DISASTER MANAGEMENT AND MITIGATION FOR MEGA CITIES - MUMBAI

PART – I : ISSUES (MICRO LEVEL)

Kavas Kapadia
Professor & Dean of Studies
School of Planning & Architecture
New Delhi, India

DISASTER MANAGEMENT AND MITIGATION FOR MEGA CITIES - MUMBAI

PART – I : ISSUES (MICRO LEVEL)

Prof Kavas Kapadia SPA,New Delhi

FROM STUDIES CONDUCTED ON KALINA AND RAJIV GANDHI NAGAR-slum settlements along the Methi River,Mumbai.

Determinants of land use :Several theories dictate the use of land in an urban context….

- The most prominent one being Land economics.
- The kind and intensity of use made of each parcel of land results from economic competition among the various possible uses.
- There are other-non economic reasons such as (James A.Quinn) ,distance, position and cost. **DISTANCE** is measured in terms of Linear-spatial displacement, **ECOLOGICAL**- Time, energy, waste, danger, discomfort of movement and **SOCIAL**- a status variable.
- Since the value of a site is determined by the economic returns that piece of land yields, the most discarded locations are often squatted upon by the urban poor.
- **SPATIAL AND SOCIAL VULNERABILITY ARE THE OUTCOME OF ECONOMIC VULNERITY.**

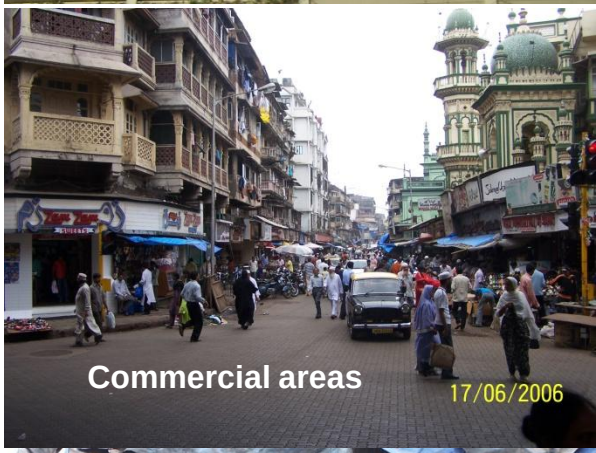
- The importance of getting the urban poor into the socio political mainstream of the Governance and management is well understood both by the political parties and the people themselves.

Land use as Indicator of vulnerability.

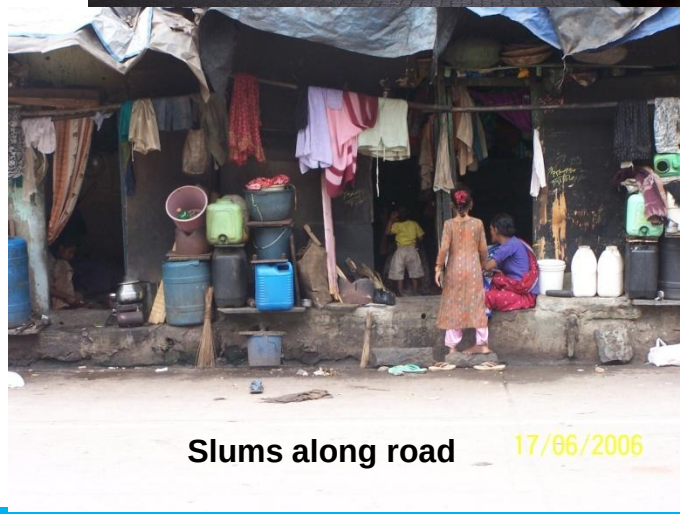
- Since the land use of a pocket of land is dictated by several variables-among these the predominant ones are Economic variables which have an environmental component in built ,a direct relation is created w.r.t the importance of the land and the use to which it shall be put.
- Environmentally degraded land tends to attract lower strata of society.
- The poorest population often end up in the most risk prone areas and poverty makes them highly vulnerable.
- Socially vulnerable groups tend to cluster together in order to lend moral /social support to each other.
- Economically unattractive land tends to be located in high risk zones.
- Squatters on the highly vulnerable lands are aware of the impending risks but end up taking a calculated risk.

The Concept of vulnerability in planning. Areas and populations that are highly vulnerable often get neglected by the concerned authority as they are of little political / social consequence.


