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URBAN RESILIENCE APPROACHES

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ABSTRACT

With rapid urbanization, the risk of disasters is increasing as more people and assets locate in areas of high risk. For instance, more than half of the world's large cities, with populations ranging from 2 to 15 million, are located in areas of high earthquake risk. The impact of Disasters is even more pounding in these high risk areas. Disasters not only erode and destroy years of development gains, destroy assets, kill people and increase poverty but impact GDP directly especially in more vulnerable urban areas. Therefore we need a long term strategy for disaster management than merely emergency management. Researchers have indicated that urban resilience is most significant and impactful method for reducing growing levels of disaster risk in long run. Resilience is also directly linked with sustainability. Urban Resilience is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience. Thus an urban resilient citizen is disaster resilient and more sustainable over the others. This paper aims at identifying the concept of urban resilience to combat long term disaster management in urban areas. Some best practices taken up for study here include-guidance for measuring disaster resilience indicated in Twigg's (2009) 'characteristics of resilience' framework; Emergency Capacity Building Project (2013) indicated in 'Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation'; DFID's Multi-Hazard Risk Assessment Framework; Oxfam GB's Multidimensional Approach for Measuring Resilience; Sendai Framework-2015; Hyogo framework 2005. We further try to identify the challenges in urban resilience and its further scope of development. With time, the disaster resilience methods have also adapted to smart techniques. We also try to identify some of these here.

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INTRODUCTION

"Building disaster resilience into urban planning will be increasingly crucial as cities continue to burgeon worldwide." says the members in the panel hosted by The United Nations Office for Disaster Risk Reduction (UNISDR) as part of a week's Global Platform for Disaster Risk Reduction (2013) (UN, 2013). With rapid urbanization, the risk of disasters is increasing as cities or urban areas concentrate risk due to huge concentrations of people and physical and financial assets. More to this, more than half of the world's large cities, with populations ranging from 2 to 15 million, are located in areas of high earthquake risk zones. (Gu, 2015) where the impact of disasters is even more pounding. Disasters cause huge economic losses. It has been noted that since 1980 the risk of economic loss due to floods has increased by over 160 per cent and to tropical cyclones by 265% in OECD countries. (UN Water, 2014) As per the disaster analysts the impact of disasters on Developing Countries and Least Developed Countries (LDC) is perhaps the most challenging.

The earthquake in Haiti (2010) is estimated to have exceeded 15 per cent of GDP or 120 per cent of GDP when total damages and losses are included (UNISDR, WMO, 2012). In larger LDC economies, such as Bangladesh or Mozambique, the loss of 3 to 5 per cent of GDP due to disasters in every five to ten years has a cumulative impact on development. (UNISDR, WMO, 2012) The situation is worse in large cities which concentrate and magnify risk. An example to this is Great Kobe urban quake which destroyed much of Kobe, Japan (January 1995), killing more than 6,000 people and bringing losses that exceeded US \$100 Billion. (Mitchell, 1999) Researchers have indicated that urban resilience is most significant and impactful method for reducing growing levels of disaster risk in long run. It is also directly linked with sustainability. This paper aims at identifying the concept of urban resilience to combat long term disaster management in urban areas. The subsequent section discusses the impacts of disasters in urban areas and their long term potential threats.

Urban disaster risks

A disaster occurs when an extreme event exceeds a community's ability to cope with that event. For city

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governments, uncontrolled rapid urbanization complimented with increased climate variability and disasters imposes great challenges to effective urban management and the delivery of key services. Disasters impact and cause many types of challenges listed below

a.Challenge on sustainable urban development-Figure 1 shows that disasters erode years of development gains and result in loss of vision of sustainable development. City authorities are increasingly finding ways to include adaptation strategies although related knowledge and expertise are still scarce and fragmented. Current approaches are limited and generally do not consider local adaptation capacities of individuals and households.

