



# **Management of Urban Floods Mumbai, India**

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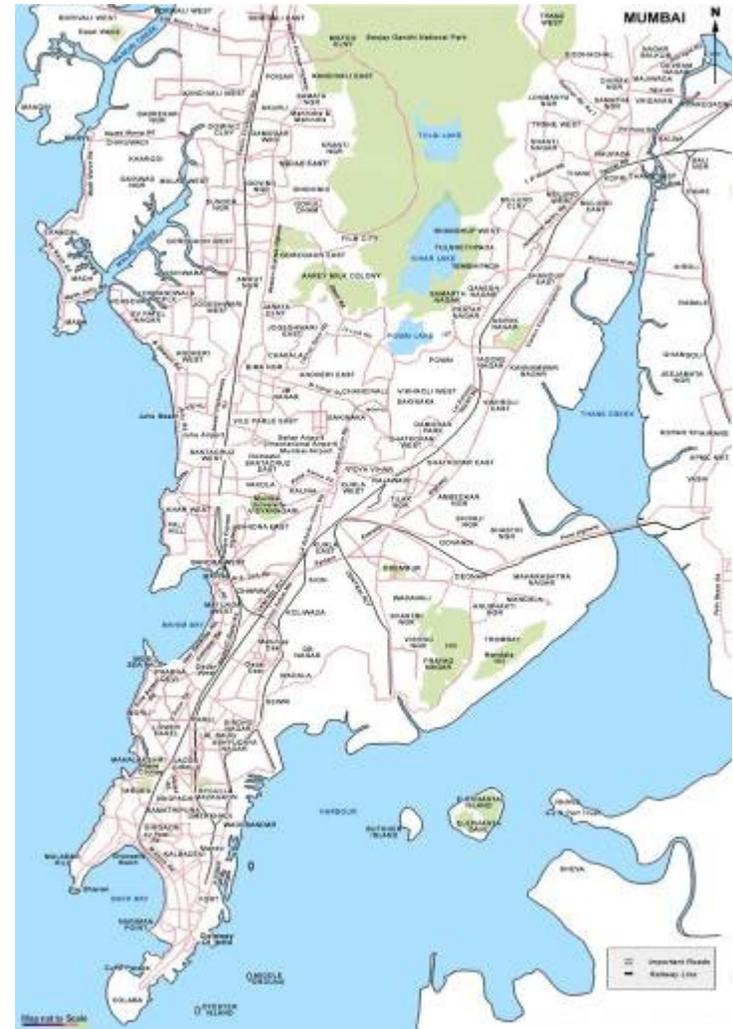


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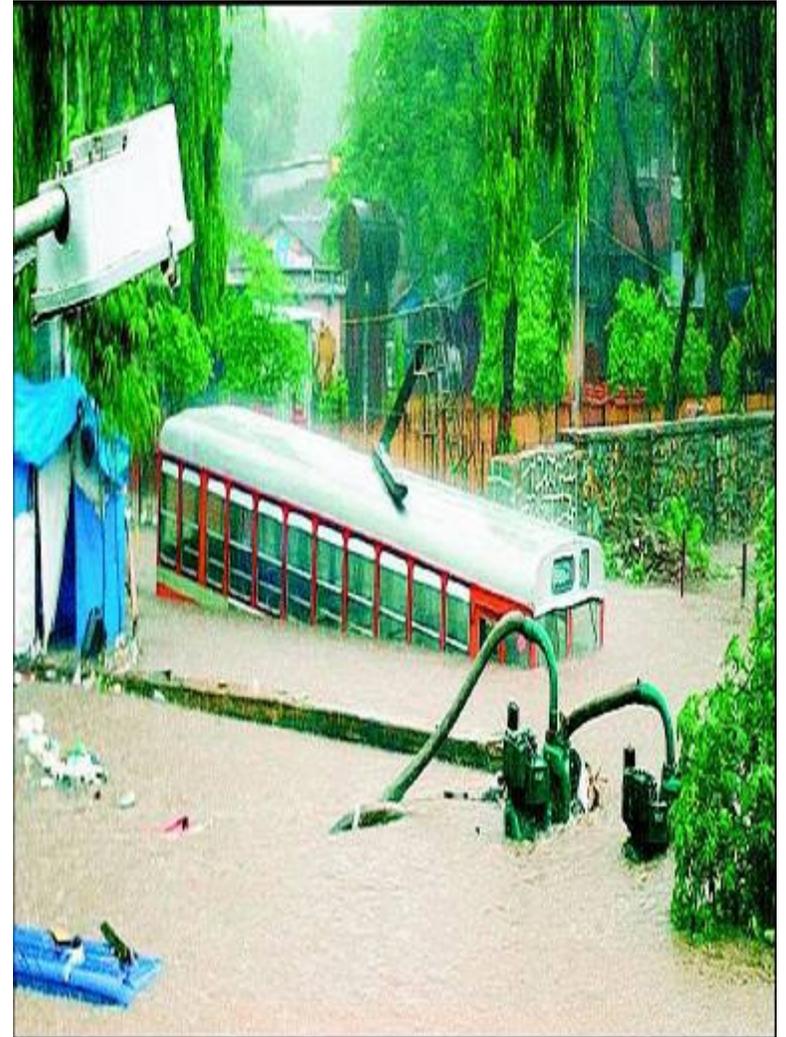
# Mumbai Floods - A glimpse of complexity

