

Exposing Vulnerabilities: Monsoon Floods in Mumbai, India

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Introduction

On July 26, 2005, the deep seated vulnerability of Mumbai's deteriorating infrastructure, weak planning and implementation of the government's disaster mitigation strategy and overwhelming socioeconomic inequalities showed through in the face of disastrous monsoon rains and flooding. As India's heaviest recorded rainfall, Mumbai was battered with 2.89 inches of rain in the city center and 37.2 inches in surrounding suburban areas in one single day.¹ Transportation, telecommunications, power and financial services came to a shrieking halt. For the first time in Mumbai's history, all domestic and international air flights were grounded due to the overwhelming flooding of the runways for 30 hours.

In the initial phases of relief, Mumbaikers found themselves stranded in their cars, on top of buses and bridges, at work and in school relying only on the help of their fellow city dwellers with little or no government assistance. Passers-by offered their homes to strangers and provided water and biscuits to those unable to wade through the flooded streets, while others fought to get home by forming human chains to fight the water head on. The metropolis' devastating flood resulted in over one thousand deaths in the state and about 410 in Mumbai.² Additionally, an estimated loss of US\$109 million in local business revenue and thousands of displaced people dependent on insurance claim returns netting over US\$436 million crippled the city.³

While most of Mumbai crept back to normalcy, the city's most vulnerable population residing in the most exposed neighborhoods of the city was still struggling to survive. Ten days following the first days of the flood, suburban and low-lying areas near the Mithi River remained waterlogged without services, appropriate shelter, potable water or food. This area, 70% of which is occupied by slum and pavement dwellers, received limited attention from the government both prior to and following this disaster.⁴

Background

The July 2005 floods called attention to India's vulnerabilities and illuminated weaknesses in the city's disaster management. While vulnerability factors such as poor sanitation and water drainage systems, crumbling buildings, and the massive population of slum dwellers are easily visible, other factors including the socio-economic root causes of poverty, corrupt real estate policies and practices and weaknesses in urban governance require deeper investigation. Growing risk is associated directly and indirectly with rapid urban population growth.⁵ The population of the city and its surrounding suburban areas increased by 38% from approximately 12,420,600 in 1991 to approximately 20 million by the end of 2005.⁶

¹ Nandy, 2005

² Bhupta, 2005

³ *Ibid*

⁴ Arunachalam, 2005

⁵ Satterthwaite, n.d.

⁶ World Gazetteer Website, <http://world-gazetteer.com/>, Accessed October 8, 2006

Mumbai alone takes in 350 families every day.⁷ While urban populations are expanding, it has become more difficult for state and municipal governments to house and provide services for the growing populations. Urban poor are commonly forced to live in informal settlements or urban slums. Because the majority of these slums are located on hill slopes, *nallahs*, low-lying areas, coastal locations and pavements along water mains and open drainage systems they are the most prone to flooding during times of heavy rainfall and high tides.⁸

Over half of Mumbai's 12 million people live in slums.⁹ With limited capital resources and entitlement rights, this population lives in constant fear of eviction under extremely dangerous environmental and health conditions. Although the city's poor physical and political environment makes all Mumbaikers susceptible to disasters, slum dwellers are unarguably the most vulnerable community within the city because they endure the greatest impact from economic instability and political marginalization. The chronic problem of population growth is compounded by the inability of the Municipal Government to provide sufficient housing. These factors represent a significant barrier for effective disaster management and successful urban development. The issue of unauthorized and illegal settlements has grabbed many of Mumbai's headlines over the years, while Mumbai's flooding clearly demonstrated the government's lack of foresight of the accumulation effect of existing vulnerabilities and disaster damage on the city's development.

The following sections will explore the socioeconomic vulnerability of Mumbai's slum dwellers and how it relates to the physical and institutional weaknesses of the city as a whole. This case study will demonstrate how the government and its people embody exposure and resistance to the city's chronic problems and their level of resiliency in responding to and learning from the July 2005 floods. The first section will examine the collective vulnerability of slum dwellers and Mumbai's chronic problems using a framework of exposure, resistance and resiliency. The second section will illustrate lessons learned from Mumbai's 2005 flooding.

