Mumbai after 26/7 Deluge: Some Issues and Concerns in Regional Planning

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Abstract

The complex processes of urbanization along with the rapid expansion of urban population have changed the traits of natural hazards and cities have now become 'crucibles of risk'. Sometimes, even the location of cities place them at greater risk from climate hazards such as cyclones, flooding, etc. These events underscore the vulnerability to natural hazards faced by the urban people, in general, and the poor, in particular, especially those living in sub-standard housing in the most vulnerable locations. Among the recent incidents of such kind, the incessant and torrential rains in the afternoon of July 26, 2005, not only caused deluge in Mumbai, but wrought equal havoc on the weak and the powerful. Why did Mumbai, the commercial capital of India, could not avert such an environmental disaster? In this paper, an attempt has been made to examine the role of various factors, which either in isolation or in conjugation with other factors might have made the circumstances more vulnerable for this urban deluge. Coupled with this, the paper discusses the need for a planning document which is prepared in the context of demographic dynamics and its significance to city planners and managers.

Introduction

Cities, being centres of population concentration and growth, serve as engines of economic development and innovation for the global economy and also places of refuge at times of crises such as drought or flood in the countryside. The foundations of prosperity and prominence for most cities lie in their long-standing commercial relationships with the rest of the world (Sherbinin *et al* 2007). But the rapid expansion of urban population and worsening economic inequality has shifted the balance of disaster risk from rural to urban areas. The process of urbanization has changed the traits of disaster risk and cities have now become 'crucibles of risk' (Pelling 2003). Urban people not only have to survive in a money economy, which may be more socially isolated than in rural communities, but have to contend everyday with many economic, social and as well as environmental hazards. There are complicated and concentrated interdependencies between infrastructure, transport networks and peoples' lives which mean that even small events of hazards can have unforeseen effects in the cities. Many a times, even their

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location on or near the coast, in low-lying areas, near the mouths of major rivers place cities at greater risk from current and projected climate hazards such as cyclones, high winds, flooding, coastal erosion and deposition, and sea-level rise (Nicholls 1995). According to Brockerhoff (2000), less than two percent of the global population resided in "megacities" of 10 million or more inhabitants about 25 years ago. Today the proportion exceeds four percent, and by 2015 it will top 50 percent, when megacities are likely to house 400 million people. The fact that so many people reside in megacities near coastlines, and that these cities continue to grow, underscores the importance of assessing the vulnerability of such cities to various natural hazards. Recent incidents have highlighted the vulnerability of cities, in particular, to climate hazards and different environmental shocks. Hurricane Katrina in August 2005 effectively obliterated much of the Gulf Coast of Mississippi and flooded large portions of New Orleans, resulting in the evacuation of all residents and more than 1000 deaths. The flooding was greatest in African-American neighbourhoods, and in the aftermath there were widespread accusations that the slow and ineffectual government response reflected a racial bias (SEDAC 2005). In July 2005, Mumbai, India, was struck by a cyclone that dumped 94 cm of rain in less than 24 hours, also leaving more than 1000 people dead, mostly in slum settlements. In terms of casualties, an even more devastating set of flash floods and landslides in Caracas and the north coast of Venezuela in December 1999 killed 30,000 people and affected another 4,83,000 (CRED 2006).

According to a report of the World Bank, about 3.4 billion people, i.e., more than half of the world's population live in areas where at least one hazard could significantly impact them (Dilley *et al* 2005). Other key findings of this report are a direct assessment of the degree of vulnerability to natural hazards faced by the countries at large.

- Approximately 20 percent of the Earth's land surface is exposed to at least one of the natural hazards evaluated;
- 160 countries have more than one quarter of their population in areas of high mortality risk from one or more hazards;
- More than 90 countries have more than 10 percent of their population in areas of high mortality risk from two or more hazards;
- In 35 countries, more than one in 20 residents lives at relatively high mortality risk from three or more hazards;

- More than one-third of the population of United States live in hazard-prone areas, but only one percent of its land area ranks in the highest disaster-related mortality risk category;
- Taiwan may be the place on Earth most vulnerable to natural hazards, with 73 percent of its land and population exposed to three or more hazards;
- More than 90 percent of the population of Bangladesh, Nepal, Dominican Republic, Burundi, Haiti, Taiwan, Malawi, El Salvador, and Honduras live in areas at high relative risk of death from two or more hazards; and
- Poorer countries in the developing world are more likely to have difficulty absorbing repeated disaster-related losses and costs associated with disaster relief, recovery, rehabilitation and reconstruction.

Each of these findings underscores the vulnerability to natural hazards faced by the people, in general, and the poor, in particular, especially those living in sub-standard housing in the most vulnerable locations.

Vulnerability is defined as the susceptibility to stresses or hazards, and the capacity (or lack, thereof) to prepare, cope and recover from such hazards. Human vulnerability, in particular, is a condition resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard. Human vulnerability includes the vulnerability of social and economic systems, health status, physical infrastructure and environmental assets (Mitchell 1999). It is the concept that explains why a community is more or less at risk to a given hazard. However, neither vulnerability alone nor hazard alone determines the occurrence of a disaster. A hazard, by itself, is simply a potentially damaging event or physical disturbance and it is the combination of hazard and vulnerability that disaster occurs. Researchers at the Centre for Research on the Epidemiology of Disasters (CRED) in Brussels, records upwards of 600 disasters globally each year, with the time trends for climate-related disasters, including floods, windstorms and droughts, showing the greatest increase, well above all geological hazards (CRED 2005). Disaster frequency appears to be increasing and represent a major source of risk for the poor and threatens to wipe out development gains and accumulated wealth in developing countries. There are two factors behind this rise in climate-related disasters. One is regional increases in the severity and periodicity of hazard events (Easterling *et al* 2000). The second factor is the large and growing

proportion of the world's population living in cities and towns near the coast or low-lying areas, and which consequently is exposed to these hazards (Sherbinin *et al* 2007). Research by McGranahan *et al* 2006 found that more than 600 million people (or 10 percent of the global population) reside in coastal zones of less than 10 metres elevation, and that 13 percent of them, or 77 million people, reside in megacities. This combination of increased hazards and exposure results in greater number of disasters that claim lives and cause major economic losses.

