CHAPTER-IV

PROFILE OF MUMBAI

4.1 Introduction

Mumbai is the commercial and entertainment centre of India, generating 5% of India’s GDP, 25% of India’s industrial output, 60% of custom duty collection, 20% of central excise tax collection, 40% of total foreign trade, significant contribution to capital market on Bombay stock Exchange (BSE) and National Stock Exchange (NSE) which accounts for as much as 75% of India's stock exchange transactions. Mumbai contributes 33% of the total collection of Income-Tax to the Exchequer of the country. (Mumbai City Development Plan, 2006).

Mumbai has been ranked 49th in the Global Financial Centre Index, according to a survey conducted by Z/Yen Group Ltd. And published by City of London. The surveying institute uses external sources to determine property and occupancy costs to judge competitiveness.

(Pooja Thakur, 2010).

This city is the home to many important financial institutions of the country like RBI, SBI, BSE, NSE, EXIM Bank. Mumbai has global importance because of International Port, International Air Port, many international banks and other financial institutions are located in Mumbai. It is also well connected with other parts of the country by Railway lines, having Western and Central Railways their H.Q.s in Mumbai and by Express Highways on Western & Eastern sides of Mumbai. Head Quarters of many Indian companies and offices of many MNCs are situated in Mumbai. In a true sense Mumbai is a financial capital of the country.

( DRMMP, Mumbai-2010-11)

As a consequence, Mumbai attracts migrants from all over India. They come here in search of jobs. The current (Census – 2011) population of Mumbai is 1,25,00,000 being the second most populous city in the world after Shanghai.
Mumbai has strategic importance from the defense point of view, with head quarters of Western Naval Command & offices of Army, Air Force & Coast Grand.

A very safe and peaceful life and environment is therefore, necessary to maintain this status of Mumbai. A strong, vigilant and prompt security system and very effective Disaster Management Plan is the need of the hour, to protect Mumbai from natural as well as man made threats.

4.2 Mumbai City Profile

a. Geography of Mumbai:

Mumbai lies at the mouth of the Ulhas River off the western coast of India, in the coastal region known as the Kokan. It occupies Salsette Island and some part of the district of Thane. The area of Greater Mumbai is surrounded on three sides by the sea; by the Arabian sea to the west and the south, the Harbour bay and the Thane Creek in the east. The MCGM limit extends upto Mulund, Mankhurd and Dahisar. Its height is hardly 10 to 15 meters above sea level. At some places the height is just above the sea level. A part of Mumbai City district is a reclaimed land on Arabian sea coast.

b. History of Mumbai:

The name Mumbai – changed from Bombay in 1995- has been etymologically derived from Mumba Devi – a Hindu Goddess.

In 1534, the Portuguese appropriated the islands from Bahadur Shah of Gujarat. Later, they were ceded to Charles II of England in 1661 as dowry. These islands were in turn leased to the British East India Company in 1668 for a sum of £ 10 p.a. From 1784 to 1845 seven original islands merged into single landmass through continuous land reclamations.

In 1887 Mumbai came under the control of British Crown and eventually become the head quarters of the Bombay Presidency.

(Gazetteer of India, Maharashtra state, History of Bombay, Modern Period – 1987)
Bombay Municipal Corporation (BMC) was established in 1882.

c. Demographic Features of Mumbai:

There is a twelve fold increase in the population of Mumbai since 1901, when the population was just 92,000. According to the 2001 census:

- The total population of Mumbai (MCGM area) 1,19,14,398
- Total number of Households 25,15,589
- Total Male population 66,19,966
- Total Female population 53,58,484
- Sex Ratio 1000:809
- The entire population is urban population
- Population Density of Mumbai is very high.
- Average Population Density is 27,209 persons per sq. km (population/area).

This density is variable as the workforce from suburbs and from other places like Nasik, Pune, Kalyan, , Surat, Navi Mumbai etc. come to south Mumbai during daytime.

Therefore, Density of Ward A (South Mumbai), (the administrative area marked by MCGM), during Day Time is 3,49,390 persons/ sq. km. and total Day Time Population of Ward A is 45,00,000 (4.5 million) and Night Time population is 200,000 persons reducing density to 17,528 persons/ sq.km. ‘A’ ward covers an area of 12.5sq. km.

(Maharashtra Emergency Earthquake Rehabilitation Programme Govt. of Maharashtra Vol. 1, 2007)

Other demographic details of Mumbai are as follows:

- In 2001, Mumbai had a moderate Literacy Rate at 76.87%, of course, it is much higher than the national average literacy rate at 64.80%. Male literacy rates are higher (81.40%) than female literacy rates (71.28%).
- In Mumbai slum Population Percentage is 55%. Census of India 2001 defined a slum area as a compact area of at least 300 residents are living in
poorly built tenements, in unhygienic environment with inadequate infrastructure, having no sanitation or even safe drinking water.