High rise high end housing



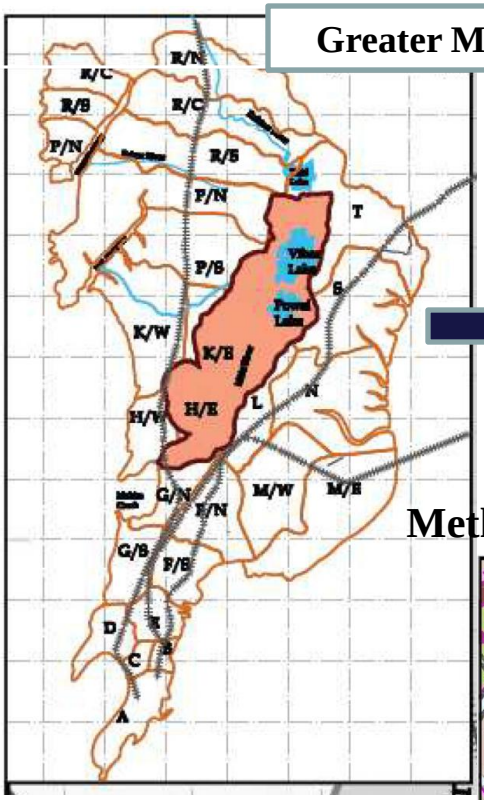
Commercial areas



Slums along road

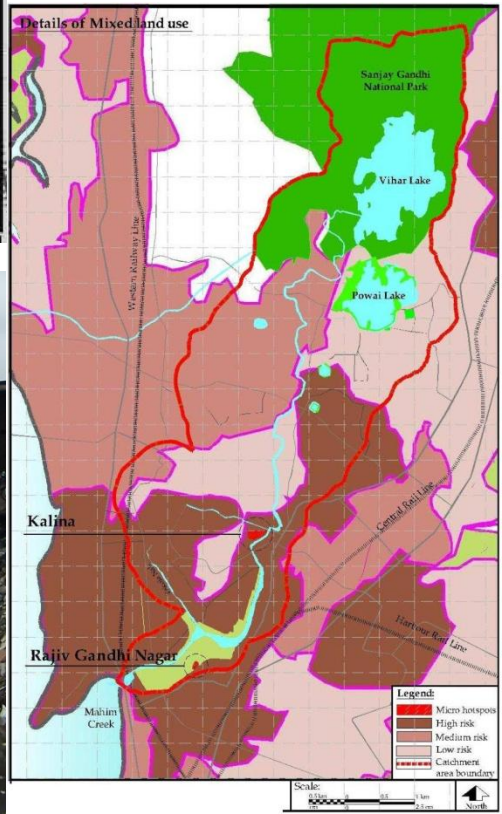
Mumbai

Source: CDP Mumbai



Source: CDP Mumbai, Greater Mumbai

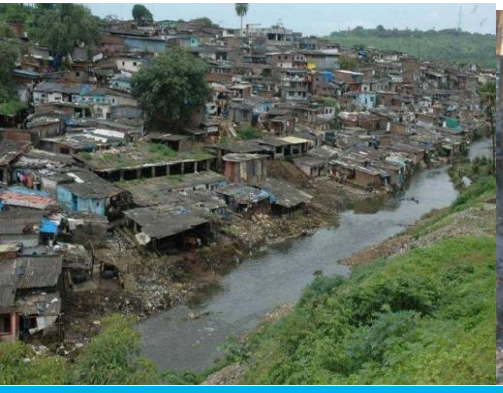
Methi River catchment area

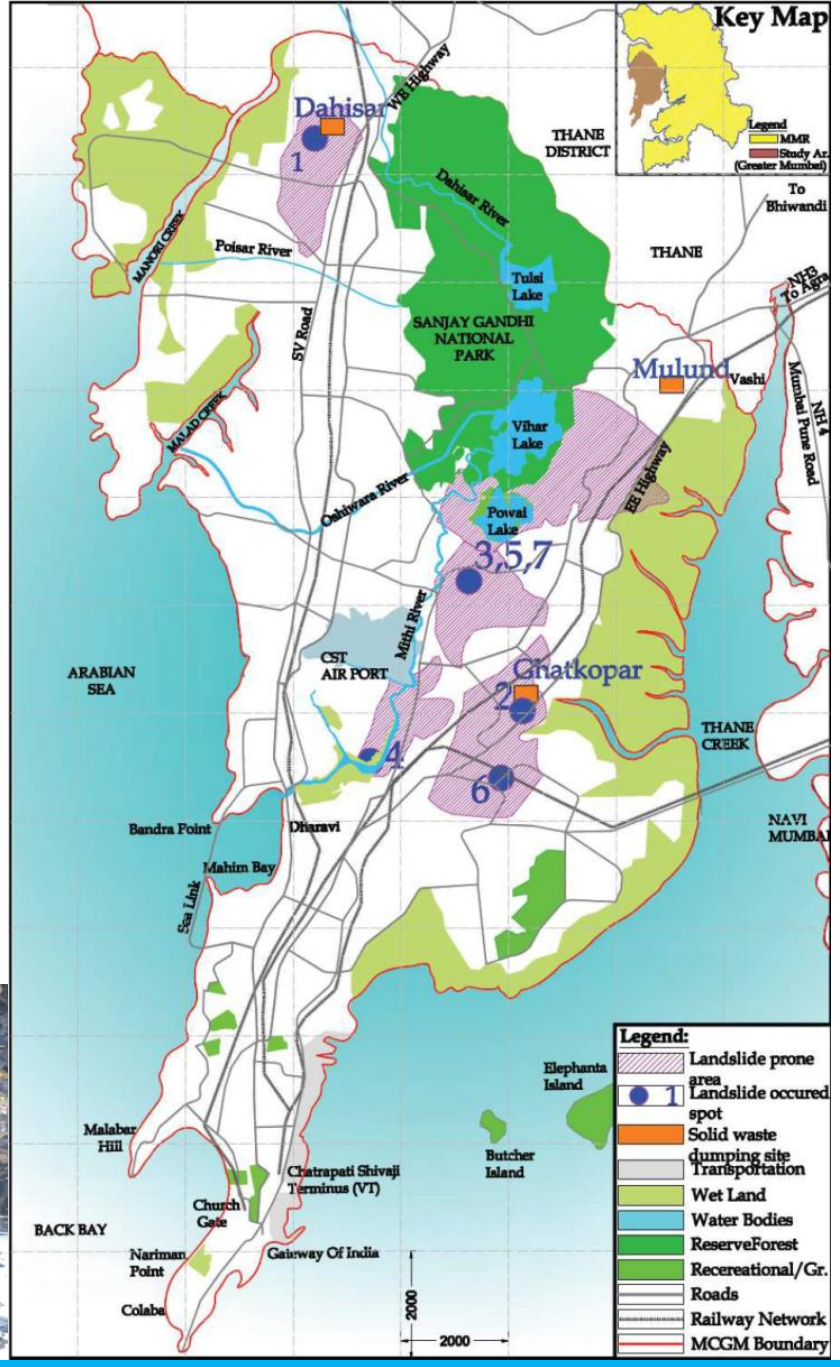


PHYSICAL **DEVELOPMENT-along Methi river**

Unplanned development and encroachment

- 70% of the population lives in slums which are high density pockets. This makes them high risk areas.
- Encroachment on low lying areas and reduction of mangroves has disturbed the natural drainage pattern of the city, increasing flood risk.
- Major landslide occurs on the southern slopes in Sakinaka (Andheri), also the location of Ghatkopar waste dumping site in landslide prone area causes leatchet which results in landslides.
- Majority of hutments are on hilly slopes.





PHYSICAL DEVELOPMENT

Reclaimation of land for new development

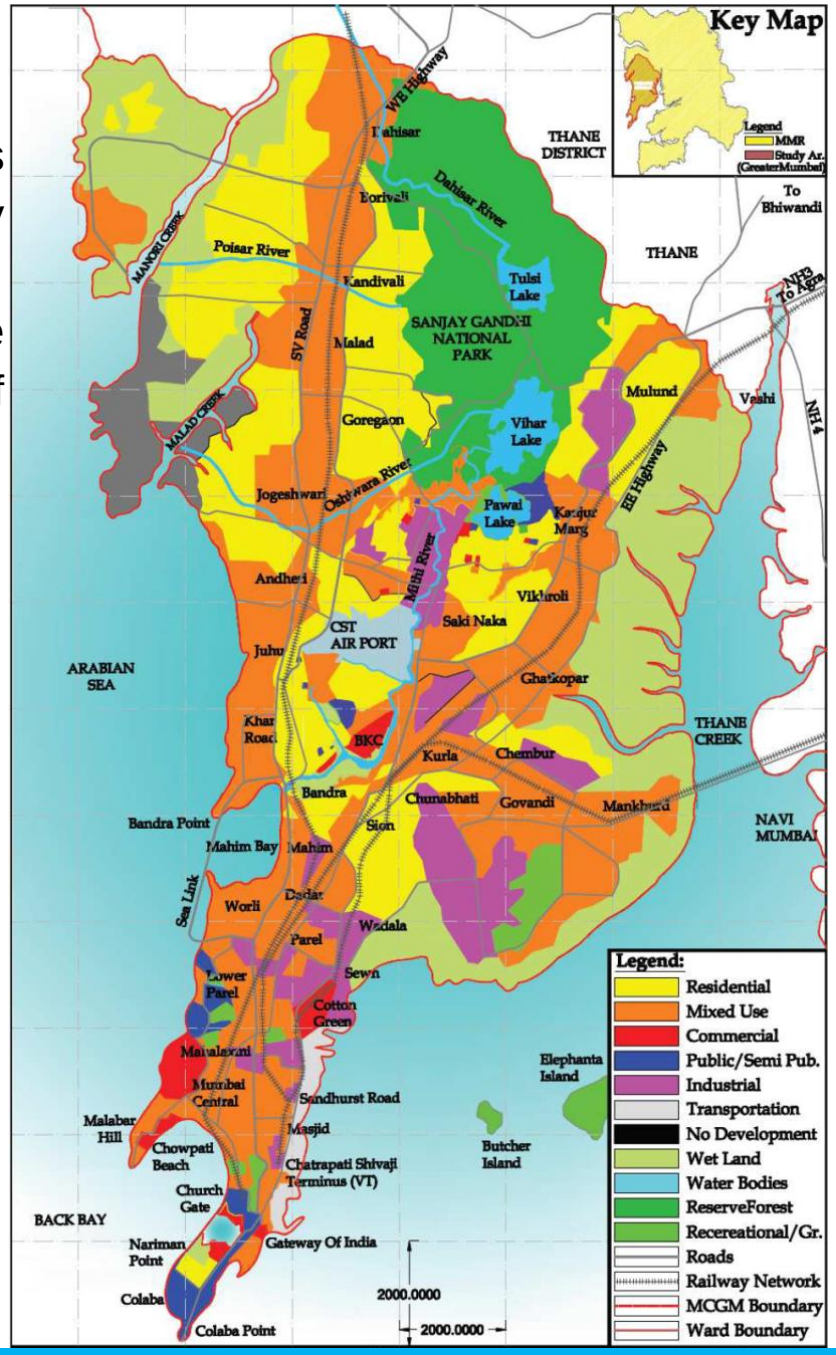
- 21.9% (96 sqkm) of the total land in Mumbai is reclaimed and 22% (21.12 sqkm) of this is highly flood prone as they are low lying.
- Reclaiming land has led to changes in the coastline regime, loss of mangroves, upstream flooding of rivers, changes in undercurrent & tidal wave pattern.