b.Ever evolving disasters and Unpredictable nature of disasters results in low capacity of the governmental institutions for disaster management - In fact, climate change is undermining the effectiveness of institutional responses which were designed to be applied in the event of known 'common' and more 'predictable' hazards and associated impacts. (Wamsler, 2012)

d.Social and Physical impact of disasters-The physical impacts of disasters include casualties (deaths and injuries) and property damage. These are usually the most obvious, easily measured, and first reported by the news media. According to Noji (1997), Earthquakes produced 28 of the greatest disasters and 450,000 deaths, whereas floods produced four of the greatest disasters and 194,000 deaths. (Al-Aawah and Boukhair, 2010)

e.Disasters impact differentially due to differential development-Figure 2 shows that there is significant variation by country, with developing countries in Asia, Africa, and South America accounting for the top 20 positions in terms of number of deaths from 1966-1990. (Hazard, Vulnerability, And Risk Analysis, 2011) Low-income countries suffer approximately 3,000 deaths per disaster, whereas the corresponding figure for high-income countries is approximately 500 deaths per disaster. Figure 3- indicates the levels of natural disaster risk- Based on the United Nations University World Risk Index 2014



Figure 1. Flood Disaster has eroded development (Koksal, 2012)

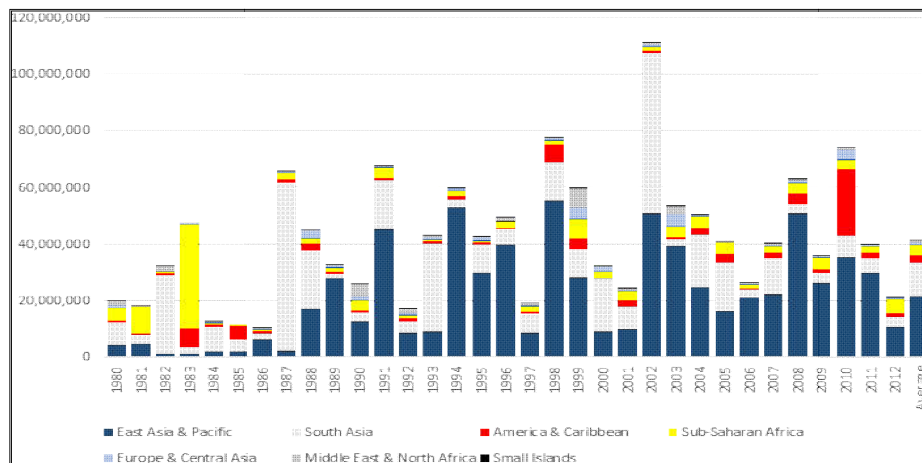


Figure 2. Total life years lost by regions (Noy, 2015)

c.Lack of urban transformation in light of increasing disasters- Since natural hazards threaten large metropolitan areas, urban transformation is needed to together mitigate disasters along with development. This approach of urban transformation includes land use decisions related to hazard, risk and vulnerability analysis and to enhance the implementation of building codes respecting the current standards with application of urban transformation methodologies. (Turkoglu, 2011)

f.Damage. Losses of structures, animals, and crops also are important measures of physical impacts, and these are rising exponentially in the United States (Mileti, 1999). However, it is evident in Figure 3 that the rate of increase is even greater in developing countries such as India and Kenya (Pearson, 2001).

g.Environmental damage impacts include damage or contamination to cropland, rangeland, and woodlands. For example, ashfall from the 1980 Mt. St. Helens eruption was

initially expected to devastate crops and livestock in downwind areas, but no significant losses materialized (Cook et al., 1981).

h. Psychosocial impacts. Research reviews conducted over a period of 25 years have concluded that disasters can cause a wide range of negative psychological responses (Lindell, 2013). These include psycho-physiological effects such as fatigue, gastrointestinal upset, and tics, as well as cognitive signs such as confusion, impaired concentration, and attention deficits. Psychological impacts include emotional signs such as anxiety, depression, and grief. They also include behavioral effects such as sleep and appetite changes, ritualistic behavior, and substance abuse. (CDRSS, 2006). Figure 4 (a, b) – indicates different types of losses due to Disasters taken from various events.

i. Economic impacts. The property damage caused by disaster impact creates losses in asset values that can be measured by the cost of repair or replacement (Committee on Assessing the Costs of Natural Disasters, 1999). Economic losses in Asia and Pacific region remained high owing to natural disasters in 2014, amounting to some \$59.6 billion. (UN ESCAPE, 2015) This highlighted the lack of economic resilience in the region, as per the review report on ‘Natural Disasters in Asia and the Pacific: 2014’ by the UN Economic and Social Commission for Asia and the Pacific (ESCAP). (Vaticana, 2015)

j. Political impacts. There is substantial evidence that disaster impacts can cause social activism resulting in political disruption, especially during the seemingly interminable period of disaster recovery. (Hazard, Vulnerability, And Risk Analysis, 2016)

What is urban resilience?