Disaster losses are caused by interactions between hazard events and the characteristics of exposed elements that make them susceptible to damage. A hazard's destructive potential is a function of the magnitude, duration, location and timing of the event (Burton *et al* 1993). To be damaged, however, elements exposed to a given type of hazard must also be vulnerable to that hazard; i.e., the elements must have intrinsic characteristics, or vulnerabilities, that allow them to be damaged or destroyed (UNDRO 1979). For a given hazard, vulnerability will vary across a set of similar elements and from one element to the next. Valuable but vulnerable include people, infrastructure and economically or environmentally important land uses. The destructive power of natural hazards, combined with vulnerabilities across a spectrum of exposed elements, can lead to large-scale co-variate losses during hazard events in areas where population and economic investment are concentrated (Dilley *et al* 2005). Aggregate losses start with losses to individual elements, reaching a point in disaster situations where economic or social systems partly or completely break down. Urban infrastructure, for example, consists of multiple sectors – transport, power, water and sanitation, housing, and communication – each of which, in turn, may encompass many separate systems, subsystems and so on, down to the level of individual components. When a complex entity like an urban area is subjected to a sudden flooding, widespread failures of vulnerable components can cause total or partial system failure, resulting in a disaster. Given the number of systems, subsystems, and components, each of which responds differently when subjected to a given hazard, it is possible to characterize vulnerability only generally when operating at scales larger than individual installations or facilities.

Urbanization in the Indian Context

India has always been considered a country that lives in its villages. But increasingly, rural India is moving towards towns and cities. The 2001 Census established that almost one-third of India's

population, i.e., an estimated 285 million people live in urban areas. By 2020, half of the country's population is expected to be city-based. In some states, the percentage is much higher than the national average. Of the 285 million urban dwellers in India, over a third – i.e., 108 million – live in 35 million-plus cities. States like Tamil Nadu and Maharashtra have 43.86 and 42.40 percent respectively of their population living in cities and towns. In actual numbers, Maharashtra, India's most urbanized state has an urban population base of 41 million. It is in these million-plus cities that the real urban crisis is being felt. Coupled with this, every city is marked by the informal settlements where the poor are forced to live without access to basic services like water and sanitation. City administrations are unable to check the flow of poor people into the city and have failed to provide them affordable housing. As a result, in some cities like Mumbai, for instance, half of the population (49 percent according to Census 2001) lives in slums. During any climatic hazards like flooding, the most vulnerable are the residents of these squatter settlements, many of which are located in low-lying areas.

The year 2005 was a crude reminder to urban planners of the crisis that urban India faces. Within a span of few months, three major metros in the country – Mumbai, Bangalore and Chennai were laid low by unexpectedly heavy rains. The worst hit was India's commercial capital, Mumbai, where after a downpour of 944 mm in 18 hours on July 26, 2005, the city came to a complete standstill for the next 48 hours. A common thread runs through the crisis that immobilized all these cities. It illustrates the crisis of urban planning in India. In every post-flood analysis, the central issue that has emerged is the absence of a long term perspective. Plans are made and implemented without considering their long term impact or their utility. Thus, in all the three cities, flooding was almost uncontrollable not only because of excessive rainfall but because the natural drainage systems had been destroyed or their efficacy minimized. Instead of appreciating and nurturing nature's safeguards against flooding, city planners tend to see open spaces and mangroves as a nuisance. No city can comfort itself in the belief that such crises were particular to these cities; for in the coming years, the same breakdowns could take place in any city across India because the perspective of urban development that is used is the same. It is a short-term view designed for instant gains instead of a long-term perspective based on a vision of how the cities should grow.

The Deluge of Mumbai on 26/7

One of the grim lessons that Mumbaikers learned from the deluge of July 26 2005, is that the city has lost sight of its ecological base. The incident was not only a horrifying memory for every Mumbaiker but has disillusioned the common people from their city known as '*Aamchi Mumbai*' (our Mumbai) and has also shattered the elite's imagination of Mumbai turning into Shanghai in the near future. The deluge brought a new perception about the city and kicked 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 downpour that laid low India's largest metropolis? Or was the crisis that Mumbai faced on July 26, the consequence of decades of poor planning and lack of vision? These are questions that are being asked by citizens not just of Mumbai but also of every major city in an increasingly urbanized India. In case of Mumbai, the many arguments put forth are unplanned development of the city, reclamation of low lying areas, negligence on the part of Brihanmumbai Municipal Corporation (BMC) in cleaning sewers and drainages, builders' lobby encroaching the areas of hills and mangroves, irresponsible city dwellers' disregard for their streets, lanes and sewers, violation of coastal regulation zone (CRZ) rules, choking up of the Mithi River providing natural drainage to the city, lack of disaster preparedness, too many people migrating into the city, the presence of multiple administrative and development agencies like BMC, Mahanagar Telephone Nigam Limited (MTNL), Mumbai Metropolitan Region Development Authority (MMRDA), Maharasthra Housing and Area Development Authority (MHADA) etc., with no clear co-ordination among them.

An inquiry into the handling of the 26/7 floods, conducted by the National Institute of Disaster Management (NIDM) at the request of the Union Home Ministry has revealed the negligence and gross lack of awareness on part of the authorities supposed to manage disasters under the detailed plan prepared for the city. This report has blamed the absence of a sustainable model of urban planning, where the planning processes have been replaced by short-term opportunistic decisions that destroy natural environmental safeguards and neglect the needs of the majority of city dwellers. Thus, the haphazard growth, unprecedented rains, and the failure of the early warning system, together created this situation. The inquiry has also revealed several shortcomings. First, the officers and agencies meant to take charge were themselves hit. The plan

had not taken this possibility into account. This was further aggravated by poor damage assessment, hence, inadequate response. Then, there was no functioning communication system, even among agencies (Sinha 2005). In this paper an attempt has been made to examine the role of various factors (natural, human and administrative), which either in isolation or in conjugation with other factors might have made the circumstances more vulnerable for this urban deluge. Coupled with this, the paper discusses the need for a planning document which is prepared in the context of demographic dynamics and its importance to city planners and managers.