- Mumbai - originally a group of 7 islands; many reclaimed areas are just 5 mtrs above low tide sea level
- Area- 437 Sq.Km; Population-12 Million (2001); Population density - 29000 per sq-km
- Mithi river dividing the city, the western & the eastern suburbs can cause floods
- Rapid urbanisation - mostly private houses - has blocked the waterways
- Storm water drainage function of MCGM



## ....Mumbai Floods - A glimpse of complexity

- Railway lines typically 10 mtrs above low tide level & Subways close to high tide level
- 82 chronic flooding spots
- The ratio of > 75 mm rainfall days to flooding days increased from 1:7 to 1.5:1 during the last sixty years
- Existing technology does not forecast rainfall >250 mm accurately – limitations with India Meteorological Deptt (IMD)
- July 26, 2005 – 944 mm rainfall. Rainfall from clouds few kms long could not be predicted !
- Sea level rising by 3 mm ever year
- Multiplicity of organisations ; over 20 agencies from the Gol, GoM, and MCGM



# The scourge of rainfall

*Both Mumbai and Singapore get about 2500 mm of rainfall , but in Mumbai the water has to discharge in one-sixth of the time, due to concentration of rainfall in monsoons during July and August*





# Government Recovery Plan

## ■ Storm Water Drainage

- Upgrade the storm water drainage system to mitigate the effects of events like July 26th 2005, when almost 35% of annual rainfall occurred on a single day
- Widening and deepening of existing water channels and causeways
- Providing smooth transition for waterways near bridges
- Moderating the river course by replacing existing sharp bends with longer gentler bends

# Government Recovery Plan

## ■ Actions by MCGM

- Operates a control room - the Main Centre of Communication
- Discharge pumps – 196 nos. deployed to discharge water
- 6 Nos. search and rescue teams kept ready under the fire brigade
- 600 personnel from Civil Defence and 10 persons per ward from NGO
- 500 buses kept ready by the transport service provider
- De-silting of Mithi river - 5.68 lakh M<sup>3</sup> silt removed pre-2007 and 3.70 lakhs M<sup>3</sup> thereafter
- 2652 residential and 1148 commercial structures removed.
- 1769 residential and 349 commercial structures rehabilitated
- Additional bridges at Kranti Nagar and Kurla-Kalina Road started.



# Government Recovery Plan

## ■ Actions by State Government

- Active traffic management / diversion when roads are water-logged
- State government hospitals/ supplement municipal hospitals.
- Home Guards & Civil Defence for disaster management
- 288 retaining walls in 74 places have been undertaken by the Slum Improvement Board
- The Chief Minister of Maharashtra acts as the highest coordinating authority - Chairs a 'Monsoon-preparedness' meeting
- Regular follow-up meetings by the Chief Secretary and Additional Chief Secretary (Home Department).

# Government Recovery Plan

## ■ Actions by Government of India

- Hon'ble Prime Minister sanctioned a special grant of Rs. 1200 crores outside the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) as 100% subsidy
- The work involves widening of drains and construction of pumping stations
- Rehabilitation of slums up to 01.01.2000.



## Conclusion and Recommendation

- Shift from conventional / reactive approach to strategic approach
- Step up structural measures such as gates on Vihar and Tulsi lakes, holding ponds upstream of airport on Mithi river, augmentation of railway culverts
- Contour mapping of city required for better storm-water management
- Upgrade flood warning and forecasting measures to “nowcasting”. Network of Doppler Weather Radars to be put in place
- Restoration of existing water bodies, natural drainage, resettle the encroachment, enforcement of rain water harvesting etc. to moderate the discharge.
- Create public awareness about warnings, teach people how to react and ensure self help grooming; collaborate with NGOs
- “Flood insurance” products have to be encouraged to cover partial loss to business

# Mumbai Floods - Aftermath - Lessons Learnt

- Sustainable and meticulously planned growth is key. Expert reports prepared for future planning
- In India - post 2005 Mumbai floods - disaster management bill passed, policy is emerging
- Political action is necessary. Regular monitoring by political executive became order of the day
- Informed, trained bureaucrats can offer co-ordinated response. Regular interaction with experts in training and research institutions
- Effective communication is key. It can make or break the response measures
- Disaster response has to be 'people centric'. People with strong civic sense and resilience make all the difference
- Local committees trained in facilitating self help foster the government initiatives
- Empowered communities respond better