Incompatible Land Use

- 32% of the industries are highly hazardous and are located within the city limit with residential areas & slums surrounding them.
- Many of the godowns are in the close proximity of the residential areas increasing the risk of fires and chemical explosions.

Development on low lying areas

- Major commercial areas like BKC, and major residential area (medium density) of Worli are low lying areas.



INFRASTRUCTURE

Inadequacy in Infrastructure provisions

- **40% of the area of Greater Mumbai is unsewered, which causes floods even at the time of little rainfall.**
- Due to the old design of drainage system (capacity of drains = 25mm/hr.) & change in rainfall pattern (short period of monsoon with the same amount of rainfall), Greater Mumbai has high flood **risk.**
- **Fire prone areas are not easily accessible increasing their vulnerability.**
- Insufficient infrastructure facilities for waste disposal in slums leads to dumping of HH, industrial and commercial wastes in vacant land, rivers, sea shores, and on road sides .This leads to choking of drains, silting of rivers, leatchet and fires.
- **Uncleared solid waste often piles up and creates unhygienic conditions specially during the monsoons.**

ENVIRONMENT

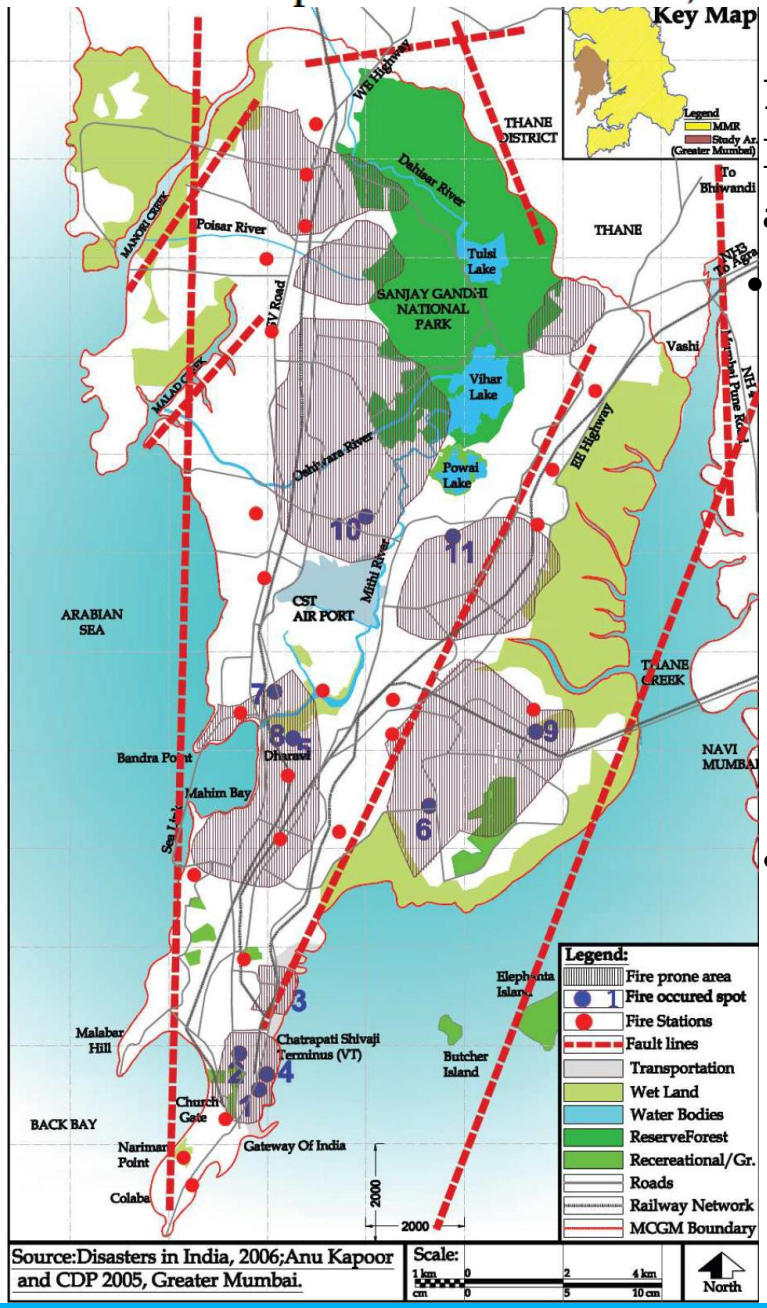
CRZ

- Maximum part of wards like M/W, G/N, H/E falls within CRZ I and these wards also house slum population which is highly prone to disaster.