Greater Mumbai - No. of households and Total Population of Slums-2001

Table No.4.1

<table>
<thead>
<tr>
<th>District</th>
<th>No. of Household</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slum</td>
<td>Non - Slum</td>
</tr>
<tr>
<td>1. Mumbai District</td>
<td>224115 (16.8%)</td>
<td>453048 (38.7%)</td>
</tr>
<tr>
<td>2. Mumbai Western Suburbs</td>
<td>580911 (43.6%)</td>
<td>533725 (45.0%)</td>
</tr>
<tr>
<td>3. Mumbai Eastern Suburbs</td>
<td>526958 (39.5%)</td>
<td>196832 (16.6%)</td>
</tr>
<tr>
<td>4. Total</td>
<td>1331984</td>
<td>1183605</td>
</tr>
</tbody>
</table>

(Source – Census of India – 2001)

d. Economic and Industrial Features of Mumbai:

In 2001 there were 44.64 lakhs employees in Mumbai. The level of economic activity is much hectic in Mumbai as compared to other parts of Maharashtra. The percentage of employees engaged in secondary sector is 41.21% and in tertiary sector 58.12% people are engaged. A very small percentage of workers are engaged in primary sector. i.e. Hardly 2 in per 1000 workers are in primary sector.

After 1980, Greater Mumbai people getting more jobs from tertiary industries which dominate the city today. wholesale and retail trade, transport, storage, communication, finance, insurance, IT enabled companies, real estates etc. are the activities conducted. Construction, manufacturing, electricity, gas, water supply are in the secondary sector. Instead of heavy industry, now gems and jewellery, leather and leather products, tourism, IT, entertainment industry are contributing to Mumbai economy.
e. Administration of Mumbai:

Mumbai is governed by 14 different and independent agencies. There is no single body/agency accountable for all of Mumbai.

Table No.4.2 Administrative Agencies in Mumbai

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Agency</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>GOM</td>
<td>State grants, Urban Planning, Industrial Policy, Housing.</td>
</tr>
<tr>
<td>3.</td>
<td>MTNL</td>
<td>Local Telecom Services</td>
</tr>
<tr>
<td>4.</td>
<td>MSRDC</td>
<td>Major Roads/ Sea links</td>
</tr>
<tr>
<td>5.</td>
<td>RTO</td>
<td>Vehicle Registration</td>
</tr>
<tr>
<td>6.</td>
<td>MP Trust</td>
<td>Port Services, Land Lease</td>
</tr>
<tr>
<td>7.</td>
<td>Mumbai Police</td>
<td>Law &amp; order, Traffic</td>
</tr>
<tr>
<td>8.</td>
<td>PWD</td>
<td>Selected Roads</td>
</tr>
<tr>
<td>9.</td>
<td>MPCB</td>
<td>Pollution Reduction</td>
</tr>
<tr>
<td>10.</td>
<td>MHADA</td>
<td>Land for new Industries</td>
</tr>
<tr>
<td>11.</td>
<td>Indian Rly MRVC</td>
<td>Housing (for low-middle I Groups)</td>
</tr>
<tr>
<td>12.</td>
<td>Mumbai Rly Vikas Corporation</td>
<td>Suburban Rail &amp; Long distance trains</td>
</tr>
<tr>
<td>13.</td>
<td>SRA</td>
<td>Slum Redevelopment</td>
</tr>
<tr>
<td>14.</td>
<td>BEST</td>
<td>Road Transport in G, M bar and Power supply in Island city.</td>
</tr>
</tbody>
</table>

Each agency operates independently and there is very little or no coordination between and among them.

The Metropolis was divided into 2 districts in 1990 – i. e. Mumbai City District and Mumbai Suburban District; each district is under the control of a District Collector who is in charge of property records and revenue collection for Central Govt. and to monitor the national elections held in city.
For the administrative purpose Mumbai city has been divided into 24 wards, as shown below:

**Figure No. 4.1 Ward Map of Mumbai**

f. **Mumbai Metropolitan Region Development Authority (MMRDA)**

MMRDA was set up on 26th January, 1975 by GOM. The purpose to plan and coordinate developmental activities in the region. It covers an area of 4355 sq. km. spanning 4 districts of Maharashtra:

Manikpur, Panvel, Pen, Uran, Vasai & Virar) MMR’s Population was 17.81 million in 2001.