Urban Resilience Concepts

The concept of resilience is used in the disasters field as a way of understanding the ability of a system to avoid damage as a result of a natural hazard impact. (Johnson and Blackburn, 2014) With the increase in disaster events and inefficient disaster management systems, resilience has emerged as an attractive perspective with respect to cities, often theorized as highly complex, adaptive systems (Peters et al., 2015). With the increasingly complex urban systems, dimensions of urban resilience are also adapting and evolving. Though there is no clear definition of urban resilience, but the concept has gained momentum and significance with various disaster management organizations. The most commonly referred concept given by “100 Resilient Cities” project Pioneered by the Rockefeller Foundation (Rockefeller, 2016) has been referred here. “Urban Resilience is the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience. Thus an urban resilient citizen is disaster resilient and more sustainable over the others.” Another theoretically referred definition by (CSIRO et al., 2007; Rose, 2007) says “urban resilience is the ability of an interdependent social and ecological system to absorb disturbances and maintain the same structure and function.” Here the urban system is divided into four quadrants and the resilience passes through all the four and thereby interconnects them as seen in Figure 5a. These have been modified by researchers to understand the components of the four quadrants connecting each other as referred in Figure 5b.

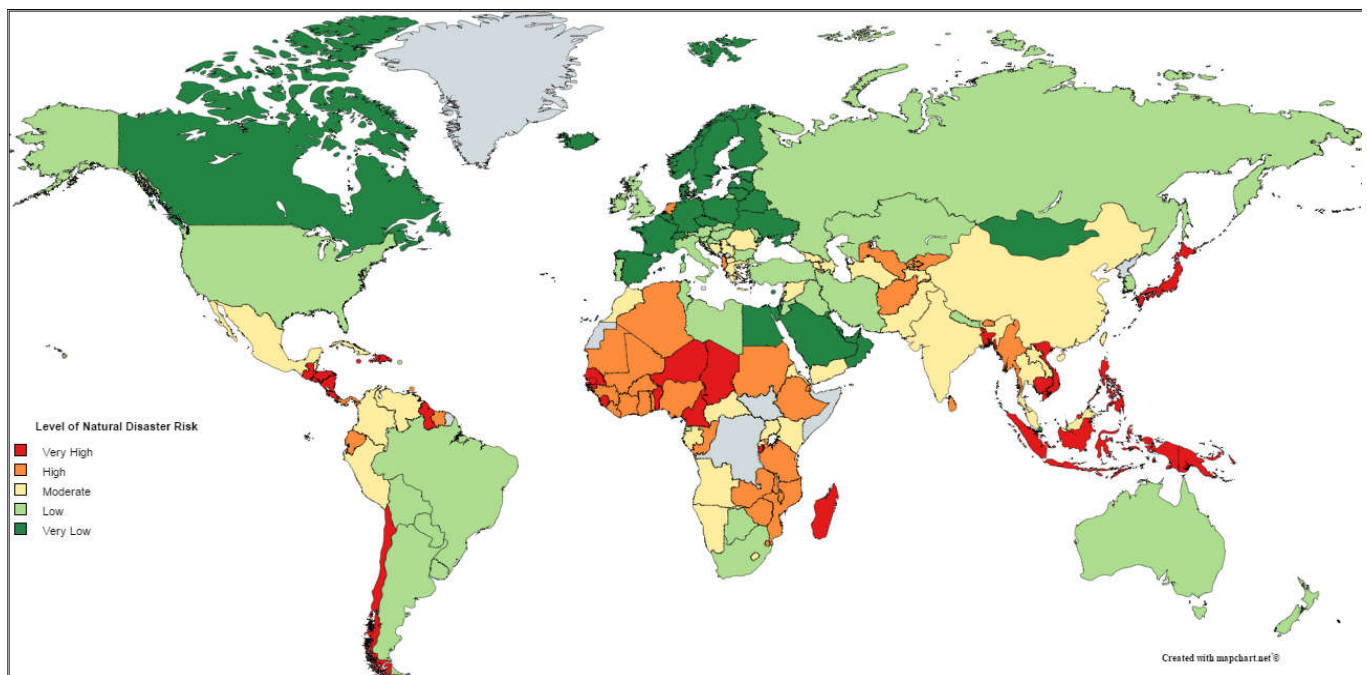


Figure 3. levels of natural disaster risk-Based on the United Nations University World Risk Index 2014 (Child Fund, 2013)

Thus urban Transformations in light of rapid urbanization and increasing disaster risks necessitate the need for urban resilience to be incorporated in urban development, which can be seen as long term strategy for disaster management. Next section discusses the concept of urban resilience.