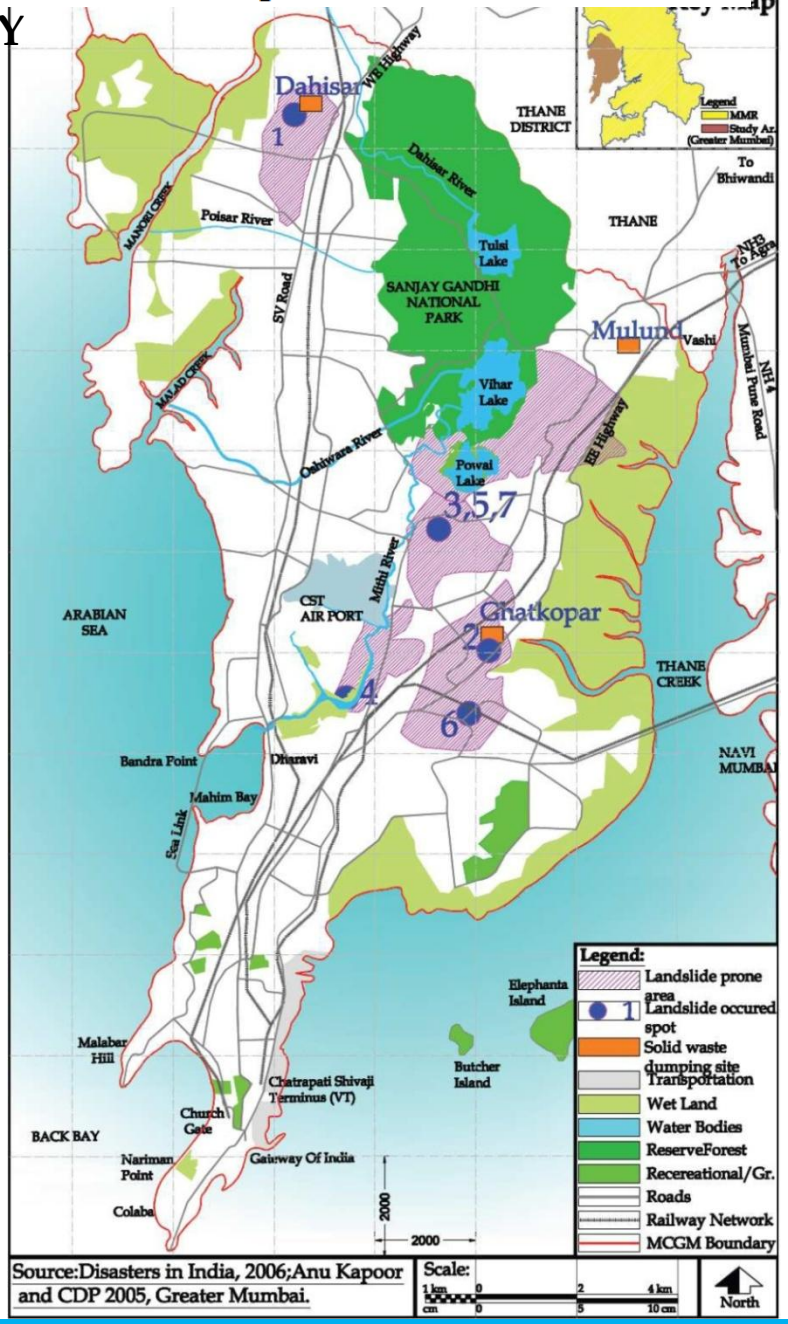
Fragile Areas

- Increase of mixed, residential & commercial landuse in the East lead to the shrinkage of wetlands & marshy areas (around 10%).

Location of fire prone area in Mumbai, 2006



Location of Landslide prone areas in Mumbai, 2006



VULNERABILITY

Development in Hazard prone areas

- 26% of the total area is fire prone due to Large no. of closely built old timber framed buildings & commercial activities
- **48% of the city lies in cyclone prone area. About 1 lakh people live in these areas.**

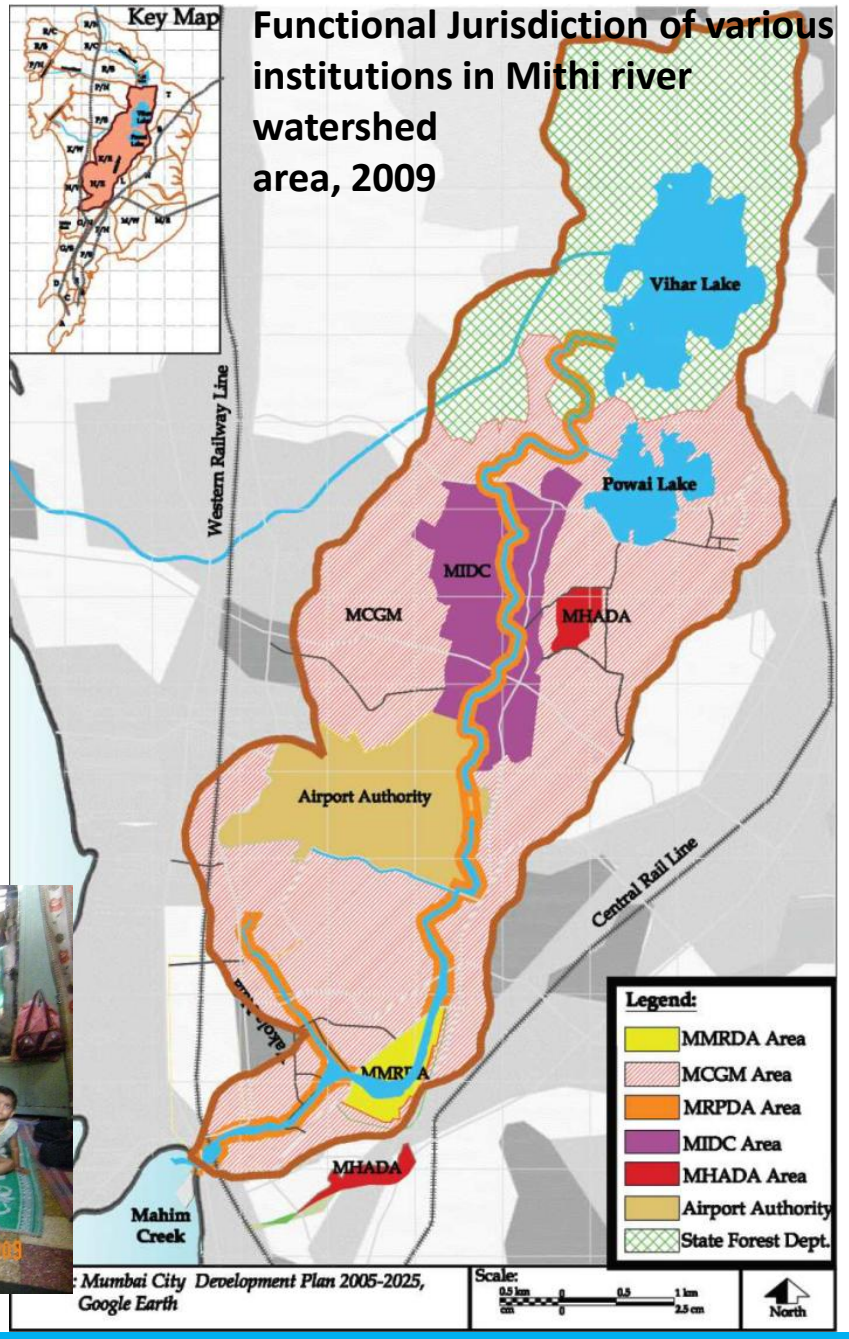
INSTITUTIONAL MANAGEMENT

Equal budget allocation for each ward for disaster management

- Equal budget allocation have been made to each ward for disaster management without consideration of share of vulnerable population.

Socio-economic aspects not give any importance

- The surveys for disaster mitigation include only technical aspects; Social and economic aspects are not included.



Physical Development and Landuse

- Reclamation- Reclaimation of wetlands for Planned developments
- Deterioration of Mangrooves- Deterioration of mangrooves is a resultant of reclaimation of wetlands.
- Decrease in carrying capacity - Decrease in the carrying capacity of the river due to re calimation of wetlands and encroachments on river bed.
- Lack of Green areas- Lack of green areas in the catchment area incease flood risk
- Detrimental Landuses- Landuse in the catchment area like mixed use and airport (measuring upto 21% with mix of residential and hazardeous industries) increases risk to industrial accidents and health hazard due to discharge of untreated sewage in the river.

Risk and Vulnerability

- Density of population (40% of the population vulnerable to disaster risks) living in High risk area

High BOD

- Concentrations than permissible limits(measuring upto 76% of 32 outfall drains) from the slums due to discharge of raw sewage

Solid waste Management

- Dumping of solid waste directly into the river causes severe choking and disrupts the flow of the river

High COD

Environment & pollution

- Higher COD than permissible limits (measuring 59% of 32 outfall drains) from slums show due to discharge of effluents from household industries like dying, chuna making, leather processing etc. in slums.

Capacity and Capability

Multiplicity of Agencies

- Involvement of Multiple agencies for carrying out same functions and lack of co-ordination for diverse functions

Lack of Community Participation

- Lack of community participation in managing disaster risks.