4.3. Disaster Profile of Mumbai:

Mumbai is susceptible to natural disasters like floods, earthquake, landslides, epidemic, climate change and its impact etc. at the same time it is a soft target of human induced disasters such as bomb blasts, riots, terrorists attack, building collapse, accidents etc. The researcher has mentioned various hazards Mumbai city has to face:

1. Hazards in Mumbai

Some of these hazards having impact on Mumbai are as follows:

a) Hydrological and Climatological Disasters such as floods, cyclones, cloud burst, sea shore erosion etc.

b) Geological Disasters like earthquakes, landslides.

c) Chemical, Industrial & Nuclear Disasters

d) Accident Related Disasters like fire, oil spills, major building collapse, festival related disasters, air, rail, road accidents.

e) Epidemics like malaria, H1N1, gastroenteritis, tuberculosis, hleptospirosis etc.


Prof. Kavas Kapadia and Prof. Dr. Sanjukta Bhaduri observe that megacities are characterized by high density, high rise buildings, high pollution levels, low proportion of open spaces, development on reclaimed land, wetland, marshes, mangroves, saltpans, floodplains etc., poor quality of housing, use of highly inflammable building material, absence of efficient disaster mitigation and management system, encroachment and extension of buildings without consideration for safety.
2. **Vulnerability of Mumbai increases due to following factors:**

   a. **Multiple agencies control Mumbai:**

       Multiple agencies control Mumbai transactions. There is no single agency accountable for the governance of Mumbai. 14 agencies operate independently having little co-ordination among them.

   b. **Insular-location:**

       Mumbai has been made as a single land mass by reclaiming land, by connecting via railways and roadways, making it low lying areas at the time of flood like July, 2005 making the city inaccessible to the rest of the country.

   c. **Limited Availability of land:**

       Shortage of land due to very narrow space from west to east. Sea and water bodies occupy 66% of the total area resulting in limited land supply and consequently very high density of population and exorbitant property prices.

   d. **Large Tracts of Reclaimed land:**

       Most of the city centre which houses the BSE, the main train stations & train lines and large number of high rise buildings are located on landfill. Landfill areas are most vulnerable during earthquake having high risk of liquefaction and floods.

   e. **Rainfall characteristics:**

       A very unique nature of rainfall in Mumbai makes the city flood prone. Almost 60% of the rainfall falls during two months in a year – July & August. The average monthly rainfall in July is often higher than London’s average annual rainfall. In addition, sometimes 35-40% of this rainfall is received in just 2-3 events. Probability of flooding is high when rainfall exceeds 40 MM in an hour on a given day which occurs between 1-7 times
a seasons. The problem of flooding becomes acute when heavy rainfall coincides with high tide of more than 4.5 mtrs. which takes place 2-3 times a season. MCGM has identified 266 flooding spots within the city of which 55 spots are chronic flooding spots. (Flood Preparedness Guidelines by MCGM, 2012)

f. Extensive coastline:

Mumbai has a 170 km. long coastline. The 57 slum settlements are within the high tide line making them the most vulnerable.

g. Location in a Seismically Active Zone:

Mumbai falls in the seismic zone III which is Moderate Damage Risk Zone. Out of total dwellings (residential, industrial and commercial) almost 60% are non-engineered constructions, which corresponds with the large presence of slum settlements (DMAP, 2007). These buildings suffer from lack of maintenance. Such constructions are more vulnerable to extreme weather events and earthquake of even moderate magnitude. Many slums face the hazards like landslides, during heavy rains, as they are situated on the hill slopes. They cannot afford well constructed houses. DMAP of MCGM has identified 117 such settlements which are extremely vulnerable to landslides and in turn possibility of loss of lives and damage to properties in case of heavy precipitation.

h. Economic and Social Vulnerability:

Rapidly increasing population of Mumbai is the most important factor which enhances vulnerability of Mumbai. This increasing population adds to the pressure on civic amenities, basic infrastructure and housing. It also leads to congestion, heavy vehicular traffic, growth in illegal slum dwellings, unhygienic living conditions which increase vulnerability. Slums have come up in almost all the wards in Mumbai, along the coast, all the hill slopes, along the highways, railways and in low-lying areas. Because of the above situation, the health vulnerability of Mumbai has increased to a
very great extend. The Mumbai Human Development Index, 2009, indicates the high incidence of various diseases like T.B. HIV/AIDS, Malaria, Jaundice, swine Flu which are the major killers in the city.