Key Aspects in Resilience

One of the researchers in her blog clearly identifies the key aspects of urban resilience (Carter et al., 2015). It says “A resilient system copes well with shock.



a. Destruction by Typhoon Haiyan in Tacloban city, in central Philippines on November 14, 2013. - AFP



b. life loss and health implications

Figure 4 (a, b). Different types of losses due to Disasters (Vaticana, 2015, Martinez, 2015)

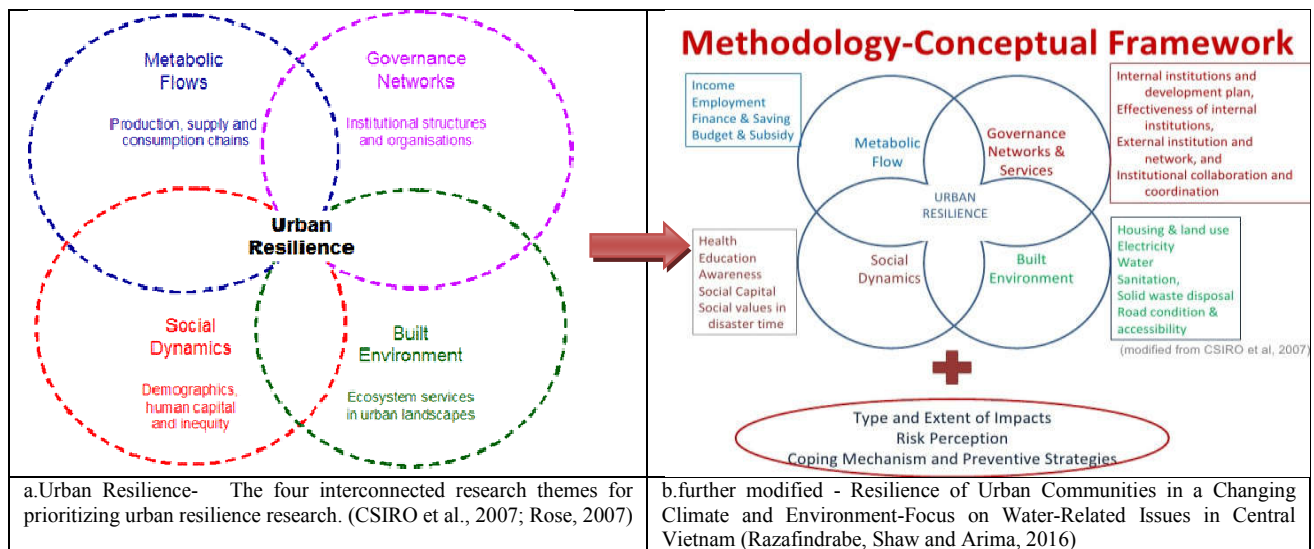


Figure 5 (a, b). Urban resilience conceptual model (Razafindrabe, Shaw and Arima, 2016)

Resilience shifts management focus from growth and efficiency to adaptability. An overemphasis on growth and efficiency leads to a dangerous rigidity and fragility. Based on this ideology, the key elements of sound resilient system have been listed below (Carter et al., 2015)

- **Nonlinearity, alternate regimes and thresholds** – SESs include nonlinear dynamics. A system can shift dramatically into an undesirable regime from a small change if a threshold is crossed. Attention to thresholds is critical.

- **Adaptive cycles** – A metaphor of systematic change that proposes that systems cycle through four phases: growth and conservation (resources committed, stable, slow change, predictable), release and reorganization (resources freed up, chaos, fast change, opportunity).

- **Panarchy – multiple scales and cross-scale effects** – function at multiple scales of space, time and social organization. You must understand the cross-scale interactions to manage effectively at a specific scale.

- **Transformability** – If a SES is pushed into an undesirable context and can't be returned to its former state, the capacity to create a fundamentally new systems with new variables, new livelihoods, and different scales of organization.

- **General vs. specified resilience** – Specified resilience is resilience of a specific part of a system to a specific shock. Focus on resilience of one part the system can come at the expense of other parts of the system. Balance between the two forms of resilience is important.

- **Social-ecological system** – an integrated system in which the dynamics of the social and ecosystem domains are strongly linked and of equal weight.