Natural Cause: Rain

The unprecedented rain on 26/7 was the result of an 'offshore vortex'- a heavy downpour but extremely localized, spread over as little as 30 km^2. Forecasting of such meteorological phenomenon is not possible without Doppler Radars that the State Metrological Department is yet to procure (Kanate 2005a, b). Experts opined that the phenomenon was unusual for Mumbai where cloud column reached as high as 15 km that day, crossing the usual column height of 6-7 km. The dangerous offshore-vortex was formed when moisture laden strong wind came in from the Arabian Sea but ran into an obstacle in the form of the Western Ghats. Unable to cross over directly it began flowing in a channel from the side, slightly northward of the Western Ghats, leading to the formation of a wedge. This wind trough became a vortex when the winds took a 360 degree turn. The low-pressure area over the central Madhya Pradesh had made the vortex deadlier. Though the amount of rain was similar to a cloudburst, but it was different as the vortex was constantly fed with moisture from the Arabian Sea, which made it more lethal and prolonged. In a cloudburst, it is the collected moisture that results in heavy rain. But here the vortex was so localized like a cyclone that only the north Mumbai and its suburbs bore the brunt (Jain 2005).

Table 1: Average annual rainfall in Mumbai

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mm	0	1	0	0	20	647	946	660	309	117	7	1
in	0	0	0	0	0.8	25.5	37.2	26	12.2	4.6	0.3	0

Source: Adopted from Ref. Ghosh (2005).

The abnormally high rainfall on 26/7 is very much evident from Table 1, which portrays the average annual rainfall in the city. While the whole month of July usually receives 946 mm rain, the city experienced more than 946 mm rain on the day of 26/7, which has given Mumbai a distinction. The city is now ranked at par with Cherrapunji and Mawsynram in the Top-10 list of places registering the highest rainfall on a single day, since 1876 (Table 2). Among these, seven spots are hilly stations, whereas, three are located in the plains. Mumbai comes second among the regions in the plains to have received the highest rainfall on a single day while Dharampur, in Gujarat, stands first.

Table 2: Top-10 places registering highest rainfall in a single day since 1876

No	Station	State	Altitude (mt)	Rainfall (cm)	Date
1	Cherrapunji	Meghalaya	1313	103.6	14 June 1876
2	Jowai	Meghalaya	1390	101.9	11 Sept 1877
3	Cherrapunji	Meghalaya	1313	99.8	12 July 1910
4	Mawsynram	Meghalaya	1401	99.0	10 July 1952
5	Dharampur	Gujarat	38	98.7	02 July 1941
6	Cherrapunji	Meghalaya	1313	98.5	13 Sept 1974
7	Cherrapunji	Meghalaya	1313	97.4	21 June 1934
8	Cherrapunji	Meghalaya	1313	97.0	12 Sept 1974
9	**Mumbai**	**Maharashtra**	**14**	**94.4**	**26 July 2005**
10	Hashimara	West Bengal	115	92.8	21 July 1993

Source: Adopted from Ref. Ghosh (2005).

Climatic conditions in the region like the directions of winds flowing in the Arabian Sea have also undergone a severe change over the last century. During the first three decades of the 20th century, the average maximum rainfall recorded in a day in Mumbai was 30 cm, which went up to 50 cm by 1970. Thereafter, Mumbai has been recording – albeit, erratically – ever more rain in a single day as is apparent in the report of the Indian Institute of Tropical Meteorology (IITM), Pune from 1876 onwards. Experts also opine that 26 July 2005 is not the only threat faced by the city, which is in the midst of a changing weather system but can, at any time, be accompanied by killer winds and towering tides. Therefore, the need of the hour, according to the IITM, is to create an exclusive and efficient system of disaster forecasting and management

for Mumbai (Kanate 2005a, b). This includes installing of a Doppler Radar to monitor cyclones and cyclone-like conditions. The High Court has ordered that the Doppler Radar may be installed at a suitable place (Ghosh 2005).

Human Cause

Environmentalists often talk about "ecological illiteracy" and this fairly describes the myopia of planners when it comes to laying down regulations governing the growth of Mumbai. To begin with, reclamation itself is fraught with problems. South Mumbai, which is where the 'Fort' and central business district are located, was reclaimed from seven islands during the eighteenth century. Further north, crossing the causeway which links the island city to Greater Mumbai, nature had fashioned the topography. The protruding rocky promontory at Bandra used to guard the Mahim Bay from the onslaught of southwest monsoon. The Mithi river, which used to empty out in this bay, was the natural drain for the hinterland. Further inland, the Sanjay Gandhi National Park in Borivli acted as a natural sponge. Mumbai was and is still unique among any megacity in the world in possessing a 104-sq.km sanctuary, almost a quarter of the city, in its heartland (D'Monte 2006).

But the present land-use of the city shows that the concrete city has pushed nature to the margins. There has been a marked increase in the built up area, which has mainly expanded along transport corridors with improved connectivity. Simultaneous with increased concretization has been the drastic reduction in the green zones and open spaces, which are effective carbon sinks and dust filters helping to keep down pollution levels (Srivastava and Mukherjee 2005, p. 3906). Athough the central forested area has helped to preserve some of the forest cover within the city, yet opening up of large area for construction has led to the peripheral areas becoming degraded into scrublands. Several hills are non-existent today, whereas, bare rocky outcrops are becoming prominent. Even mangroves, which act as the city's sponges and support an impressive ecosystem, have shrunk from 235 km^2 in 1924 to 160 km^2 in 1994 around Mumbai and Navi Mumbai. An additional 1000 hectares are estimated to have been destroyed by the year 2000 and much of them in violation of the CRZ rules (Sekhar 2005). Wetland and forest that used to cover 28 and 60 percent respectively of the total land use of Mumbai in 1924 has come down to 18 and 30 percent in 1994. During the last 60 years period from 1924 to 1994, the

built up areas of the city has increased fourfold from 12 to 52 percent (Sekhar 2005). As a result, six drainage basins in Mumbai are gradually chocking due to construction of roads, buildings, and encroachment of slum areas, as evident from Table 3. Basin 4, 5 and 6, covering the vicinity of Jogeshwari to Kandivali and the region around Mithi river were worst hit during the 26/7 downpour.

