluster Cities Project also enables Mumbai to work with different multilateral agencies and international experts in disaster management. The city intends to share its experiences in dealing with different types of disasters.

The first workshop of Asia Cluster Cities Project was held in Mumbai on December 4-6, 2004 with around 300 participants. The workshop considered the heavy responsibility placed on the member cities due to their large size and access to resources and agreed to extend their brief to also assist the smaller cities for developing disaster management plans. The CCP cities also agreed to provide training facilities to participants from the smaller cities and to send rapid response teams in the event of a disaster.

### **FUTURE PLANS**

No Disaster Management Plan can be static and needs to evolve constantly. The MCGM's Disaster Management Plan is constantly being upgraded with the latest data. Plans are being worked out to empower disaster management with powerful tools like Geographical Information Systems (GIS) and Relational Database Management Systems (RDBMS) to enable disaster managers to instantaneously sift through gargantuan amounts of data to help take informed, instant and optimal decisions. The Search and Rescue Task Force is to be trained extensively and equipped with the latest equipment in a containerized fashion. All ancillaries will be taken

care of for the rapid deployment of this task force in any disaster situation across the globe. The KEM hospital is working on training courses for paramedics as well as the SAR Task Force One on Cardiopulmonary and Cerebral Resuscitation (CPCR). All emergency services will be trained on Basic Life Support and other pre-hospital care activities. The ethos of this training is to minimize long-term trauma by rendering effective Medicare within the golden hour.

Apart from this, plans are being worked out to face new challenges. The recent global epidemic, SARS, has found loopholes in most advanced of disaster plans. Diseases like AIDS and Ebola are also disasters waiting to happen. Current events have proven that terrorists have access to the latest technology including Weapons of Mass Destruction. Nuclear, Biological and Chemical disasters are a challenge for every disaster management agency on the planet. NBC events need not occur during wartimes only. They may also occur as accidents in industries involving hazardous materials. There are also slow disasters that are common place and escape attention. However, their impact is by no means negligible. Environmental disasters like global deforestation, oil spills like the Exxon Valdez, the ozone hole and the Greenhouse Effect are all examples of slow disasters. Any contemporary disaster management plan must address these issues as well. Efforts are therefore being made to include these disasters in the Mumbai Disaster Management Plan.