- **Assessment:** understanding the regime the system is in, where it is in the adaptive cycle, where the system thresholds are, what the key variables are, and how the cross-scale interactions either increase or decrease resilience.

- **Management:** how to avoid an undesirable state or get from an undesirable state to a desirable one, and how to transform a system when that's the only option.

After a clear understanding of the concept, some best practices taken up for understanding the urban resilience methods. We also try to identify the challenges in urban resilience and its further scope of development. With time, the disaster resilience methods have also adapted to smart techniques. We also try to identify some of these here. These have been discussed in next section.

Urban resilience- best practices

As resilience primarily increases coping capacity, it has been observed that some practices have already incorporated it in present system of disaster management. This at initial stage can be attributed to the development of effective early warning systems, based on advancements in monitoring and forecasting of weather-related hazards, combined with effective coordination, communication and emergency preparedness at national to local levels in several countries. (WMO, 2016) These countries having high-impact weather-related hazards include countries like Cuba, Bangladesh, France, and the United States. (Golnaraghi, 2016) Whereas some other practices have been listed below-

1. Twigg's (2009) 'characteristics of resilience' framework. (Twigg's, 2007) Based on five dimensions of resilience identified in the Hyogo Framework for Action (governance, risk assessment, knowledge and education, risk management and vulnerability reduction, disaster preparedness and response), it provides an extensive inventory of 28 components and 167 characteristics or indicators.

2. DFID's Multi-Hazard Risk Assessment Framework - detailed recommendations for indicators of urban resilience in at least eight DFID Country Offices. The framework is primarily based on five components-Magnitude and likelihood of hazards, Vulnerability analysis, In-country capacity to address disaster risk, Overall impact assessment and role of DFID. These components are evaluated based on set of indicators. A varied range of data and methodology (Interviews with key stakeholders, Historical data, evaluations, understanding Early Warning Systems, Poverty assessments, Humanitarian evaluations, Post-Disaster Needs Assessments, External analysis, Country Assistance Strategies, Poverty Reduction Strategy, Risk matrix) is used based on available. Components of resilience derived include-DRR policy, planning, priorities, and political commitment, Legal and regulatory systems, Integration with development policies and planning, emergency response and recovery, Hazards/risk data and assessment.

3. A Multidimensional Approach for Measuring Resilience (Oxfam GB, 2013)- is based on five dimensions affecting the ability of households and communities to minimize risks from shocks and adapt to emerging trends and uncertainty. These are - (1) Livelihood viability: the extent to which livelihood strategies can thrive in spite of shocks, stresses and uncertainty; (2) Innovation potential: the ability to take appropriate risks and positively adjust to change; (3) Contingency resources and support access-access to back-up resources and appropriate assistance in times of crisis; (4) Integrity of natural and built environment-health of local ecosystems, soundness of natural resource management practices, and robustness of essential physical infrastructure; (5) Social and institutional capability- extent formal & informal institutions are able to reduce risk, support positive adaptation, and ensure equitable access to essential services in times of shock/stress. (Oddsdóttir, Lucas and Combaz, 2013)

4. Toward Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation (Emergency Capacity Building Project, 2013)- This guide is a resource for staff of development and humanitarian organizations, providing principles of effective practice, guidelines for action, case

studies, and tools and resources for the application of an integrated, rights-based approach to disaster risk reduction and climate change adaptation. It provides advice on the design, implementation, monitoring and evaluation of programmes that build disaster and climate resilience, following a simplified programme cycle with three phases: analysis, design, and implementation. (Oddsdóttir, Lucas and Combaz, 2013)

5. Community Based Disaster Preparedness (Catholic Relief Services, 2009)- This guide was developed to support a community-led disaster preparedness process. It does not provide specific indicators for measuring resilience, but recommends participatory methods to collect information for monitoring progress and highlights the value of qualitative information. It provides participatory strategies and tools for a three-phase approach to developing disaster preparedness, the first two phases of which involve assessing resilience in the community. (Dummett, 2009)

6. Participatory Capacity and Vulnerability Assessment (Oxfam GB, 2012)- is a framework based on two social development methodologies. First, it indicates the Capacity and Vulnerability Analysis (CVA) methodology which enables programme design based on a community's capacities as well as its vulnerabilities. Secondly, it gives the belief about enabling communities to genuinely participate in programme design, planning, and its management that leads to increased ownership, accountability and impact, and is the best way to bring about change. PCVA draws on a range of participatory learning and action (PLA) techniques and tools designed to channel participants' ideas and efforts into a structured process of analysis, learning, and action planning. (Oddsdóttir, Lucas and Combaz, 2013)