Individual and Collective Vulnerability

Disaster risk is a product of the coming together of human and environmental hazards and human vulnerability. Vulnerability is accumulated through poverty, social marginalization and environmentally unsound housing, creating a susceptibility and proclivity to disasters. Vulnerability is experienced by individuals and also collectively by social units such as households, families, communities and cities. Action to reduce vulnerability at one scale has the potential to reduce vulnerability at other scales or for other individuals or groups.

Mark Pelling (2003) devised a framework for the human elements that shape vulnerability that is separated into three components: exposure, resistance and resilience. Exposure is predominately a result of the condition of a physical location and its supporting infrastructures. Resistance pertains to the socioeconomic status, level of political inclusion of individuals or groups in vulnerable places and condition of infrastructural maintenance systems that protect a city from a disaster. Lastly, resilience is a product of the level of disaster preparation, relief, response and reconstruction that promote the city's sustainability.

⁷ Bhupta, 2005

⁸ Government of Maharashtra, Department of Relief and Rehabilitation, "Disaster Management Plan of Mumbai," GoM Website at <http://mdmu.maharashtra.gov.in/pages/Mumbai/mumbaiplanShow.php>, Accessed September 21, 2006.

⁹ Revi, 2005

Understanding the components of social vulnerability is necessary in addressing the dynamic causal factors of Mumbai's disaster experience.

Exposure

As a megacity, Mumbai's large physical area, growing population and complex social factors make the development and implementation of disaster management plans inherently difficult. The size and dynamic nature of the city increases the liability to disaster risks. The existing physical hazards and correlating social conditions prior to the flooding have increased Mumbai's exposure.

Physical Hazard as Exposure

The July 26 floods took Mumbai's government by surprise. While Mumbai is prone to unstable weather, there are distinct reasons why the 2005 floods caused so much damage. Without a city government system, the city's development is managed by the Maharashtra state government and appointed city planners. Throughout the years, the government of Maharashtra and Mumbai's many development agencies have ignored outdated regulations and policies that have led to specific chronic problems and exacerbated Mumbai's exposure to disaster, specifically during the July 2005 floods. Neglecting archaic zoning regulations, rent control policies and inflated land markets, in particular, have contributed to the overall vulnerability of Mumbai and its inhabitants.¹⁰

Many of the zoning policies have not been changed since British Colonial rule, thus reflecting World War II era ideas of what a city should be.¹¹ For example, the floor-space index (FSI), or floor-area ration (FAR) – of 1.6 in Mumbai is far below that of other comparable cities.¹² An average Asian city's FSI is anywhere from 5-15. This means that buildings in Mumbai must continue to be built within a certain height, therefore not utilizing available vertical space. While there have been measures taken to increase FSI, that too has raised concerns thus no workable solution has surfaced. Therefore, with land space quickly disappearing, vast numbers of people are limited in their housing options. Zoning regulations in Mumbai hinder the number of occupancy each building allows, and people are left to find housing outside of the city proper or on pavements, thus creating a greater strain on the underdeveloped infrastructure and maintenance systems including drainage lines.¹³

Rent control has constrained the willingness and ability of landlords to maintain rental accommodation leading to inadequate housing in the formal rental sector. For example, many apartment buildings are subject to rent control that prohibits landlords from increasing rents. While this might be a positive benefit for the tenants, it has negatives consequences for rent-controlled buildings throughout the city. There is no incentive for landlords to repair and maintain buildings, as they are not allowed to redevelop until all tenants have voluntarily moved out.¹⁴ Incidentally, the city has no power to force owners of unsafe buildings to improve conditions for tenants. Policies such as this not only hinder the overall growth of a

¹⁰ Sekhar, 2005

¹¹ Mukherjee, 2006

¹² Floor Space Index is the ratio of total floor area of buildings on a certain location to the size of land in that location.

¹³ Bertaud, 2002

¹⁴ *Ibid*

city like Mumbai, but as a result, more and more buildings are dilapidated and crumbling due to the lack of proper maintenance.