Table 3: Major Drainage Basins in Mumbai Metropolis

No. of basins	Flowing into	Area (Km^2)	Built up (%)
1.	Vasai creek	8.98	43
2.	Vasai creek	27.20	10
3.	Manori creek	37.44	8
4.	Malad creek	16.56	49
5.	Malad creek	24.21	50
6.	Mahim creek	42.07	54

Source: From Ref. Sekhar (2005)

Mithi river, a 14 km long channel that flows from Tulsi-Vihar-Powai lakes through Kalina-Kurla to Mahim creek (Fig. 1) and which, once upon a time, acted as a storm water outlet of the city has turned into one of the dirtiest drainage filled with mud, sludge, etc. In 1994, the National Environmental Engineering Research Institute (NEERI) and the Indian Institute of Oceanography submitted a joint report on the improvement of the river and warned about the ineffectiveness of the river as a rainwater outlet due to severe pollution. The water of the Mithi river is so polluted due to constant disposal of industrial and hazardous waste as well as garbage and raw sewage that it is a threat to marine life. It has turned into one-third of its size due to reclamation of Bandra-Kurla Complex. Moreover, a large mangrove patch that provided a natural barrier against flooding was illegally reclaimed in between the river and the complex. The damage, human loss and transport disruptions that the city faced due to the heavy rain on July 26 would have been much less, if steps were taken in time to rejuvenate the river. The Dahisar river, another natural drainage of Mumbai is no better. The river is a hutments huddling gutter near the National Park area. In fact none of these rivers have the capacity to carry natural rainwater flows, but have instead turned into nallahs, garbage dumps and gutter ditches over the decades due to built up areas encroaching them on all sides.

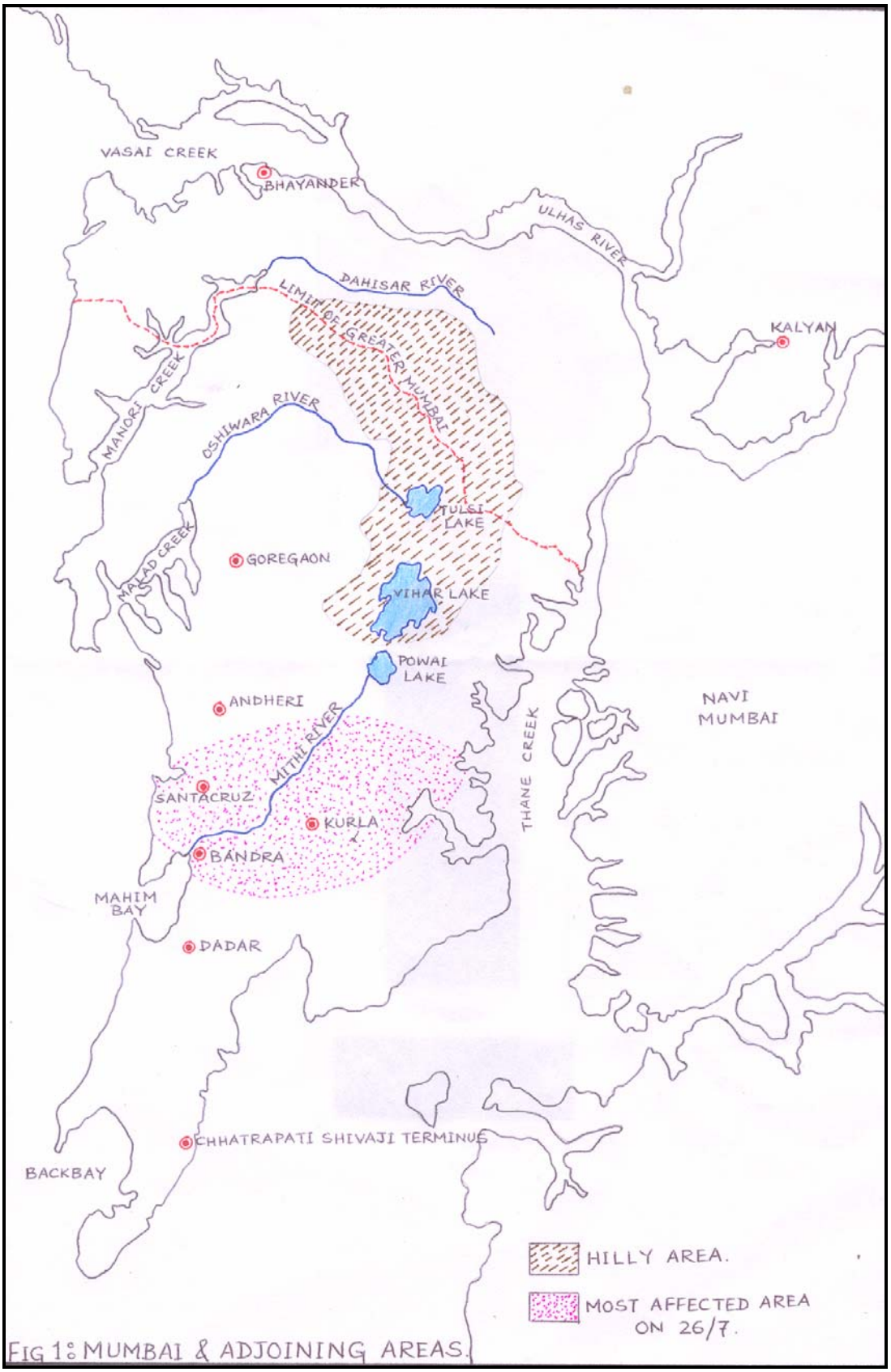


FIG 1: MUMBAI & ADJOINING AREAS.

The real crux of the poor drainage system in Mumbai is that unlike the city proper, the suburban Mumbai has not yet developed a sound network of underground drainage system. The open gutters serve as outlets for both the sewage and storm water flows. All these gutters ultimately pour water into the Mahim Creek just below the mouth of Mithi river, creating a cesspool of stinking filthy water that drains off very slowly into the sea. The attempt to create a deep tunnel for the sewage discharge in the Mahim Bay to be taken 10 km deep into the sea is half done as the tunnel collapsed while in construction. With the complete infrastructure failure during the floods of July 26 2005, it has been realized that the future lies in eco-friendly architecture, energy-sensitive and climate-sensitive structures that consume little energy.

