Social vulnerability
Summer Academy 2007
Megacities as hotspots of risk

Munich Re Foundation
From Knowledge to Action

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Vulnerability in megacities

A case study of events in Mumbai and Paris

Munich Re Foundation poster series

Mumbai

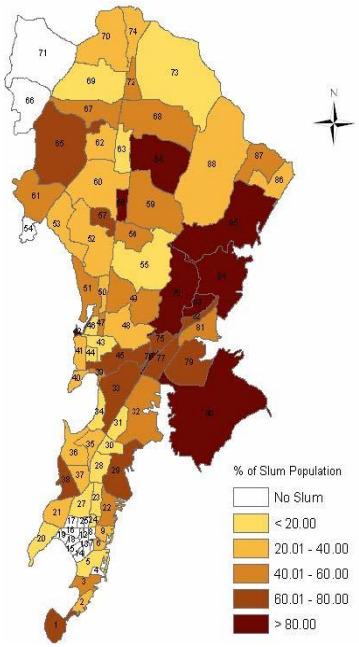
- Population:
  - 2001: 20m
  - 1985: 8.3m
  - Population density (inhabitants/km²): 19,377
- Area: 440 km²
- More than 2,000 distinct slum settlements
- More than 5 million of the city's residents are slum dwellers

Poor planning and rapid illegal development: predispositions to vulnerability in Mumbai

- The expansion in population has not been matched by infrastructure improvements
- Minimised floodplains due to rapid development
- Under-dimensioned, aged drainage system
- Malfunctioning pumping system
- No warning systems
- At least ten rail sections of central railway get submerged during heavy rains
- Lack of dykes and other coastal defences for dealing with sea-level rise
- Weak disaster preparedness

Mumbai slums

- An estimated 55% of Mumbai's population live in slums, roughly half of which are severely dilapidated.
- Slum location tendency:
  - Low-lying areas with tendency to flood during high tides
  - Costal locations
  - Along water mains or open drains
  - On hilltops or slopes
- The population densities for roughly one-half of Mumbai's slum communities are estimated to be as high as 94,000 people per square kilometre
- Many slum structures are single storey and built of salvaged materials.
- The majority of inhabitants suffer from inadequate access to potable water and sanitation



Mumbai flooding 2005

On 26 July 2005, Mumbai came to a complete standstill as unprecedented heavy rains flooded the city, affecting the lives of many.

Precipitation:	880 mm/12h
Death rate:	> 1,000 (mostly in slum settlements)
Affected:	20m (in Maharashtra)
Evacuated:	52,000 (in Maharashtra)
Houses collapsed:	10,000
Manner of death:	Drowning, landslides, stampede due to false tsunami rumours, trapped in vehicles, electrocution, wall collapse, diseases in the aftermath

Cultural behaviour reduces social vulnerability

- "The spirit of the Mumbaikars" in coping with the event
- Mutual help among strangers (e.g. water, food, shelter)
- High sense of cooperation and communal togetherness

Paris

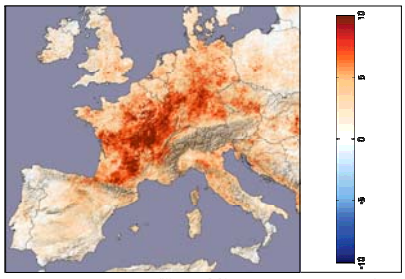
- Population:
  - 2000: 10.6m
  - 1985: 9m
- Population density (inhabitants/km²): 3,545
- Area: 1,118 km²

Heat wave 2003

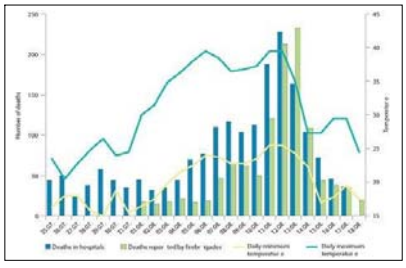
In June through to mid-August 2003, summer temperatures in Europe were 20 to 30% degrees higher than the seasonal average. With a death toll estimated at over 30,000, the heat wave of 2003 was one of the ten deadliest natural disasters recorded in Europe in the last 100 years.

Impacts of the heat wave on France

- Death toll exceeded 15,000 people
- The death figure surpassed 60% of normal expectations
- Excess death tolls in respect to age group:
  - 45-74 years of age: 20%
  - 75- 94 years of age: 70%
  - Over 94 years of age: 120%
- Many deaths were recorded in areas with a low socioeconomic living standard
- Mortality rate increases in the metropolitan area of Paris:
  - + 127% for Paris
  - + 147% in l'Essonne
  - + 161% in Hauts-de-Seine
  - + 160% in Seine-Saint-Denis
  - + 171% in le Val-de-Marne
- Location of the reported deaths:
  - 42% in hospital
  - 35% at their home address
  - 19% in a nursing home
  - 3% in private clinics



Temperature difference [K] between average summer and 2003



Relationship between recorded deaths and temperatures in Paris, summer 2003

Factors contributing to high death toll

- Most victims lacked knowledge of how to react with regard to rehydration
- The majority of homes and retirement homes were unequipped with air conditioning
- Non-existence of heat-wave plans
- Occurrence in August, a month in which many people, including government ministers and physicians, are on vacation
- The 35-hour working week affected the amount of time doctors could work
- Most families went on vacation leaving their elderly behind
- Lack of nursing staff, heat health-warning systems and organisational preparation in long-term care centres

Conclusions

- Natural disasters in megacities often lead to human tragedies.
- Those living on the fringes of society are the most vulnerable.
- Cultural behaviour strongly affects social vulnerability.
- Assessing vulnerability requires sufficient knowledge for appropriate action.
- Structural measures are clearly important but not the key to success.

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