7. Participatory Assessment of Disaster Risk (Tearfund, 2011)- This framework is based on a tool known as Participatory Assessment of Disaster Risk (PADR). The purpose of the tool is to enable a community to assess the factors that contribute to the size and scale of any potential disaster and to develop a locally owned plan to address those factors and reduce the risk of disaster. It also enables the community to identify and address the social, political and economic structures which contribute to their vulnerability. (Oddsdóttir, Lucas and Combaz, 2013)

8. The Yokohama strategy based on the Hyogo Framework for Action 2005-2015 has gained recognition in addressing the multidimensional aspects of disaster risk from a development perspective. Hyogo Framework for Action 2005-2015-Building the Resilience of Nations and Communities to Disasters was adopted at the World Conference on Disaster Reduction in Kobe, Hyogo, Japan in 2005. The Framework serves as the guiding instrument for international cooperation, disaster risk reduction and resilience building. The multi-stakeholder and multi-sector nature of the Hyogo Framework for Action provides guidance on how disaster risk reduction contributes to sustainable development and provides the solutions for clearly defined, agreed and monitored goals and targets around disaster risk reduction and resilience. (UNISDR, 2013)

9. Sendai Framework-2015- is the successor instrument to HFA-2005-2015. The Sendai Framework was adopted by UN Member States on 18 March 2015 at the Third UN World

Conference on Disaster Risk Reduction in Sendai City, Miyagi Prefecture, Japan. It has seven targets and four priorities for action which include: (Priority1) Understanding disaster risk; (Priority2) Strengthening disaster risk governance to manage disaster risk; (Priority3) Investing in disaster risk reduction for resilience and (Priority 4) Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction.(UNISDR, 2012)

10.Other Initiatives-A number of initiatives have been undertaken to build consensus on measuring results at the regional and sub-regional. These include- six *high level regional strategies or plans of action on disaster risk reduction* were adopted in Africa, Americas, Arab States, Asia, Europe and the Pacific. (United Nations System, 2013); *the Incheon Roadmap for Asia*(AMCDDR, 2010); National or community targets seen in Bangladesh (Sixth Five-Year Plan 2011-15), Mozambique (Five Year Government Plan 2010-14 and Master Plan for Disaster Prevention and Mitigation 2006), Peru (State Policy 32) and Philippines (Philippine Development Plan 2010-14) (National Economic and Development Authority, 2011); Disaster resilient construction techniques in Western Sumatra. (JITI Foundation, 2015) etc. These can be referred in detail in respective literatures.

Challenges in urban resilience

- a. Problems at global scale in resilience building - Global goals and targets for disaster risk reduction and resilience raises a particular concern for implementation and accountability (UNISDR, 2012). These global targets need to relate as closely as possible to human development indexes, especially as vulnerability increases.
- b. The speed and pace of changes, and the high degree of uncertainty in many domains today pose a challenge to many decision-making processes. Over the last several decades, progress with hazard monitoring, predictions and forecasting is leading to forward-looking information, assisting decision makers to reduce risks of extreme events. But still the predictability is changing at a faster pace in most cases due to rapidly unpredictable changes in climate.(Reeves and Deimler, 2011)
- c. The application of scientific evidence, supported by technology transfer and capacity development is critical in disaster risk reduction and resilience building. Further investment is therefore needed to make science and climate information and evidences more available to support policies around investment and planning (Bosher, Dainty, 2011).
- d. Though, many cities have started including resilient programs in their master plans, they lack a holistic vision of the systemic relation between different urban parameters and an effective operational mechanism for timely signalization and modus-operandi to face these disaster situations.(Gupta, 2015)

Conclusion

From the above arguments it can be concluded that the best way of managing urban disasters are mechanisms of Resilience. There is growing evidence of the intensity and frequency of climate related extreme events highlight the criticality. Thus time to see disasters through the lens of

reducing risk of and building resilience to disasters, rather than just a response to a one-off disaster event. The incorporation of disaster risk reduction and resilience into development process for integrated approach is needed. These need to be through public and private sector strategies and planning for development and growth. In addition, more explicit recognition of the importance of reducing disaster risk and building resilience – with measurable goal and targets would be a major step in meeting the challenges of resilient sustainable development.

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