Garbage problem

Urban waste constitutes another major problem with which Mumbai appears unable to cope. Though Mumbai is phenomenally productive when it comes to garbage; it has only three landfills - at Gorai, Deonar and Mulund. These collectively receive 8000 ton. of garbage daily. The city is divided into six zones and 24 wards. Of these, only seven wards carry out segregation of wet and dry garbage. With the average life of a dumping ground being 30 years, Deonar, the largest dumping ground, has only 5-6 years left, and so far, no alternative site has been found for waste disposal. In some parts of the city, a citizen's initiative, in partnership with, the BMC has launched a vigorous drive to encourage Advanced Locality Management (ALM), for local management of solid waste by collecting and recycling the organic waste, while giving the non-biodegradable waste to rag pickers. Presently, there are 783 ALMs functioning in the city. But segregation levels of waste are very low, as only two percent of citizens are aware of separating out recyclable waste (Pujari 2005).

Administrative cause

Although on paper all cities have some kind of Development Plan (DP), the actual development follows no particular pattern except that dictated by expediency, patronage and privilege. As a result, every city is the epitome of urban chaos – lacking in adequate water and sanitation, affordable housing, all weather roads, decent transport and clean air. In case of Mumbai, the planning authority, essentially the BMC is supposed to draw up the DP for the city in every decade but unfortunately the existing DP has not been updated for decades. Engineers and

architects basically design all the DPs, as the BMC lacks trained urban planners. However, the MMRDA is full of urban planners, but by law it is not allowed to plan for the municipal limits of Greater Mumbai. So MMRDA plans for the regions adjacent to Mumbai. Authorities, however, appear to work at cross-purposes as there exists no clear delineation of responsibilities. The BMC has squarely blamed the MMRDA for the disastrous flooding of the city on 26/7 and has claimed that the nearly 40 unfinished improvement projects of the MMRDA were responsible for blocking storm water drains on all the roads that saw unprecedented water logging (Sawant 2005). Thus it is necessary to strengthen the planning powers of the BMC and establish a good understanding of the BMC and the MMRDA in urban and urban fringe planning. Under the 74th Amendment of the constitution in early 1990s, a metropolitan planning committee comprising of both state legislators and municipal corporations was supposed to have been set up to plan for the city, though it has not yet happened. As a consequence there exists no dynamic plan for the most populous mega city of India.

As opined by Hamine (2005), the BMC is planning to increase the number of municipal wards from 24 to 30. A few of the existing wards will be split into two or more parts and some will be redesigned. The civic body is in the process of adding 2500 employees at various levels, including clerks, engineers, legal assistants and health assistants. A three-phase action plan to clean up the Mithi river within two years could solve two-thirds of the problems plaguing the river, if implemented without any political pressure. In the 26/7 deluge, encroachments along the river bank had augmented the inundation of large areas of Saki Naka, Kalina, Santa Cruz and Kurla. Although the widening of riverbed to 50 feet at most places may not be possible, the authorities can ensure desilting to increase the depth. Not more than 1200 slums at about eight places along the riverbed will have to be relocated. Since the MMRDA has been involved in construction of the Bandra-Kurla Complex where the flow of the river has been diverted, the agency should now be asked to finance the scheme for protecting the river. The BMC has officially identified 13 chronic flood spots across the city. However, it does not have any data or solution to the problem that leads to water logging in these areas (Hamine 2005).

At the end it should be admitted that the *Mumbaikers* too have the responsibility to make the city cleaner and better instead of only blaming Government bodies whenever something goes

wrong. It is not only the slum dwellers who throw plastic bags; even the elites do the same. The disaster management plans talk of the involvement of ALMs. Forming ALMs is the first step towards good governance as it can bring order in small areas. The solution of any problem is to meet, discuss and resolve issues together instead of blaming one another. Thus, urban hazard and vulnerability are not givens but the product of inadequate access to basic urban services, of economic and political inequality, and of poor governance (Pelling 2003).

Need for a viable urbanization policy for Mumbai

The pace of urbanization especially the rate of growth of metropolitan cities indicates that India needs to frame its population policy very cautiously as also devise a suitable urbanization policy. In case of Mumbai, the recently prepared document called the '*Vision Mumbai'* proposes an investment of $40 billion from both private and government sources and assigns the leading role to the Chief Minister in the mobilization of this massive investment in the next decade (Bombay First-Mckinsey Report 2003). Though the document was intensively debated and attributed to be elitist, yet it continues to be important in shaping the perception and thinking of the state government about the future of Mumbai (Sharma *et al* 2003). It promises to fulfill the aspirations of the powerful sections of the city ignoring the fact that more than half of Mumbai's population lives in slums. In fact, city planning is a political process of restructuring city space causing benefits to some groups, while loss to others. Even as the academicians and social activists are contesting the philosophical moorings of globalization and privatization ideologically and empirically at the national level, the '*Vision Mumbai*' document spurred a debate on the future of Mumbai city. It is argued here that planning for a city like Mumbai for the next 10 years must take into consideration the following aspects, which the Vision document did not take into account.

Defining Mumbai

At the first instance, the geographical entity of Mumbai seems to be non-problematic. But there is a need to understand today what constitutes the global city of Mumbai in order to solve its problem in the larger context and to find a sustainable solution. The '*Vision Mumbai*' document adopts a very narrow definition of city defined by the municipal boundary popularly known as the BMC. Internationally, the definition of city has its roots in the concept of Urban

Agglomeration (UA) (Champion 2004). An UA is defined based on the functional linkages and interdependencies between a main city and its adjacent urban centers. The Census of India, which provides population data on cities and towns, has demarcated the Greater Mumbai UA consisting of BMC, Thane (Municipal Corp.), Kalyan-Dombivili (Municipal Corp.), Ulhasnagar (Municipal Corp.), Mira-Bhayander (Municipal Council) and Navi-Mumbai (Municipal Corp.). One would also like to add Vasai and Virar in Mumbai UA. Any long term planning for the city cannot ignore the changes taking place in these adjacent towns.

Demographic size and growth by 2013

The Greater Mumbai UA is the largest in India in terms of population and in fact, has the distinction of being one among the largest cities of the world in this respect. In 2001, the population exceeded 16 million with the BMC alone contributing to nearly 12 million. The main satellite towns, each of which has a population exceeding one million, are Kalyan-Dombivli and Thane. The other satellite towns are Navi Mumbai, a planned town established three decades ago, Mira-Bhayander and Ulhasnagar. Table 4 shows the population and decadal growth rates of Greater Mumbai UA that incorporates Mumbai Municipal Corporation along with the city suburbs and the satellite towns mentioned above. The growth of the city core has declined substantially and the rate has become negative after 1981. The tremendous growth of suburban areas that were worst hit by the 26/7 rains have actually made the city grow. However, the total growth rate is coming down as is evident during the last thirty years.