Land markets in Mumbai are also said to be artificially high due to the aforementioned zoning regulations that limit space in the city raising market values. The housing market commands a higher price for a premium apartment in Mumbai (\$870 per square foot) than an average apartment in Manhattan.¹⁵ Mumbai is a very attractive city for commercial development. Many times, available space that could be used as residential housing is sold to large multinational corporations that are able to finance their own construction as well as the necessary supporting infrastructure like roads and pipelines. In fact, cost of living in Mumbai is the highest in the country.¹⁶ For example, compared to Delhi, India's capital, in 2004 Mumbai's average commercial rental values, per square foot, was US\$2 as opposed to US\$1.50 per square foot in Delhi.¹⁷

The municipal government has been reluctant to make changes in zoning regulations, rent control and land use markets because of the backlash from powerful developers and speculators that such action would produce. For example, if they increase the FSI to that of an average Asian city, they would most likely have to supply more pipelines of water to the buildings and increase road width to accommodate the growing buildings. All of which are nearly impossible as Mumbai's water supply is already strained and the roads are extremely narrow especially in central Mumbai. In order to extend the widths of the roads, slum dwellers and proper buildings alike would have to be demolished. On the other hand, commercial renters are more favorable because they are able to finance their own construction rather than relying on municipal funds for supporting infrastructure.

To date, the government's inability to address these policy gaps significantly affects the social geography of the city and the environmental conditions under which different populations live. As in many other cities, even where low-income housing areas are improved, there is a danger that land and house prices will increase attracting less poor populations effectively displacing lower income groups.¹⁸ The consequence of this process, if it is uninterrupted is that poor populations are trapped, forced to live in environmentally hazardous places despite the implementation of urban upgrading and hazard mitigation investments.

Slum Dwellers' Unique Exposure Experience

In cities like Mumbai, where the majority population is forced to live in slum conditions, the sustainability and viability of the city as a whole must be considered as being in a place of significant risk to disasters. The people living in informal housing throughout Mumbai are more prone to health related risks due to the unsanitary conditions in which they are forced to live, but their location, poor infrastructure and lack of accessibility, make them the most vulnerable group in Greater Mumbai. At the greatest risk to hazards, slum dwellers experience the brunt of Mumbai's natural disasters.

Typically, these populations occupy land that is close to the streets or main transportation hubs such as railways. The railway system allows workers to gain access to the center of the city from the suburbs, but its periphery serves as an attraction for informal settlements

¹⁵ Ninan, 2006

¹⁶ Gulabrani, 2003

¹⁷ Colliers International Asia Pacific Research Report, 2004

¹⁸ Bhupta 2005

because of its accessibility to employment and other income sources. On the other hand, the areas inhabited by informal settlers are usually very dangerous. These communities are constantly in danger from passing trains and denied formalized access to water, sanitation and electricity because they build on land owned by the Indian Railways and other public or private companies.

Due to the fact that many of their homes have been built with unstable materials on unauthorized property, slum dwellings are a constant problem for Mumbai's development. The history of bulldozing mass settlements in order to free up space and land to be used for land developments continues to instil fear and adds to a culture of instability throughout the city. Therefore, given that the land in which they settle is on or near core transportation infrastructure such as streets or railways, it is impossible for pipelines providing water and electricity to be installed in their communities. The lack of running water and electricity sometimes forces families to illegally tap into other water and electricity resources directly affecting the economic stability of other Mumbaikers who are paying for this lapse in service. Frequently when the pipes run dry, people are forced to pay exorbitant amounts from tanker trucks or black market water suppliers. These prices can range from 22-33 cents per day, which most commonly equate to a day's income for an entire household. These physical hazards of informal settlements and land on which they stand directly influences the economic instability of Mumbai's poor.

The survival strategies of Mumbai's poorest populations directly affect the city's ability to maintain and repair physical infrastructures designed for disaster mitigation. Due to poor land regulations and policies, Mumbai's poor are forced to settle on vital drainage areas. The encroachment of slumdwellers limits the capacity of the city to ensure effective drainage both prior to and following heavy rains. The lack of attention paid to the city's main drainage systems is compounded by the fact that the majority of slums are positioned in low-lying areas prone to flooding. The overwhelming accumulation of new and stagnate rainfall inevitably spills over into relatively dry areas of the city. By not addressing chronic drainage and sanitation problems in Mumbai's slums, the entire city will experience devastating flooding during the monsoon season.