Regarding economic vulnerability, Mumbai has an important position in the country as the commercial and trading center. Mumbai’s per capita income is much higher than the national average, it contributes major share to income-tax and other tax revenue to the ex-chequer of the country. Due to very high concentration of major industries, Mumbai has become most vulnerable to attacks from outside. If any disaster takes place—natural or man-made, huge loss of life along with economic loss is quite possible.

i. 55% population living in slums:

Slums are vulnerable primarily because of their location, density and lack of access to infrastructure. These settlements are located in areas that invariably get flooded during high tides, in coastal locations, along water mains or open drainage within industrial zones or under high tension writes. As Mumbai grows rapidly, marginal land is often all that is left for the poor. Slums are often located on steep hillsides which are prone to landslide during the monsoons. Many squatter structures are single storey and built on salvaged materials which are vulnerable to collapse. World Bank estimates that these communities suffer from inadequate access to potable water and sanitation.

Photo No. 4.1 Slums in Mumbai
j. Quarrying of Hills:

The city’s hill ranges are being systematically captured by developers with disastrous environmental consequences. Quarrying in the hills at Dindoshi hills outside the National Park is triggering landslides. MCGM has listed 117 landslide prone sites in hilly areas like Kurla, Mulund and Saki Naka. (Greater Mumbai Disaster Management Action Plan, 2007).

Photo No. 4.2 Land Slide in Mumbai

k. High levels of spatial concentration of population:

Concentration of population in a limited area poses higher risk of loss of lives. In Mumbai according to 2001 census density of population was 27000 persons per km2, one of the highest in the world. South Mumbai has a large floating population during office hours. In ward A – for example during day time population is 45 lakhs; making density of population as high as 394390 people per sq. Km.

Mumbai suburban Railway Network caters to 6.3 million commuters daily which is the life line of the city. The passenger density is highest in the world ahead of even Tokyo and Seoul. They are extremely overcrowded. Because of this, the suburban trains have been a target for terrorist
activities. Any disruption of the train services has a major impact on the functioning of the city.

Photo 4.3    Crowded Railway In Mumbai

Population density is very high in slums; which is as high as 94,000 people per sq. Km. in some slum areas making these areas one of the most densely settled areas in the world

I. Inadequate transport facilities

The transport network is very efficient but extremely inadequate and therefore, trains are overcrowded and slow moving buses on extremely congested roads and acute paucity of parking space. One estimate says that there are 24 lakhs four wheelers in Mumbai but the roads are not sufficiently wide. It creates pollution. Travel time of people increases to any extend.

m. Utilities and services :

Utilities like electricity supply, water supply, sewerage systems and garbage collection and disposal is a great problem. In Mumbai daily 8000
M.T. garbage is collected but cannot be disposed of properly for the want of space. It creates health problems and health services are also inadequate. Mumbai’s water supply depends on several rain-fed lakes located to the north of the city. Their location on hills makes them less susceptible to impact from sea-level rise, although their dependence on local rainfall means that increasing rainfall variability could threaten local supply. This happened in 2009, when there was inadequate rainfall in the catchment areas.

n. Building Stock:

It is one of the most vulnerable elements exposed in Mumbai. There are different types of building structures which are made of concrete frames, brick masonry building and some are made of tin sheets, thatch and other light weight materials.

Several buildings have been constructed without proper design or engineering resulting in lower strength.

Almost 90% of the buildings located in ward A, B & C in the city area are dilapidated. Such structures are in the state of collapse and may become a death trap in case of any accident like fire etc.

Photo. No. 4.4 Dilapidated Building in Mumbai
o. Presence of hazardous industries:

Mumbai has around 900 industries that are involved in manufacturing or processing or storage of hazardous materials (hasmats). Many of them are very much close to residential and commercial areas increasing the risk of fires and explosions.

Trombay, in the eastern suburbs – there are two oil refineries, a petro-chemical complex, a fertilizer plant, a thermal power unit and the Bhabha Atomic Research Centre. These are highly vulnerable centers to accidents.

p. Storage of Hazardous Substances:

The chlorine gas leak from two cylinders at the Mumbai Port Trust highlights the vulnerability of the city due to storage of hazardous substances. There are over 750 such substances which are stored legally in different parts of the city.

q. Marine pollution:

Due to Bombay High and two ports- Mumbai Port Trust (MPT) and Jawaharlal Nehru Port Trust (JNPT) Mumbai is highly vulnerable to marine pollution. The collision between two cargo ships in 2010 almost 879 m. tons of oil spilled over into the sea.

(City Profile- Greater Mumbai-2010-11)

4.4 Deluge in Mumbai on 26th July, 2005:

26th July 2005, no Mumbaikar can ever forget this day. Indian Meteorological Department (IMD) recorded a 944 mm. of rain for 24-hour ended at 8.30 am on 27th July. The MCGM Officials started getting calls that due to heavy rain there was water logging in suburban areas. There was water logging on railway tracks. As a consequence, trains were halted completely in the afternoon. Passengers were stranded. Due to stoppage of trains, road traffic increased. But even roads were under water in many areas, due to which vehicular traffic came to a grinding halt. Mithi River overflowed and consequently led to water logging of Western
Express Highway. By evening Airport became non functional and air traffic was suspended. People had to take resort of whatever was available - such as public or private places, flyovers, rooftops of BEST buses, railway platforms etc. Many people found out their way to homes through dirty and contaminated water, which caused them water-borne diseases. Thousands of school and college students were stranded due to flooding and could not reach home for up to 24 hours.