Low level of awareness

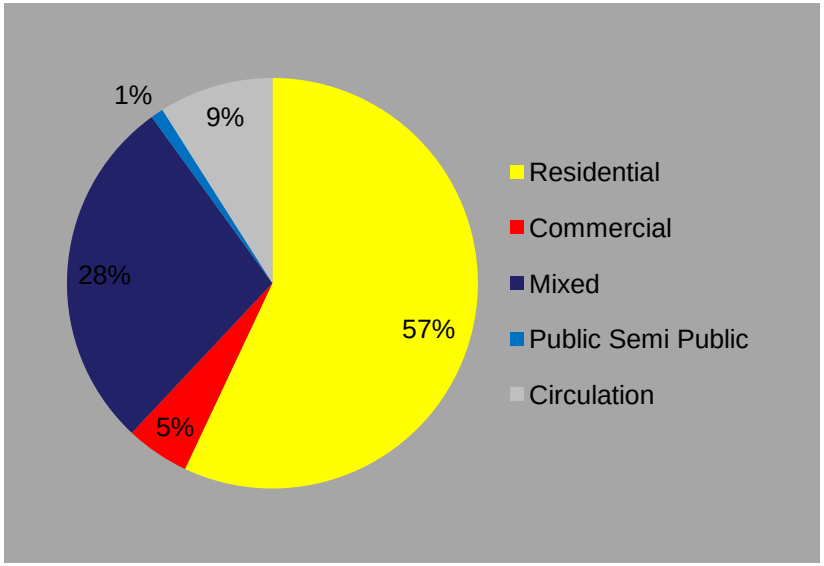
- Low level of awareness of impacts of River ecology and environmental hazards.

Budget Allocation

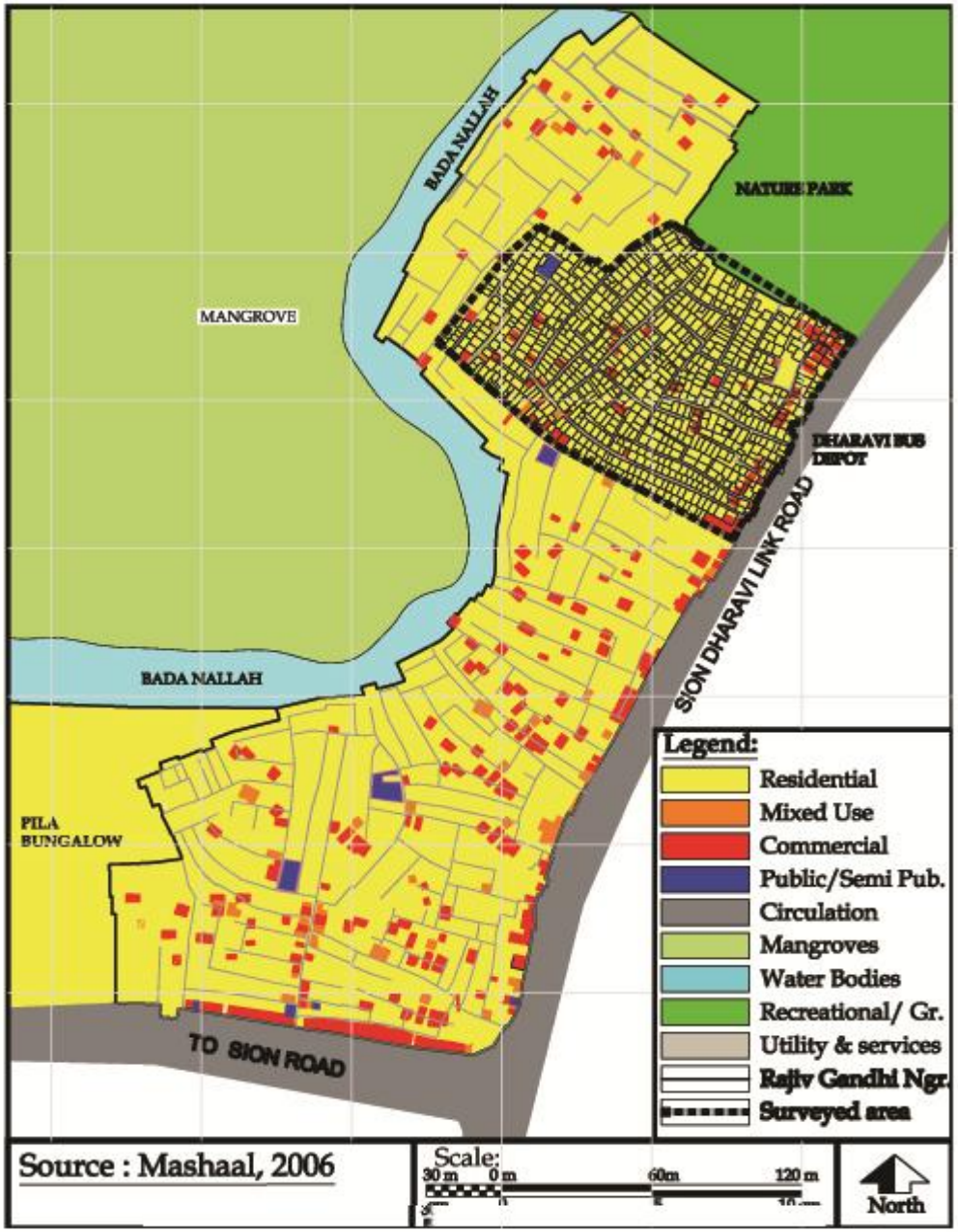
- Equal budget allocation have been made to each ward for disaster management without consideration of share of vulnerable population.

AREA PROFILE : Rajiv Gandhi Nagar

Area	**4.1 ha**
ward	**G-N**
Total population	**16000**
Population (1 Ha)	**4062**
Surveyed area	**1 ha**
Plot Size	**9 sq.m**
Land ownership	**Public land**
Land value(in Rs.)	**3500-6000 per sq. feet**
Rental Value (in Rs.)	**1,200-1,800 per unit**