Resistance

Resistance represents the city's capacity to withstand the impact of a disaster. This case study illustrates that if resistance is low, even commonly experienced hazards such as the yearly monsoon season can lead to gross systems failure. What follows is an analysis of Mumbai's planning and city development characteristics, drainage maintenance, disaster management planning and the slum dwellers' lack of political legitimization that inhibits the resiliency of the city.

Gaps in Urban Development Planning

Despite spectacle among Mumbaikers, Mumbai's Disaster Management Plan (DMP), prepared by the Relief and Rehabilitation Division of the Government of Maharashtra was in place prior to the July 2005 floods. The Government of Maharashtra developed India's first urban disaster management plan for Mumbai in the late – 1990s. The DMP was designed to accompany the Maharashtra state DMP, which focuses primarily on creating and coordinating institutional networks with little focus on Mumbai's unique disaster risk context.¹⁹

¹⁹ Revi, 2005

The Mumbai DMP details many of the chronic problems and risks outlined above. It provides a risk assessment and vulnerability analysis that identifies flooding as a major risk to the city and even goes as far as explaining bottleneck locations and communities that are most at risk, from living in flood prone areas. It also emphasizes areas with large numbers of slum dwellers including 10 sections along the Central Railway, 12 sections along the Western Railway and 235 additional points within the city that are at the highest risk from flooding during the monsoon season.²⁰ This risk analysis is followed by a mitigation strategy that focuses on public information systems, infrastructure and sanitation improvements, and land use policies and planning to address the city's vulnerability issues. The DMP identifies the need to clean and increase the capacity of storms drains to mitigate flooding. The strategy also includes a plan for coordination between public service providers, emergency personnel and disaster aid nongovernmental organizations.

A question asked by Aromar Revi in his article "Lessons from the Deluge", is not where were Mumbai's disaster management plans, rather why was the plan never enacted in a way that prevented the 2005 floods? In fact, in the decade that has elapsed since the DMP came about, there has been no action taken to alleviate the pinpointed risks and chronic problems that the plan identified. According to Revi, the City government has not coordinated any response to the DMP that will support efficient city planning and risk mitigation, although it clearly states the areas of needed intervention. Specifically as the DMP relates to risks associated with flooding, the government has not devised or implemented a plan of action to repair and maintain working drainage systems, that Revi suggests would provide new housing options for slum dwellers living in flood prone areas or the creation of sound land policies to address the city's over population.²¹

Revi Aromar then goes on to review how the government's lack of attention to the DMP also carries over to the city's culture of planning and development. While the government took no systemic action to enact the DMP, it also failed to heed the warnings of academic planners and architects pertaining to Mumbai's dangerous development path.²² In fact, the Brihanmumbai Municipal Corporation (BMC), in charge of maintaining and upgrading city infrastructure has produced reports that state the needed road and drainage upgrades throughout Mumbai. While the reports are available to government administration, the BMC complains that there are no available funds and the needed multilateral agencies that could help fund such development projects, will not do so until other reforms take place such as property tax and rent reforms.²³ The zoning and land market problems discussed in the previous section also inhibits the government's ability to control development. The city is growing in a very ad-hoc and haphazard way resulting in higher rents, increased profit for developers and the loss of ecologically necessary lands.²⁴ There is an overwhelming lack of accountability and an abundance of conflicted interests among Mumbai's government officials. Several municipal ministers, including the Environmental and Chief Ministers, have become real estate developers and owners of commercial land.²⁵ Within this environment of unregulated construction, politicians and developers form a contingency, and as a result, neglect the welfare of Mumbaikers, particularly those most susceptible to physical and

²⁰ *Ibid*

²¹ Revi, 2005

²² *Ibid*

²³ Bhupta, 2005

²⁴ Revi, 2005

²⁵ Dossal, 2005

socioeconomic disasters, shocks and stresses. On behalf of their private interests, Revi explains how government officials have failed to support efficient planning and risk mitigation systems. As one can see, despite its economic and human resource capacity, Mumbai has proven to be considerably weak in its ability to resist and respond to disaster situations. While a Disaster Management Plan was put into effect for the city, it is outdated, and was never fully implemented. Lack of a coordinated effort to prepare a master plan for the city also hinders the government's ability to execute cohesive strategies for development and construction, thus further feeding an already corrupt real estate environment. Additionally, the government has not provided an opportunity for the inclusion of over half of their urban population in the planning of the city's disaster mitigation strategies and land development. The slum dwellers have limited influence over the planning or development of the city. The combination all of these dire situations reduces Mumbai's resistance to disasters and ultimately affects the city's ability to respond to such events.