Adding to the chaos was the lack of public information. Radio stations and television stations did not receive any weather warnings or alerts from government agencies. Mobile phone service was jammed, so absolutely there was no communication. Electricity was cut off. No T. V. communication for public was available

The rain water caused the sewage system to overflow and all water lines were contaminated. The government ordered all communities to add chlorine to their water tanks while they decontaminated the water supply.

Thousands of animal carcasses floated in the flood waters,

Apart from the heavy rains, few more factors contributed to the intensity of the disaster: an age old storm-water drainage system, uncontrolled and unplanned development in the northern suburbs, destruction of mangrove ecosystems and heavy rains coincided with high tides, there was no way to stop the seawater from rushing into the drainage system during high tide.

Development in the northern suburbs of Mumbai is haphazard and buildings are constructed without proper planning. The drainage plans in those suburbs were developed in an ad hoc manner. Mangrove ecosystems which exist in and around the city were being destroyed and replaced with construction. These ecosystems serve as a buffer between land and sea. It is estimated that Mumbai lost about 40 per cent of its mangroves between 1995 and 2005, some to builders and some to slums.

(Fact Finding Committee Report, 2006)

The deluge brought a new understanding about the city and started a debate concerning the planning and development of Mumbai in the coming decades. The
question is: why did Mumbai see the ill-fated day of July 26, 2005. Was it just the unusually heavy rainfall that brought India’s largest metropolis to its knees? Or was the crisis that Mumbai faced on July 26, the consequence of decades of poor planning and lack of vision?

(Bhagat, R. B., Guha, Mohua and Chattopadhyay, Chattopadhyay.2007).

1. Impact of Deluge on July, 26, 2005:
   - Over 60% of Mumbai was flooded to various degrees.
   - Total collapse of the transport and communication system.
   - Electricity cut off in most parts of the city
   - Backflow of sewage into storm water due to failure of sewage pumps.
   - 419 people deaths including 65 killed in landslides.
   - 216 people deaths due to deluge-related epidemics.
   - 6307 animal carcasses disposed off.
   - 2000 residential buildings fully damaged, 50,000 partially damaged
   - 40,000 commercial establishments suffered heavy losses.
   - 30,000 vehicles and 850 BEST buses damaged.
   - 30,000 vehicles and 850 BEST buses damaged.

(NDMA Report)

Estimated Financial Loss due to Flood: The Indian Merchants’ Chamber estimated the loss up to Rs.30 bn. The Mumbai Chamber of Commerce and Industry’s Chairman Shree Abheek Barua says, it must be not less than Rs.40bn.

Record-breaking Insurance Claims:

India’s four big private insurance companies ICICI Lombard General Insurance, Iffco-Tokio General Insurance, Bajaj Allianz General Insurance and Tata AIG General Insurance have received claims for damages totaling Rs.10bns.

(Supriyo Nandy, 2006)
Photo No. 4.5  Flood in Mumbai

Photo No. 4.6  People stranded in flood on 26\textsuperscript{th} July, 2005

Photo No. 4.7  Carcasses of buffalos
2. The help provided by the MCGM to the affected community:

- MCGM organized emergency relief operations on a war footing in various parts of the city. Food packets and drinking water was arranged for the stranded people with the help of NGOs and Social Organizations on the 27th July, 2005.
- Over 25,000 people were provided relief material at 15 locations across the city including Air India Colony, Kranti Nagar (Jari Mari Road), Filter pada at Bhandup and Panchsheel Nagar. Affected people were shifted to nearby Municipal schools, local buildings and halls on the 27th July, 2005.
- MCGM conducted relief operations in several areas through its own rescue and relief teams. For example, 8,750 and 3,250 food packets were distributed in City and Western suburbs. At the Air India colony, MCGM distributed 5,000 food packets and 1,000 litres of milk to more than 3,500 families stuck in water.
- Water was supplied to the affected areas using more than 50 tankers delivering 57 lakh litres of water through 631 tanker trips.
- On 2nd August, 2005, relief operations lasted for more than 12 hrs. and were conducted by a joint team of MCGM and NGO using 1 rib boat, 1 rescue boat and 3 rowing boats.
- MCGM also coordinated relief work at other places with the help of social service organisations (such as Nirmala Niketan College of Social Work and Tata Institute of Social Science). Over 20 NGOs including Akanksha, Yuvak Pratishthan, Apnalaya and industry houses (e.g., Tata Group through Dorabjee Tata Trust) also volunteered their help. Coordination mechanism was set up through the Deputy Municipal Commissioner (DMC) to coordinate the continuing relief operations by individuals, industry houses and NGOs on the 2nd August, 2005.
- The MCGM machinery lifted a total of 2,53,612 Metric Tonnes of garbage from all wards from 29th July till 21st August, 2005. The waste lifted on a daily basis was almost double of what MCGM lifts on a normal day.
- The MCGM Disposed of carcasses of more than 1,307 buffalos and 15,000 sheep & goats.
• A total of 16,307 carcasses were disposed off including those of 15,000 sheep and goats (mainly from Deonar) and 1,307 buffaloes (mainly from Goregaon, Kandivli and Andheri).