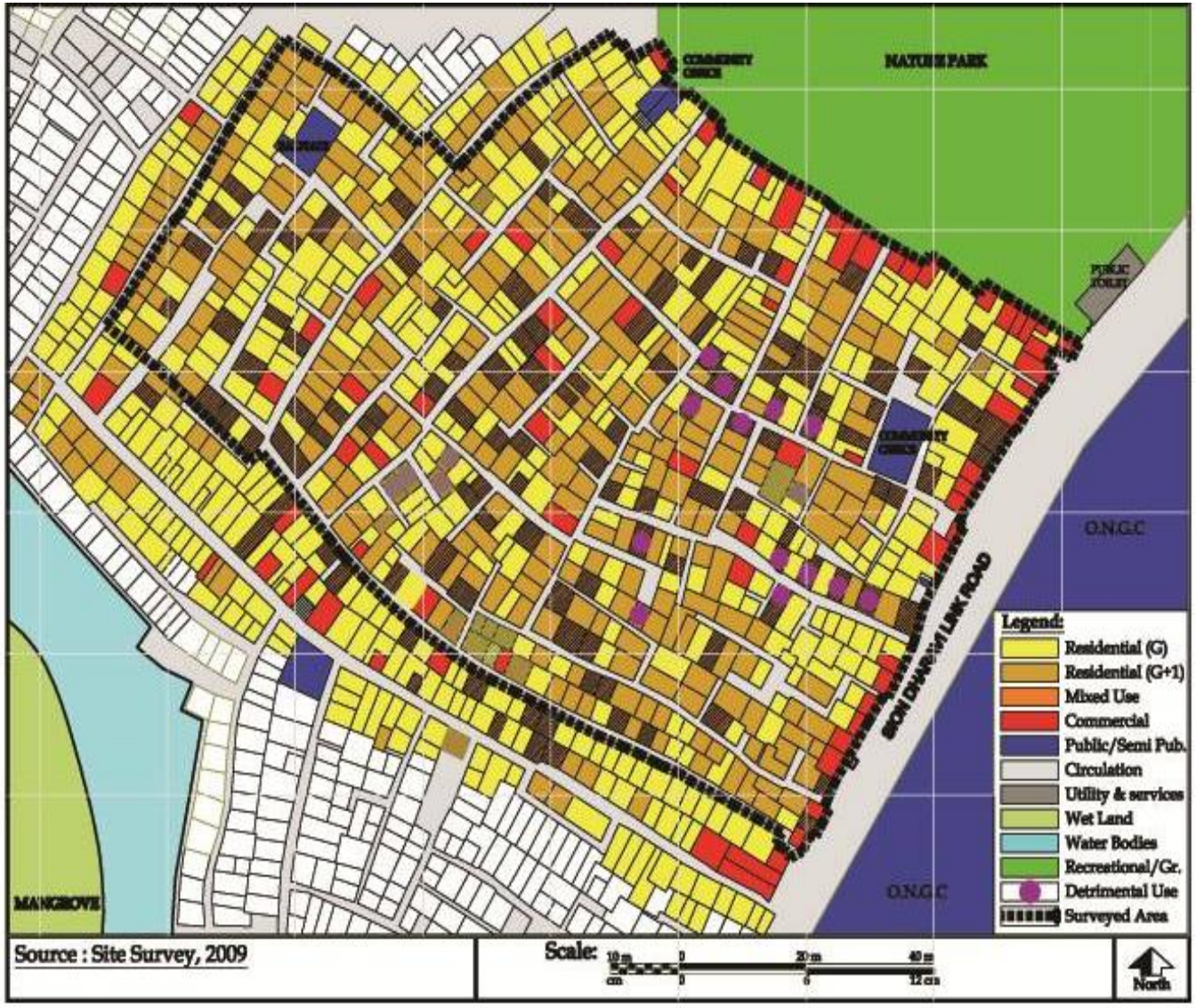


LAND USE DISTRIBUTION



LAND USE – RAJIV GANDHI NGR.

LAND USE (Surveyed Area) :



INFERENCES :

- High density (4062 pph)
- Narrow Access routes (1.2 - 2mts), Evacuation becomes difficult.
- Building materials used are not structurally sound (kuchcha) - vulnerable to collapse.

Narrow access ways

DISASTER PREPAREDNESS : RAJIV GANDHI NAGAR

Indigenous Techniques :

- As a preventive measure, people of Rajiv Gandhi Nagar have raised their plinths or constructed 1st floors or lofts in case the ground floor submerges in flood.

Evacuation :

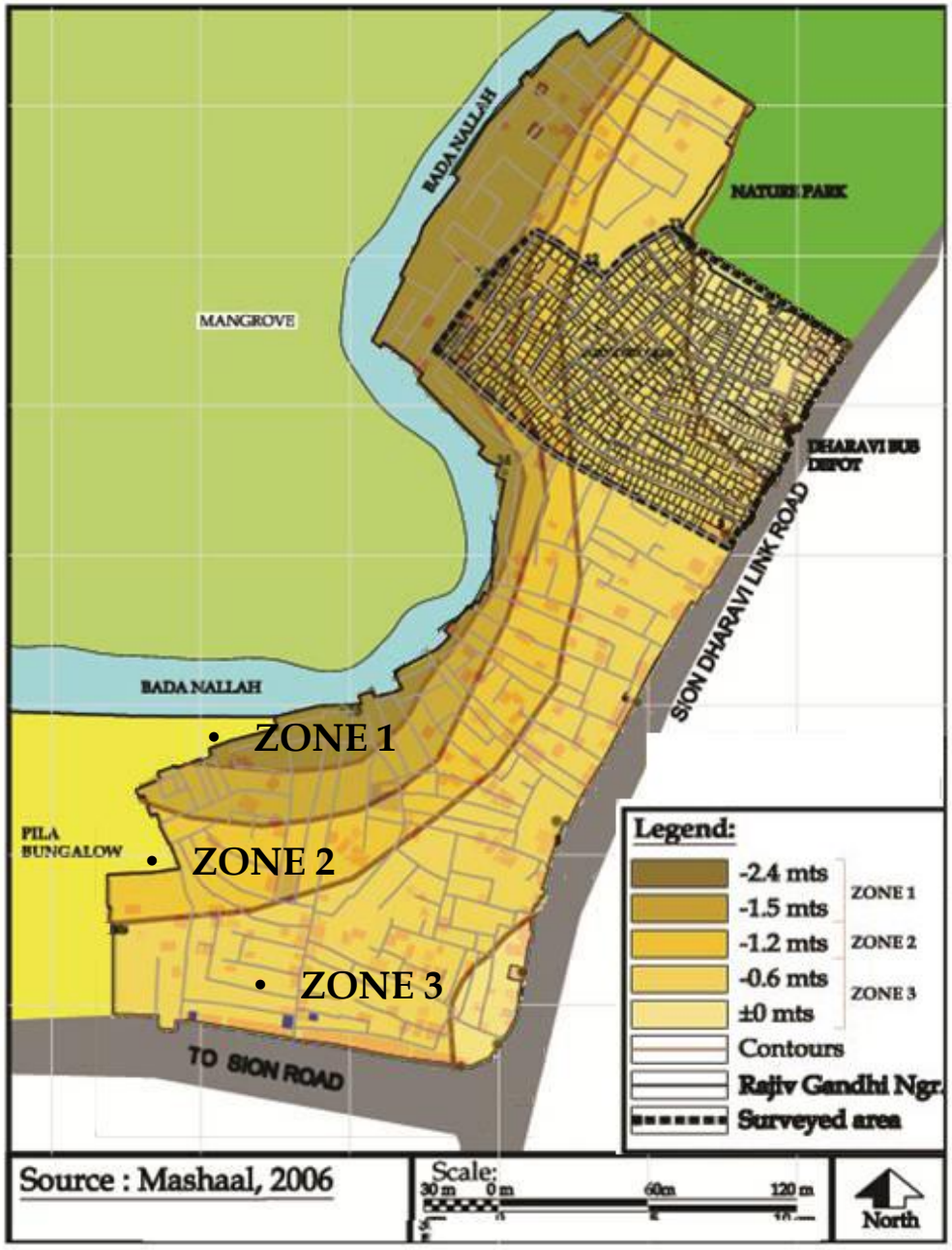
- In case of a flood, people escape towards the main road or the nature park that is located at a higher level, however, access routes tend to get submerged
- The public buildings that could have been used as refuge places are unsafe, as they are located in the low lying areas.

Health Facilities :

- There are a few clinics or health centers in Rajiv Gandhi Nagar. However these do not have qualified doctors.
- The pharmacies often sell expired medicines.
- These accentuate the problems in a disaster situation.
- There is no way to ensure the presence of medical help DURING the crisis.

Status of water supply and drainage

Status of water supply and drainage



RISKS PERTAINING TO R. G. NGR.