Faulty Drainage Systems

Equally as alarming are aged and poorly maintained drainage systems throughout Mumbai. There are two main "problem areas" in Mumbai where water collects and the drainage system fails. The two areas are in the central depression near Colaba and the suburban areas, especially those surrounding the Mithi River. It is no surprise that these were the areas that were most affected by the July 2005 floods resulting in the highest number of deaths.²⁶

Colaba, the city's center, has an over 100-year-old drainage system which is cracked and frequently leak into drinking water pipelines. In addition to their dilapidated structure, the pipelines are far underground below sea level. During the monsoon season when the rains raise the sea water level, these pipelines flood with water, mixing with street sewage and causing subsequent street closings every year.²⁷

The second problem area of Mumbai is that in the surrounding suburban areas the underground drainage system for the river has not yet been completed. Due to the pressure to create housing for the growing population and incentives of high real estate profits, the development of suburban areas were precarious and insufficient in establishing the necessary infrastructure. While there are open sewers throughout this area, they are usually clogged with garbage and closed due to road expansion and construction. This area is home to both new government development and the largest portion of the city's slum dwellers population residing on the Mithi River's banks.²⁸ In fact, 70 per cent of the Mithi River's embankments are occupied by informal settlements.²⁹

Drainage pipelines and systems throughout the city have become obsolete. The encroachment of people and construction on infantile systems in suburban areas and the outdated pipelines in the city center create a scene of destruction every monsoon season. While this is true, Dossal (2005) is quick to point out that the BMC urban service delivery has been in decline for years and poorly funded, despite Mumbai's vast technical expertise and engineer pool.

²⁶ Arunachalam, 2005

²⁷ *Ibid*

²⁸ *Ibid*

²⁹ Express News Service, 2005

Political Marginalization of Slum Dwellers

Lastly, slum dwellers are a very inaccessible group for politicians and government agencies. While organizations such as The Society for the Promotion of Area Resources Centres (SPARC) promote their political organization and inclusion, their communities remain largely misunderstood.³⁰ While families continue to flood into Mumbai, settlements grow, usually without any particular direction. It is particularly hard to demarcate between households and families because they frequently share residences or spaces.³¹ The government of Mumbai has made limited strides to legitimize this group of people and continues to enact policies without taking their wants and needs into consideration. This leaves slum dwellers in a precarious position where they must rely on outside help from non-governmental organizations (NGOs) and aid organizations to help them formalize their civic status and teach them how to enter the space of city politics. As a whole people living in slums are politically weak, as the government does not view them as having a legitimate voice. While these populations are seen as a chronic problem in Mumbai, the government has not successfully included them in addressing their dangerous housing situations and root socioeconomic instability as a means to a more effective development process.

Resilience

Resilience reflects the ability of active political and civic actors to cope with or adapt to existing hazardous conditions and potential risk to disastrous events by implementing and managing risk mitigation strategies. The resiliency of a city stems from not only its ability to respond to a disaster situation, but its ability to use the disaster experience as a learning opportunity for future preparedness.

Government Coping Strategies

The government's short and mid term responses to disaster followed the same line of performance seen in their maintenance of the infrastructure and management of the city's development. Once the rains began to accumulate by the end of the first day, the Chief Minister of Mumbai's state of Maharashtra, Vilasrao Deshmukh, declared a two-day public holiday for all city employees, including those needed for relief and rescue efforts.³² Instead of looking for ways to improve the city's response, India's Prime Minister, Manmohan Singh, on his visit to Mumbai following the deluge, insisted that the Meteorological Department (IMD) upgrade its weather forecasting technology immediately.³³

After strong negative reactions from Mumbaikers of all income levels, NGOs and urban development professionals, the Chief Minister set up a committee of secretaries under the leadership of a chairman who was on holiday in Spain to manage relief efforts for the crisis. The committee deployed Army, Air Force and Navy personnel for search and rescue operations heavily relying on the assistance of non-governmental and community based organizations. Relief efforts included the removal of 100,000 tons of garbage and 15,321 cattle carcasses in addition to the provision of food grains, chlorine tablets for safe drinking water and oral re-hydration solutions. The government released public health advisories and distributed 133 medical teams to prevent the spread of infectious diseases such as cholera and