• Preventive health measures were adopted by the MCGM. Due to heavy rain, people had walked through flood waters to their destinations. There was a high risk of water-borne diseases like gastroenteritis, hepatitis and also leptospirosis. MCGM implemented several preventive measures to minimize these risks. Extensive spraying of disinfectants and insecticides was undertaken to control pests and minimize flies and mosquitoes. In addition, water purification tablets were distributed.

• Over 24 metric tons of bleaching powder disinfectant and over 2 metric tons of carbophenol powder were sprayed to disinfect public spaces.

3. Causes of the Deluge and Solution:
To find out the causes behind the Mumbai Flood and what are the Measures necessary to avoid such catastrophe, number committees were appointed by the State Government, Central Government and by the Civil Society:

1. Inquiry by NIDM Committee: The Ministry of Home Affairs (MHA) requested the NIDM to conduct an inquiry in to the handling of the 26th July’s deluge.

The Report revealed that:

• The authorities having responsibility of managing disaster were completely negligent and there was total lack of awareness among themselves.

• The absence of sustainable model of urban planning.

• Instead of proper planning process, short sighted decisions were taken neglecting the needs of majority of the people

• Natural cause for unprecedented rains was the result of an ‘offshore-vortex’- a heavy downpour but extremely localized, spread over as little as 30 km2. Forecasting of such meteorological phenomenon is not possible without Doppler Radar which was not installed at that time.
• Haphazard growth and failure of the early warning system is responsible for the situation.
• The officers and the agencies who were to take the charge of the situation, themselves were affected by the flood, so they could not join the response operation. This was not considered in the planning, that is lack of visualization.
• After the flood the damage assessment was not done properly therefore, the response also was not according to need.
• There was no communication and coordination among the agencies.

2. **Fact Finding Committee** under the Chairmanship of Dr. Madhav Chitale was appointed by the Government of Maharashtra on 19th August, 2005 to find out and analyse the short term and long term factor responsible for this situation, the deficiencies and limitations of the present storm water and sewerage disposal systems and the reasons for the bad condition of five rivers in Mumbai and solutions on all those problems. The committee submitted a detailed report on these issues. Some of the findings are as follows:

• Rain monitoring and Hazard Warning system was outdated and was not working properly.
• Mumbai is controlled by multiple agencies. The Municipal Commissioner is having control and command during disaster, but it does not become effective.
• A strong and prompt public communication network is required to handle such situation. But it was the first casualty during disaster.
• Mass Transit system by rail or by road is the dire need of the day. Due to water logging railway tracks were submerged and roads which are already inadequate, went under water.
• Due to heavy downpour, power distribution main and sub-stations got submerged on which communication, water pump operation and many other thing depend.
• No staying arrangements at government offices, commercial, industrial establishments and educational institutions are made.
• No special road corridors for emergency relief and rescue vehicles and for ambulances were reserved.

• Fire Brigade facility for such a large city is absolutely inadequate, manpower as well as equipments.

• Mumbai Disaster Management Plan is to be up dated thoroughly considering the changed situation, technology etc. It should be more operational with small details. Vulnerability analysis of the city should be done, risk zoning map of the city to be prepared.

• Data compilation from all sources is utmost important for exact planning.

• Present Disaster Management Plan is to be modified with various accurate details- For example in the plan only two rivers are mentioned, actually there are five rivers in Mumbai along with number of nallas and other watercourses which need to be deepened regularly.

• While revamping the Disaster Management Plan- shelter houses, emergency communication numbers, city evacuation process etc. should be mentioned.

• The population, almost 60 lakhs, staying in slums, whether notified or not, is most vulnerable area of the city. Proper prevention measures are necessary to avoid any mishap,

The Fact Finding Committee has given a detailed report about problems, analysis and possible solution on all aspects of disaster management such as mitigation, prevention, preparation and response to any natural calamity faced by Mumbai megacity in future.