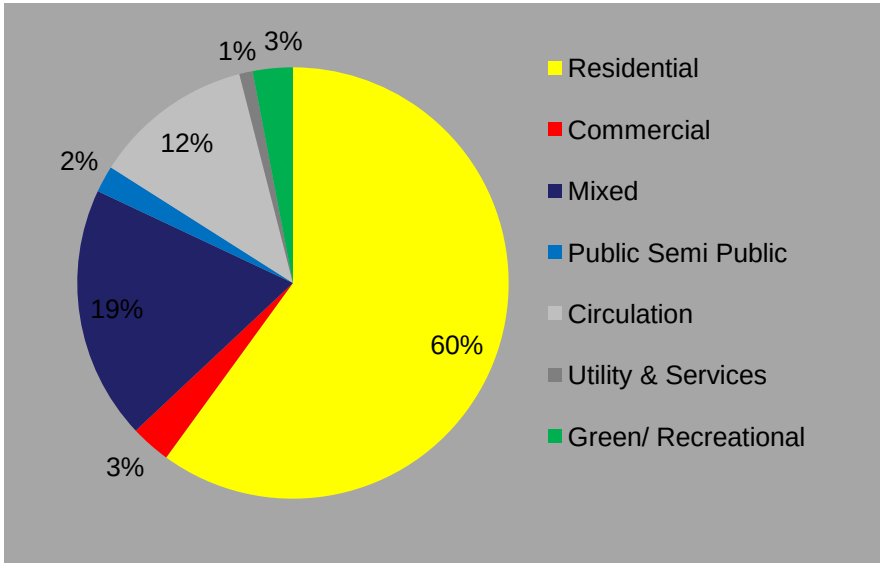
- Areas near the Bada Nallah being at a lower elevation are more prone to floods.
- Limited access for the people to evacuate from the area and for ambulances or fire tenders.
- Flood risks are high due to choking of the open drains.
- High hutment density.
- Use of highly combustible and structurally weak construction material.

- **ZONE 1 - High risk zone**
- **ZONE 2 - Moderate risk zone**
- **ZONE 3 - Low risk zone**

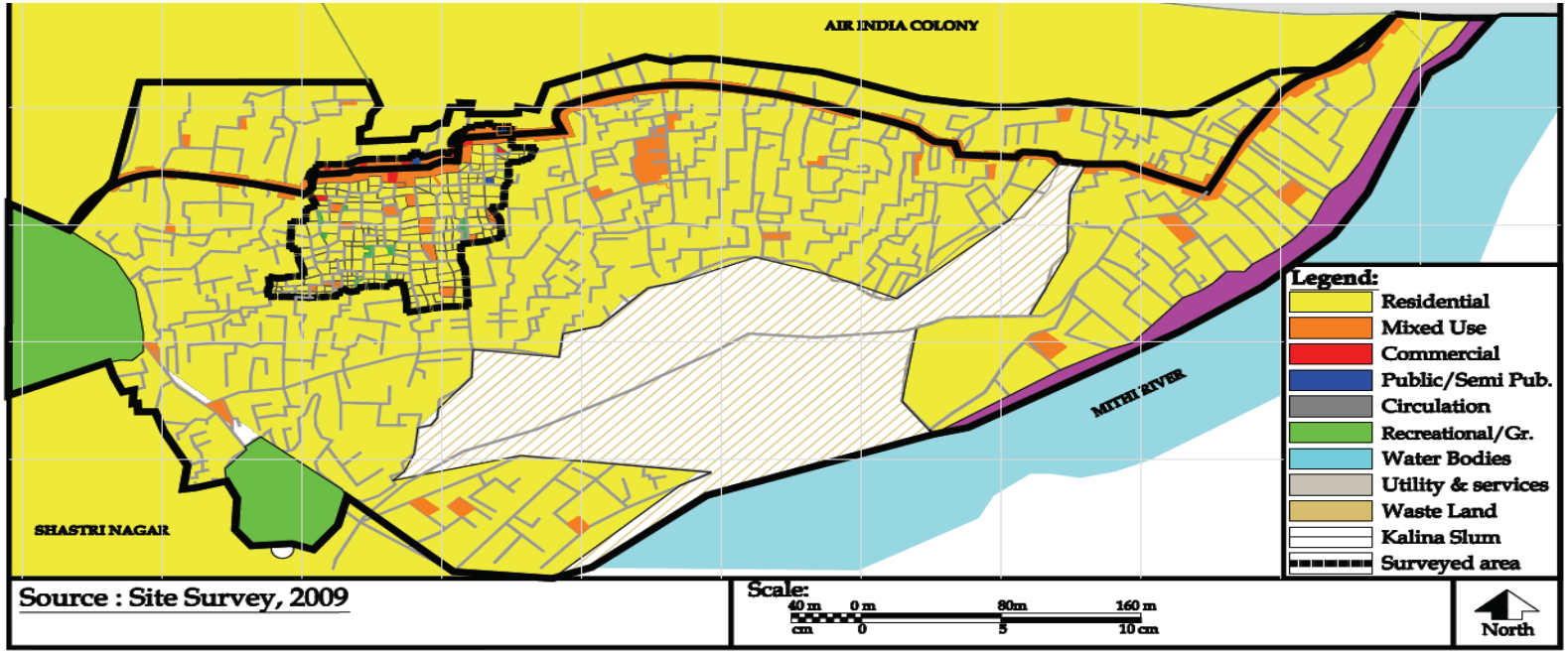
AREA PROFILE : KALINA

Area	**13 ha**
ward	**H-E**
Total population	**17000**
Population (1 Ha)	**1325**
Surveyed area	**1ha**
Plot Size	**25 sq.m**
Land ownership	**Public land (Collector's land, Air India land)**
Land value(in Rs.)	**6000- 9000 per sq feet**
Rental Value (in Rs.)	**3,000-5,000 unit**