³⁰ SPARC Website, at www.sparcindia.org

³¹ Express News Service, 2005

³² Dossal, 2005

³³ Bhupta, 2005

gastro-enteritis. The Chief Minister also committed to providing financial assistance of US\$22 for each of the approximately 842,185 destitute persons.^{34 35}

A week after the deluge, Vilasrao Deshmukh created the Mithi River Authority (MRA), under the jurisdiction of the Mumbai Metropolitan Region Development Authority (MMRDA), to address risk associated with the river and the surrounding area. A major component of the MRA's responsibility in reducing Mumbai's vulnerability to disaster is undertaking the removal of the encroachment of slum dwellings upon the river and to improve the area's drainage system. In an effort to address city center's 100-year-old drainage system, the Chief Minister also submitted a request for central assistance of \$262,000,000.³⁶

Neither of these coping strategies initiated by the government called for the active involvement of citizens or non-governmental urban planning engineers and professionals. The lack of inclusion of slum dwellers is particularly important when discussing MRA's call to remove the settlements on the river putting the poor at risk of further displacement and enhanced vulnerability. Reminiscent of the policies of the MMRDA, these institutional responses failed to incorporate representatives of the city's vulnerable groups or address the institutional biases and political patronage thwarting the city's development. Despite the publicized creation of the committee and MRA, there has been no known official discussion or action to address political corruption and lack of accountability of government personnel.³⁷

Community Coping Strategies

It is not uncommon that a state of emergency brings people together even in the most diverse and fragmented cities. However, as the time of relief subsides newly formed social networks tend to re-coalesce around previously established informal social institutions based on race, gender, caste, religion or neighborhood.³⁸ In the past, Mumbai's communities were not known for their ability to come together despite social affiliations and class. During the early 1990s Mumbai was home to ethnic tensions between Hindu and Muslim factions. These tensions ultimately turned into riots in early 1993 and resulted in the loss of life of over 200 people.³⁹ The July 2005 floods, though, brought together a new spirit in Mumbai as communities across the city came together to lead relief and rescue efforts. With little or no help from the government during the devastating 48 hours, the resiliency of Mumbaikers was displayed through collective coping strategies.

Media outlets were bombarded by stories of individual Mumbaikers going out of their way to help their fellow citizens. Social workers, fire officers and other solitary relief workers, not in conjunction with any government agencies, formed teams to fill the gaps left by the government's initial disaster response.⁴⁰ Without a coordinated effort from government agencies and the inability of these spontaneous community coalitions, the warning system for disaster updates was inaccessible to many Mumbaikers. Incidentally, rumors of a tsunami

³⁴ Dossal, 2005

³⁵ Government of Maharashtra, Department of Relief and Rehabilitation, "Maharashtra Floods 2005: Status Report," GoM Website at <http://mdmu.maharashtra.gov.in/pages/Mumbai/mumbaiplanShow.php>.

³⁶ *Ibid*

³⁷ Dossal, 2005; D'Souza, 2005

³⁸ Pelling, 2003

³⁹ Sahadevan, 1999

⁴⁰ Koppikar, 2005

and a dam breach spread throughout some neighborhoods. Due the lack of communication, a subsequent stampede of people fleeing for higher ground killed 18 people in the process.⁴¹

Despite the government's reluctance to work with the poorest of the poor in Mumbai, namely the slum dwellers, a vast NGO network collaborates with these communities. The Alliance, which is a collection of grassroots organizations and NGOs in India, has functioned as a platform for which local citizens have been able to collectively work towards improving their infrastructure and gaining a political voice.⁴² There are NGOs that work to improve hutment neighborhoods, infrastructure and employment opportunities in addition to those that specifically work to improve the lives of women residing in these areas. Groups like the Mahila Milan (women's collectives) work towards pooling their money to create savings and credit groups within slum communities, partially as an effort to collectively respond to disasters.⁴³ The National Slum Dwellers Federation, a community-based organization formed, in 1975 has led movements to increase poor community's access to resources.⁴⁴ Groups such as these have worked for years to band the poor communities of Mumbai together and increase the cohesion in order to become a legitimate voice in the arena of Mumbai's politics. Many believe that these alliances and functions helped support the resiliency of the community to the July 2005 flooding. Communities were used to utilizing their own coping strategies and had previously formed collectives without the help of the government.⁴⁵