The State Government has appointed various committees for different purposes, all of them directly or indirectly related to mitigating disasters.

These committees and their assignments are as follows:

a. Natu Committee Report 1975: to study the problems of the S.W.D. system in the island city & the suburbs & to suggest improvements

c. **Shah Technical Consultants Report 1988** – on Dharavi Storm Water Drainage System. To study the components responsible for flooding at Dharavi, and to suggest remedial measures with detailed technical & financial proposals.

d. **BRIMSTOWAD report 1993**: To study to S.W.D. system of Mumbai including detailed physical surveys & to suggest recommendations with preliminary engineering proposals for individual catchments.

e. **I.I.T Powai Report** (2005) - To select methodology to abate flooding at Milan Subway & Slater road, Nana Chowk.

f. MMRDA and the Government of Maharashtra have appointed some other committees after the deluge in July, 2005:

g. **CWPRS interim report**, 2005 on Mithi River development

h. **WAPCOS interim report, 2005** on Dahisar, Poisar and Oshiwara

i. **IIT’s report on Mithi river Pollution, 2005.**

j. **MERI Interim report** on Ulhasbasin, 2005

   *(Fact Finding Committee, 2006)*

3. **The BRIMSTOWAD Project**

This project was very important and crucial from drainage system of Mumbai point of view. The storm water Drainage system was laid down during British period, naturally it has become very old and now inadequate to drain out water of expanded Mumbai. This was also one of the main causes of 26th July deluge.

In the year 1990 M.C.G.M. appointed M/s. WATSON HAWKSLEY International Ltd. of U.K. with their Indian counterpart M/s. Associated Industrial Consultants (India) Pvt.Ltd. as consultants to carry out detailed studies for improvement of storm water drainage system in 1990. The company submitted its report in 1993.

**Major recommendations in the BRIMSTOWAD Report:**

- Removal of obstructions of water mains, cables, etc. in the SWD system
- To rehabilitate old/dilapidated SWD system in City and augmentation of SWD in certain stretches
- To remove encroachments, structures within/above nallas/SWDs
- To change the design criteria from 25 mm/hr to 50 mm/hr rainfall intensity and coefficient of runoff as 1.00 from earlier value of 0.50
- To augment the SWD system for new design criteria with tidal effects
- To train, widen and deepen nallas
- To augment railway culverts at various flood prone areas
- To provide pumping stations at the city outfalls at Haji Ali, Love Grove and Worli.

(Fact Finding Committee, 2006)

4.5 MCGM’s Role in disaster management:

The State Government of Maharashtra, under the Disaster Management Act, 2005, has assigned the Municipal Corporation of Greater Mumbai (MCGM) the responsibility to provide proper and conducive environment for the smooth functioning of all the stakeholders.

Also, the Mumbai Municipal Corporation Act, 1888, under section 63(k) and 64(2A), has mandated the Municipal Corporation of Greater Mumbai for mitigation and management of natural or man-made disasters and is expected to take all necessary measures to promote public safety and minimize danger or damage to life and property of the citizens.

- **Establishment of Greater Mumbai Disaster Management Authority:**
  Initially in the Disaster Management Act, 2005 there was no mention about the role and responsibility of a municipal corporation like Mumbai or Delhi, though the provision was made to have State, District, Panchayat and even village level institutional structure.

  On this background, Government of Maharashtra on 19th January, 2011, under the said act, established the ‘Greater Mumbai Disaster Management Authority’ for Mumbai City District and Mumbai Suburban District. The Municipal Commissioner of MCGM will be the Chairman of this Authority and
the Additional Commissioner (Disaster Management) of MCGM will be the Secretary of the Authority.

\( \text{(G. R. of Government of Maharashtra, 2011).} \)

- **During disaster time Municipal Commissioner will be the Single and Supreme Authority:**

  For a long time, ‘Multiple Controlling Agencies of Mumbai’ was a hurdle in the effective and unified functioning of disaster management of Mumbai. Now, another very important decision taken by the Government of Maharashtra that during disaster time the Municipal Commissioner of MCGM will be the Highest Authority and all other agency heads like Railways, Air Port Authorities, MMRDA, MHADA, IMD Port Trusts etc. will work under him.

  In the last few years Mumbai city has faced number of disasters- either natural or manmade such as floods (2005), serial train bomb blasts (2006), terrorists attack on Mumbai (2008), Building collapse and landslides are a regular feature in Mumbai.

  Considering the responsibility assigned by both the acts mentioned above, the MCGM has prepared a Disaster Management Plan for Mumbai. In order to implement this plan effectively, the MCGM has established a well equipped Disaster Management Unit at the Head Office of the MCGM and a disaster management unit at all the 24 ward offices of MCGM in Mumbai Mahanagar.