Nevertheless, the growth rate of Greater Mumbai UA is significantly higher than that of the BMC, indicating the faster growth of satellite towns, as shown in Table 4. The growth rate of the UA has however declined during 1991-2001 compared to the previous decade, while that of the city has remained approximately the same. The growth rates of both the major satellite towns i.e. Kalyan-Dombivli and Thane have shown a marked decrease compared to 1981-91. This is partly due to administrative reorganization. The fastest growing satellite towns in 1991-2001 were Mira-Bhayander and Navi Mumbai. The former reflects the outward movement of population along the western railway corridor, with relatively cheaper real estate acting as a pull factor. Navi Mumbai, after a sluggish start in the 70s of the last century took off during the last

decade due to the completion of mass transport links with the main city as well as improvements in infrastructure.

Table 4: Population size and decadal growth rates of Mumbai UA and its constituents

Name of UA & its constituents	Population (in lakhs)						Growth rate (in %)				
	1951	1961	1971	1981	1991	2001	51-61	61-71	71-81	81-91	91-01
1. Gr. Mumbai UA	32.17	45.15	65.92	94.22	125.96	163.68	40.37	45.98	42.94	33.69	29.94
(a) Gr. Mumbai M Corp	29.67	41.52	59.71	82.43	99.26	119.14	39.95	43.80	38.07	20.41	20.03
(i) Mumbai Suburb District	6.65	13.80	29.00	49.58	67.51	85.88	107.41	110.14	70.97	36.15	27.20
(ii) Mumbai District	23.29	27.72	30.70	32.85	31.75	33.27	19.02	10.77	6.99	-3.35	4.79
(b) Thane M Corp	0.74	1.09	2.07	4.32	8.03	12.62	46.97	89.86	108.18	86.11	57.02
(c) Kalyan-Dombivli M Corp	0.89	1.39	2.35	4.40	10.15	11.93	57.61	68.24	87.28	130.84	17.61
(d) Ulhasnagar M Corp	0.81	1.07	1.68	2.73	3.69	4.73	33.27	56.33	62.45	34.86	28.14
(e) Ambarnath MCI	--	--	--	--} Merged		2.04					
(f) Badlapur MCI	--	--	--	--} in Kalyan M Corp		0.98					
(g) Mira-Bhayander MCI	0.06	0.07	0.11	0.26	1.76	5.20	10.23	51.96	141.99	584.73	196.29
(h) Navi-Mumbai M Corp	--	--	--	--	3.08	7.04	--	--	--	--	128.76

Note: 1) Kalyan Dombivli Municipal Corp. for 1981-91 includes Ambarnath & Badlapur MCIs.
2) The decline in growth rate for Kalyan Dombivli Municipal Corp. during 1991-2001 is due to the bifurcation of Ambarnath and Badlapur Municipal Councils from Kalyan Dombivli Municipal Corp.
Source: From Ref. Registrar General of India (2001).

There is no doubt that the influx of migrants into Mumbai UA is increasing. It has increased from 4.4 million in 1991 to 7.1 million in 2001 (migrants defined on the basis of place of last residence). However, the migrant population still constitutes less than half of the population of Mumbai UA. Further, nearly half of them come from the state of Maharashtra only (42 percent in 2001). Another noteworthy characteristic of population distribution within Mumbai UA is that a bulk of the population is concentrated in the BMC area. The supporting towns constitute nearly 27 percent (Table 5) of the population of Mumbai UA in 2001, which is likely to increase to 36 percent by 2013. BMC's problem could be ameliorated only when a

suitable planning strategy for supporting towns is also developed in tandem with the planning for the BMC. It is also important to note that the supporting towns are demographically growing much faster than the BMC. In the recent flood, towns like Thane, Kalyan, Panvel were badly affected and increased the miseries of the BMC by disrupting road and railway transport originating from Mumbai.

Table 5: Projected Population of Greater Mumbai UA, 2013

UA/Constituents	Total Population 2001 (000)	Percent	Projected Population 2013 (000)	Percent
Greater Mumbai UA	16368	100	23443	100
Greater Mumbai (M. Corp.)	11914	73	15145	64
Rest*	4454	27	8298	36

(1) * Rest includes Thane (Municipal Corp), Kalyan-Dombivili (Municipal Corp), Ulhasnagar (Municipal Corp), Mira-Bhayander (Municipal Council) and Navi-Mumbai (Municipal Corp).
(2) Kalyan-Dombivili (Municipal Corp.) includes Ambarnath and Badlapur which have separate Municipal Councils in 2001, but were part of Kalyan (Municipal Corp.) in 1991.
(3) The figures are projected by the author based on 1991 and 2001 census information.

The density map of Mumbai Municipal Corporation shows quite clearly how the population pressure has shifted over the last two decades (1981 to 2001) from southern Mumbai towards western and central Mumbai, signifying the decay of the core (Fig 2). Although, the document of '*Vision Mumbai*' has been prepared keeping in view the economic and quality of life goals to be achieved by 2013, it does not take into consideration the likely size and distribution of population within the BMC, let alone the Mumbai UA. Can any document ignore the demographic size, distribution growth of population in Mumbai city? The recent flood has also shown that the areas badly affected were located in the suburbs, not in the Central Business District (CBD) i.e., South Mumbai. Kurla, Chembur, Sion, Bandra, Mahim, Kalina, Ghatkopar, Andheri, Saki Naka and Santacruz are some of the localities, which were partly or fully submerged under water. The demographic pattern of growth shows that in the recent decade both the eastern and western suburbs have grown much faster than the CBD (Sita and Bhagat 2006). As such, the land use and housing provisions in the suburbs needs to be much more planned and regulated in future.