The reaction and resiliency of Mumbai was largely due to the actions of the people rather than the government. The above information shows the ability of Mumbai's people to work together despite the government's lackluster response and recovery efforts. Mumbaiker's coping strategies portrayed that they are a viable community that can work well together in the face of adversity and that need to be included in future planning and development initiatives. With proper government assistance and backing, their resiliency can potentially support increased resistance and decreased exposure to disasters.

Lessons Learned

Vulnerability is directly influenced by and rooted in larger socioeconomic pressures.

These pressures include individuals' access to civil and entitlement rights and capital resources. Loss of these assets due to chronic environmental factors or hazardous events will dramatically reduce the income generating capacity and entitlement rights of Mumbaikers, thus increasing their vulnerability to any future stresses or shocks. Access to social capital in the form of community networks and organizations can also influence vulnerability-reduction strategies and build individual and collective resiliency and resistance. The marginalization of Mumbai's poor greatly reduces their potential social capital, which could serve as both an insurance and information system in times of disaster.

⁴¹ Roy, 2005

⁴² Appadurai, 2002

⁴³ *Ibid*

⁴⁴ SPARC website April 2006

⁴⁵ Roy, 2005

Neglecting to address the vulnerability of Mumbai's poor majority places the city as a whole at risk.

Coupled with their limited resources, the lack of political inclusion of slum dwellers in the planning of the city's development fails to encourage these communities to take a more active role in the maintenance of the infrastructure. Exposure can be reduced by hazard mitigation investments made by individuals or households, such as building houses on stilts in flood prone areas, or collectively through public-private partnerships, such as regular maintenance of community drainage systems. The collective vulnerability of slum dwellers affects the entire city as their precarious situation exacerbates the vulnerability of the city as a whole. Without actively working to provide suitable housing drainage systems and flood prone areas will continue to be encroached upon. This enhances and accelerates the intensity of the negative impact of disasters on all Mumbaikers. The exclusion of slum dwellers inevitably contributes to the poor management of the city's infrastructure. When a disaster strikes, the city is unable to address existing vulnerabilities or prevent the burgeoning of new vulnerabilities.

Government and influential civic actors need to ensure community participation in the planning and implementation of disaster risk mitigation strategies.

The collective action taken on part of Mumbaikers of all incomes, religions and ethnicities during the July 2005 floods proves how capable they are and their willingness to support each other in the time of crisis. The resiliency displayed by Mumbaikers demonstrates how disasters can provide an opportunity for communities to have an influential role in disaster relief, and potentially in the management of disaster mitigation and city development. Creating partnerships between government, civic organizations and Mumbai's most marginalized population interrupts the cycle of the city's vulnerability. Organizations like SPARC have proven this, but it is time for the government to formalize these partnerships. In order to guarantee the inclusion of slum dwellers in disaster preparation as a strategy to reduce Mumbai's risk to disasters, political actors must be committed to creating an environment for equal partnerships. Addressing the lack of an elected body of government centrally located and developmentally focused on Mumbai may ensure greater community participation in disaster risk mitigation. Formalizing a space for those most susceptible to disasters will create accountability structures for government officials and their supporting agencies of city planners and service providers. Mumbai's leaders will have an incentive to devise disaster management plans that incorporate strategies to repair the city's deep-seated infrastructural, institutional and socioeconomic problems.

Conclusion

The collective vulnerability of slum dwellers due to chronic physical and socioeconomic hazards is an inherent barrier to disaster risk mitigation and sustainable development in Mumbai. Acknowledging this fact will lead to more responsible and effective city management that addresses issues related to disaster exposure, resistance and resilience. Only by identifying policy gaps and seizing potential assets to disaster risk mitigation such as community resiliency will Mumbai achieve its development goals. A comprehensive disaster management plan and implementation process that supports the needs and strengths of all Mumbaikers will promote prolonged growth of the city and its inhabitants.

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