- **Mumbai Disaster Management Plan:**

  An effective Disaster Management Plan includes Standard Operating Procedures (SOP) that is a standardized, predetermined, step by step method of doing work to control a particular situation which disturbs normal routine life. This plan provides a blueprint for the response that all involved agencies will implement 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 to strengthen and reform the institutions.
- 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 optimum 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 between 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 Pre-disaster as well as During the disaster stages. Well defined and simple report formats for effective communication between various agencies have also been given in the Plan. Importantly, the plan also specifies the role of the media and NGOs regarding how they can help the administration while responding to disasters. The plan also underlines the need for a change in the mindset in understanding that the local community is always the first responder in any type of disaster response.

**Volume 1 – The Plan**

The plan gives detailed information about the physical, geographical and administrative layout of Greater Mumbai. It includes Mumbai city, all suburbs (mentioned elsewhere).
This includes the geology and geomorphology, land use details, historical, tourist, religious centers and other places of mass get together., 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 (Inventory)**

In this volume the list of all the resources and their ownership and where they are available is mentioned.. It covers all concerned agencies’ contact details are given. This volume also describes the requirement of specific resources in response to a particular type of disaster.

In the book of inventory all inclusive details of public and private resources such as hospitals, ambulances and their numbers, earth moving equipments, transportation facilities, food and clothing etc are given.

This information definitely would prove invaluable during the disasters when making resources available is most crucial. Importance of HAM radio communication system has been underlined in this document, especially when regular systems of communication are failed.

Presently, a project has been undertaken to assess the structural stability of Municipal schools with this intention that such schools can be of great use as shelter houses at the time of calamity.
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

(Mumbai DMP, 2005).

In order to implement this plan effectively, the MCGM has established a well equipped Disaster Management Unit at the Head Office of the MCGM and a disaster management unit at all the 24 ward offices of MCGM in Mumbai Mahanagar.

This office is equipped with state-of-the-art communication system. Supporting the city-level disaster management plan are the ward level plans of the 24 wards. The roles and responsibilities of ward officials in disaster risk management have been specified. When the disaster is localized and can be managed locally, the
Assistant Commissioner acts as the site officer responsible for the coordination of field activities of various line departments including coordination and providing support to line agencies so as to enable them to operate efficiently (Mumbai DMP, 2005). He has to remain in constant communication with the MCGM Control Room and the field officers from the police, traffic police, fire brigade, railways, BEST, BMC Hospitals, MTNL, BSES, TEC, revenue, state government when necessary, among others.

Disaster situations that cover a large portion of the city call for coordination of activities at the city level. In such conditions, the ward level plans would be in place along with the Mumbai DMP. The Assistant Commissioners maintain their coordination functions and activities at the ward level while inter-ward coordination is the responsibility of the MCGM Control Room.

The Municipal Commissioner also ensures that disaster response drills are conducted by the Assistant Commissioners and other agencies on a regular basis, especially in the disaster-prone areas to maintain the readiness of the various departments and the local communities.

Many vital installations in the city like Hindustan Petroleum Corporation Limited, Reliance Energy Ltd, Bhabha Atomic Research Center, Tata Power Corporation Ltd, Maharashtra Telephone Nigam Ltd, and Mumbai Port Trust have their own Emergency Response systems that cater to their needs and are available to MCGM on request. The informal arrangement is functional despite the absence of a MOU between these organizations and MCGM.

(City Profile- Greater Mumbai-2010-11)

Strengths, weaknesses, opportunities and threats of Mumbai

Strengths

Strong commercial and industrial base, potential workforce and Social Capital, Key infrastructure linkages to places within and outside the country( such as airports, ports, rail and road links to and from Mumbai)
Weaknesses

Lack of infrastructure regulations, lack of supporting legal and regulatory framework to facilitate investments, Authorities with overlapping roles and responsibilities, limited land mass available for development, skewed policy promoting slums development.

Opportunities

Grant assistance under JNNURM (Jawaharlal Nehru National Urban Renewal Mission) for city infrastructure development, Reforms to support growth, Public Private Partnership for development, Enhanced access to markets and opportunities to attract investments due to change in policies and globalization.

Threats

Globalization, Paucity of funds for infrastructure provision, Decelerating economy due to decrease in manufacturing activity.

Source: (Mumbai City Development Plan 2005-25, Prepared by MCGM)

Institutional Framework for Metropolitan Cities:

In the larger cities (say, with population exceeding 2.5 million), the recommendation of the second Administrative Reforms Commission has suggested that the Mayor, assisted by the Commissioner of the Municipal Corporation and the Police Commissioner to be directly responsible for Crisis Management. It has now been accepted by the Government.