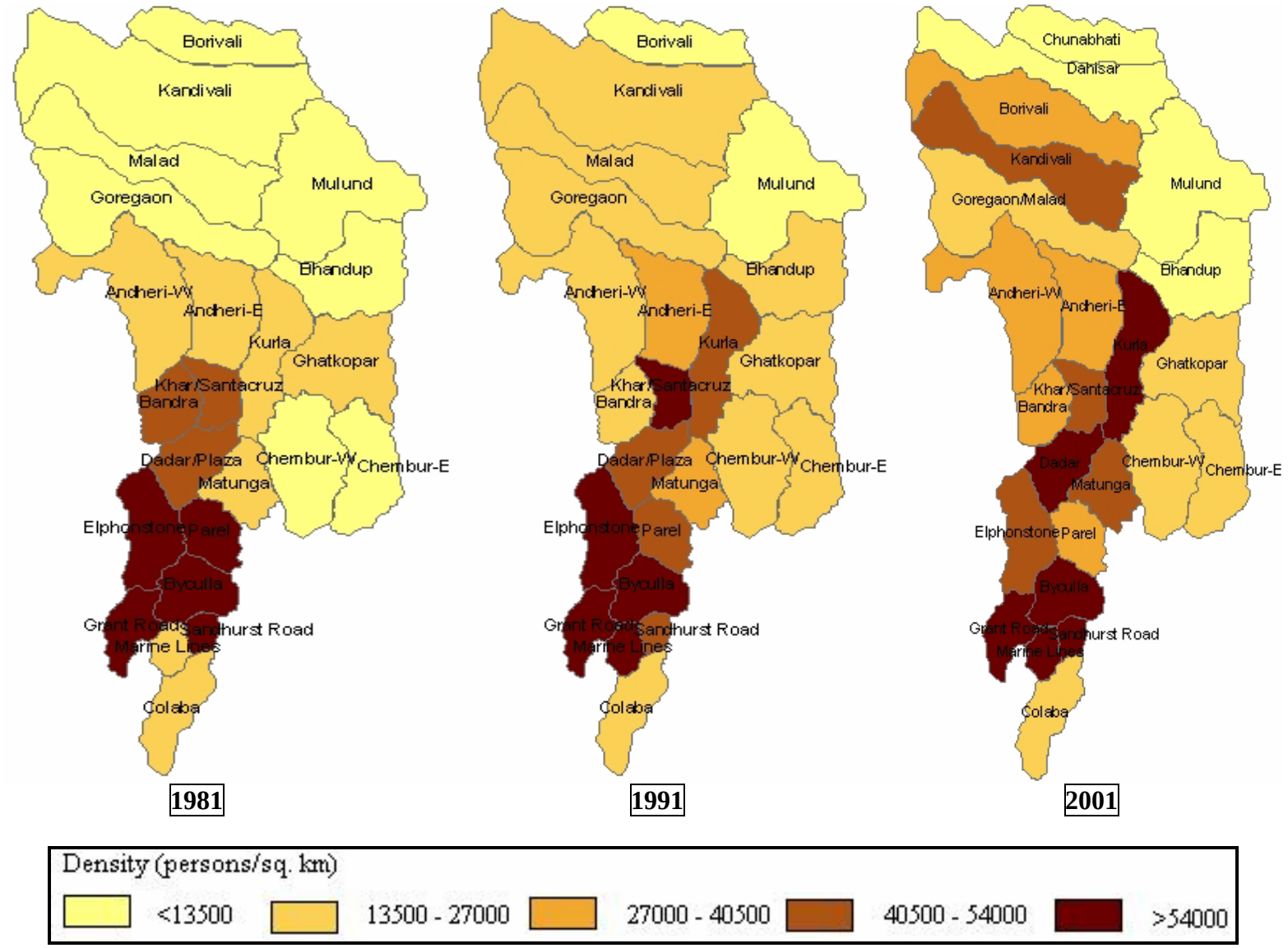
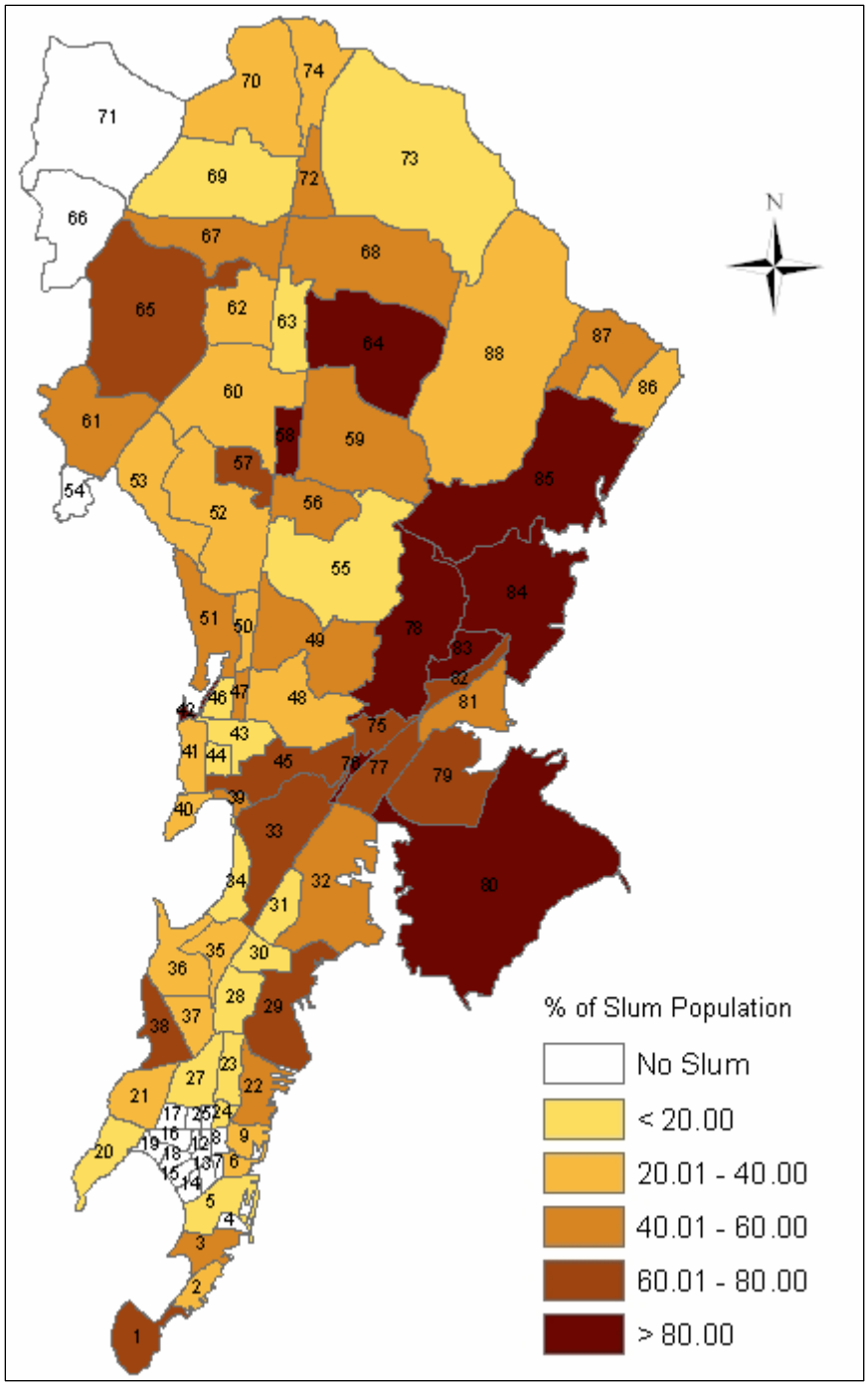