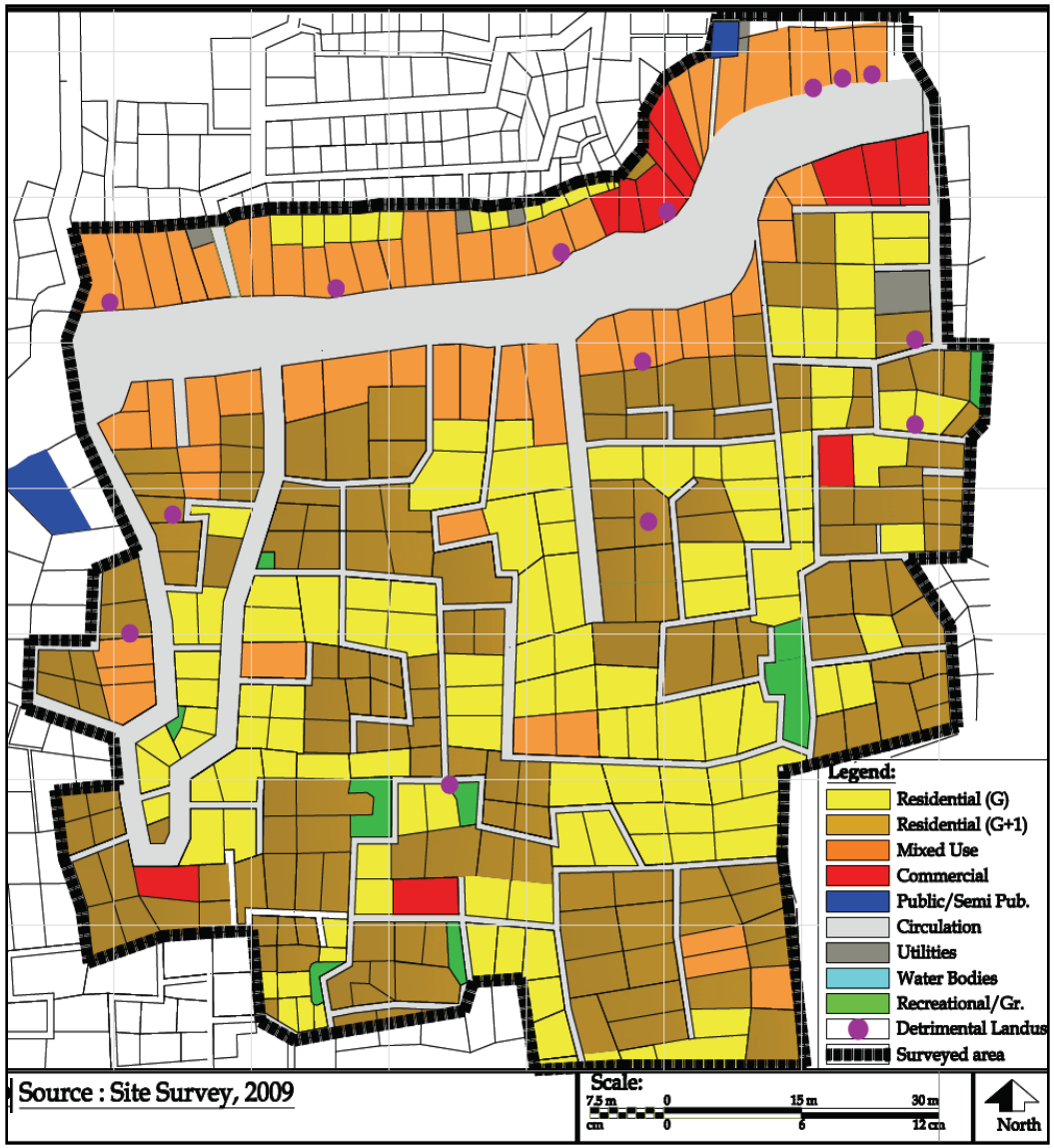
LAND USE DISTRIBUTION



LAND USE – KALINA



LAND USE (Surveyed Area) :



INFERENCES:

- Land use of Kalina is predominantly residential and mixed use.
- There are a number of polluting units & scrap dealers.
- The major spine (10 mts. Wide) caters to slums.
- The slum area is vulnerable as the buildings lack structural stability.

DISASTER PREPAREDNESS : KALINA

Indigenous techniques :

•As a preventive measure, people of Kalina have constructed 1st floors or lofts in case the ground floor submerges in flood.

Evacuation :

•The slum dwellers in case of a flood run towards the church road or the areas that are located at a higher level.

•Church and the SHED office can be used as a safe refuge places at the time of disasters.

•People have constructed upper floors for refuge at the time of floods.

Health Facilities :

•1 dispensary was present in the vicinity, however, the nearest hospital is around 3 kms away.

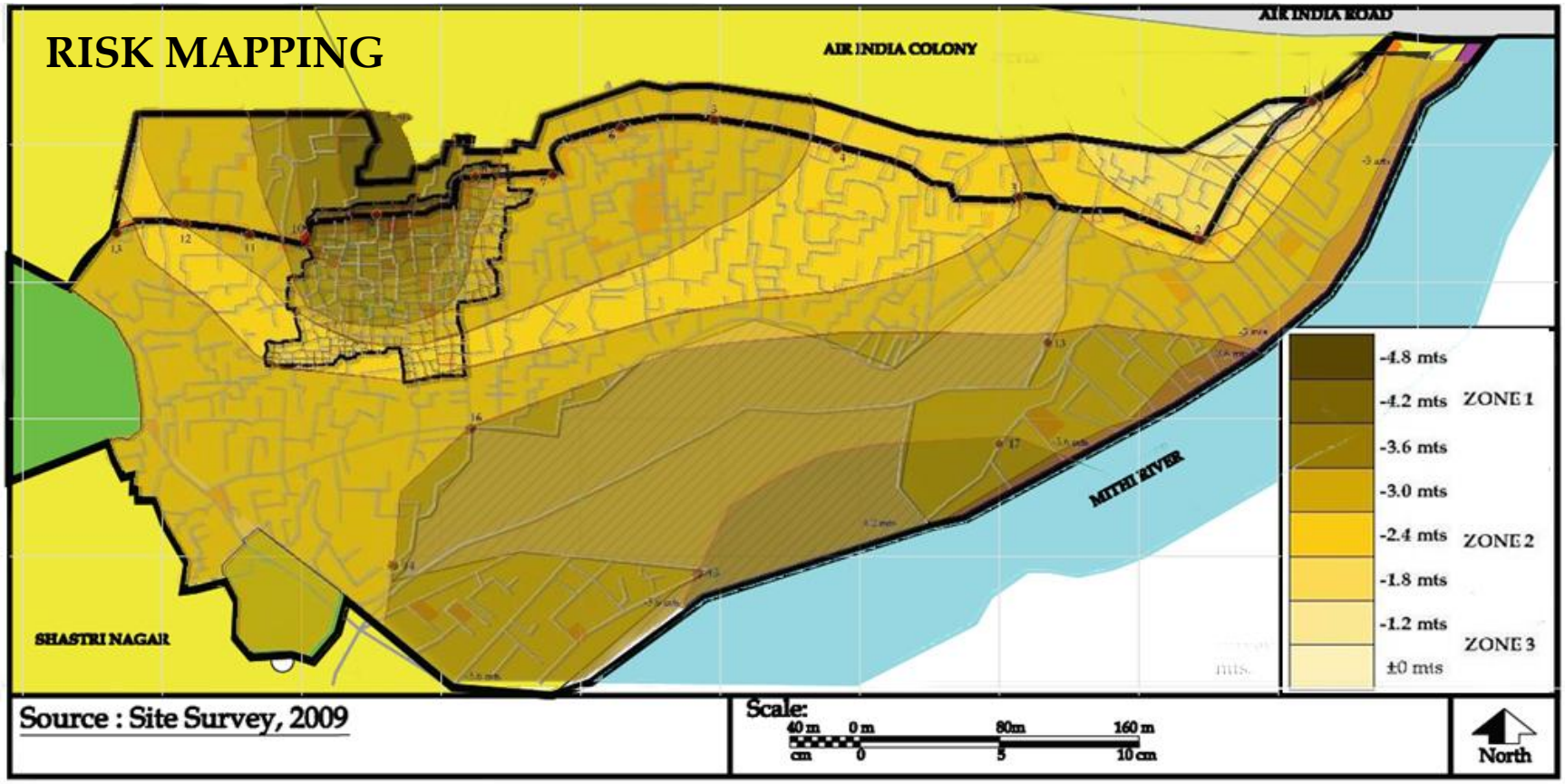
Illegal water connections

Condition of Sewage

Power theft

Solid waste in Kalina

RISK MAPPING



RISKS PERTAINING TO KALINA :

- Area is saucer shaped, which leads to accumulation of water at the low lying areas.
- The end-points of the major spine being at higher elevation acts as safe places during the floods.
- Risk of fire is contained in the pockets mainly located along the main road and along the river.

- **ZONE 1 - High risk zone**
- **ZONE 2 - Moderate risk zone**
- **ZONE 3 - Low risk zone**

INFERENCES :

•Slum Dwellers (residents0 are not fully aware of the risk potential of the place.

• People Value their assets and possession of house more than their lives, as 95% of them don't want to leave the place, knowing well that they are residing in highly vulnerable area. Besides other alternatives are not available.

• Lack of trust on government and NGOs as they are seen to be politically biased.

• People are highly Individualistic but are united during disasters.

• Lack of Coordination between NGOs , Government and people.

•People realise the need of coordinated actions.

•A lot more needs to be done.

RELATIONSHIP BETWEEN GOVERNMENT, NGO'S & PEOPLE