Fig 2: Density of population, Greater Mumbai, 1981-2001

Fig 3: Section-wise Percentage of Slum Population, Greater Mumbai, 2001



Slum Population of Mumbai

It is estimated that 55 percent of Mumbai's population lives in squatter communities, locally referred to as slums, roughly half of which are severely dilapidated. Population densities for roughly one half of Mumbai's squatter settlements are estimated to be as high as 94,000 people per square kilometer, with 45,989 people per square kilometer for Mumbai as a whole (Sherbinin *et al* 2007). The density map of the wards (section-wise) of Greater Mumbai, 2001 shows that in some parts of the city, concentration of slum population is more than 80 percent (Fig 3). With the rapidly accelerating growth profile of the slums in the city, it can only be expected that the pressure is going to rise in the coming decades. There is an emergent need to undertake appropriate measures to control population growth and the unabated inflow of migrants in the city, without which no policy can

work out to be sustainable. Only integrated, spatial and economic plans might help in stabilizing the future urban development.

Grass Root Concerns - Decentralized Planning at Ward Level

Any grass root level planning must begin with a situational analysis of environmental conditions and an assessment of quality of life at the ward level. In this respect, a study on the land use changes in Mumbai city on the one hand, and the planning strategy to utilize the surplus lands arising from the closures of cotton textile mills on the other are extremely important. Also, an assessment of the needs and the associated problems of housing, water, health, sanitation, education, transportation and clean environment at the ward level is very fundamental to the local planning and can be tackled by the civic administration with the active support of the citizens. On the other hand, the state government and its agencies should think and work for a planning strategy for larger geographical areas known as the Mumbai UA in order to plug the sources of problems that lie outside the BMC limits. A regional approach to the management of environmental disaster is crucial for the development of Mumbai and its adjoining towns. The interactive planning model of the new growth strategies can lay the foundation, which starts with the premise that regional plans should reflect a consensus among equal partners and the local governments within a region (UN Habitat 1995).

Any vision of the development of Mumbai could be realized only when the city planning adopts a people centric approach to planning. This precisely means how participation of people in the decentralized governance and planning could be increased as mandated by the 74th Amendment to the Constitution by working towards replacing ‘top-down’ with localized initiatives moving ‘bottom-up’. It must be admitted that there is no alternative to the participatory process of planning and consensus-based collaboration amongst various units of the governance (Phatak and Patel 2005). Thus, the functioning of the local governance and the development strategies that begin at the neighborhood remains critical in city planning which requires both the detection of the sources of misgovernance and the knowledge of the sources of corruption along with the means to fight them. It could be made possible by strengthening the citizen’s forum at the neighbourhood, ward and city levels. The Constitution has only made the framework for political decentralization mandatory. This has to be further designed to cover

administrative, fiscal and economic decentralization (Litvack and Seddon 1999). Without such decentralization the full benefits would not accrue, particularly in emergencies like the recent deluge of 26/7.

Conclusion

An expanding city like Mumbai exploits its own land and water resources as well as the resources from its vicinity. Mumbai, being limited by sea, hills and creeks, experiences very high pressures on land. Unfortunately, the tremendous pressure on land in Mumbai has destroyed the landforms and natural drainages of the city. Further, the planning norms are not followed in the expansion and development of the city. The destruction and misery brought by the torrential downpour on July 26 2005 could have been minimized if the existing contours of the land were taken into consideration while implementing the developmental plans. Some of the short term as well as long term action plans as suggested by scholars are: desiltation and deepening of Mithi and Dahisar river followed by removal of material away from the river; removal of structures along the banks of two important rivers to a distance of 20 metres away; construction of high wall along the banks to prevent spilling out of flood water as well as to stop all encroachments; stopping the destruction of mangroves and completion of underground drainage system in the suburbs (Arunachalam 2005).

It is very important to note that the built up areas in the city have increased manifold engulfing the open spaces, hills, mangroves, wetlands and the natural drainages provided by Mithi and Dahisar rivers, and a disaster like July 26 might occur again. Although a rainfall of approximately 100 cm in just few hours as a result of cloudburst was unprecedented, the biggest question, however, is how to reach people at the moment of crisis like this and keep the transport network and means of communication functional in the city. Among other elements, disaster preparedness and managements plans are vital components of an adaptation strategy. But to design these, we need a better understanding of which people and systems are vulnerable to such hazards; also what makes them vulnerable, and where they are located. No doubt that a disaster plan to mitigate such a situation will be very helpful, but at the same time the city administration and the Government can do their best to educate people on disaster related issues and prepare them to meet the situation. Local or municipal government is perhaps the most critical actor in

urban governance, which can act as a facilitator between local communities and the state, between civil society and the private sector. Most importantly, it is only the local government that is elected and can represent the diverse communities of the city. Thus, any planning document for Mumbai needs to incorporate appropriate strategies that meets the needs of majority of the people (including the marginalized) and withstands disasters like 26/7. Planners, developers and most importantly, the governing authorities must not overlook the physical and natural aspects in the development and planning of Mumbai city.

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