

Barriers for Flood Resilience Cities

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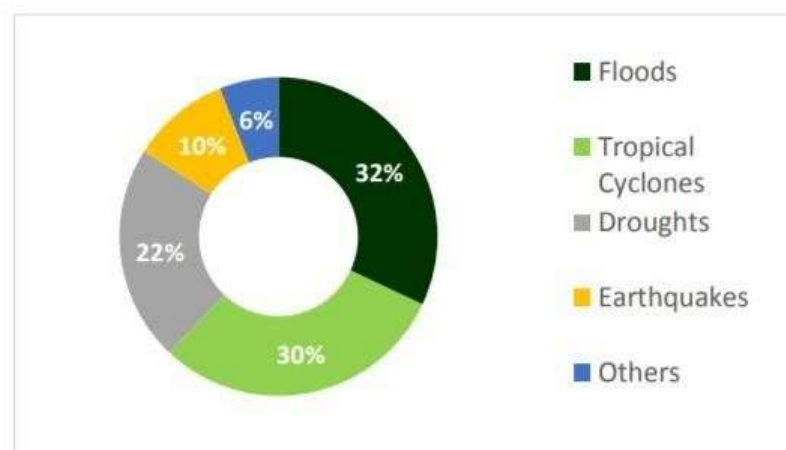
I. INTRODUCTION

Understanding barriers is critical to enhancing our understanding of developing resilience. ‘Barrier’ here is defined as anything that might hinder the process of urban community resilience building. The barriers to community resilience building are expected to differ from one setting to another. As per the fourth Assessment Report of intergovernmental panel on climate change, It is evident that there is an increase in the global precipitation and extreme rainfall, and the average air and ocean temperature resulting in storm surges and coastal flooding, Widespread melting of snow and ice, and rising global mean sea level, Communities will be at increased risk due to increase in intensity and frequency of extreme weather events as a result of climate change. The hydrological cycle will be severely impacted due to the

unprecedented increase leading to decrease in water resources, increase in draughts and floods and damage to the ecosystem in general (Balica, et al., 2012) The impact would be particularly disastrous for developing countries including India and further degrade the resilience of poor, vulnerable communities, which make up between one quarter and one half of the population of the most Indian cities

Climate Change is Disrupting National Economies and affecting Lives, Costing People, Communities & Countries dearly today and even more Tomorrow. People are experiencing the significant impact of climate change, which include changing weather patterns, Rising sea Level and more extreme weather events, Poorest and most vulnerable People are the major Victims of it. (Sustainable Development Goals, Goal 13)

Figure:1.1 Damages caused by Natural Disasters (Global Scenario) Source: (World Meteorological Organization)



II. RESEARCH FRAMEWORK

A systematic approach was undertaken to complete this research work. Firstly, an extensive literature review of related studies was carried out to list out the barriers. After that, barriers were categorized into six sub groups. The framework for the study is established to find a linkage between different barriers and the Urban Flood vulnerability which is to be measured based on Physical, Social, Socio-economic, Infrastructural, Financial, Poverty and meteorological aspects.

An extensive literature review was conducted to shortlist the barriers for Flood Resilience cities in both Global and Indian context. The barriers were then categorized into six major groups, i.e., Technological barriers, Socio-economic barriers, Infrastructural barriers, Institutional barriers, Financial barriers and Social barriers based on their characteristics. The contextual framework of this research can further be divided into several sub groups. The classification of these barriers is delineated in Table 1, and a brief description of each barrier follows.

1.1 Barriers in implementation

Table 1 Classification of barriers

Major Barriers	Sub Barriers	Literature Support
Technological Barrier	Absence of Robust Forecasting Techniques	Scolobig, A.; Prior, T.; Schröter, D.; Jörin, J.; Patt, A. Towards people-centred approaches for effective disaster risk management: Balancing rhetoric with reality. <i>Int.J.Disaster Risk Reduct.</i> 2015, 12, 202–212
	Absence of Alert Communication	Tompkins, E.L.; Adger, W.N. Building Resilience to Climate Change through Adaptive Management of Natural Resources; Tyndall Centre for Climate Change Research: Norwich, UK, 2003; Working paper 27
Socio-economic Barrier	Absence of Linking Vulnerability and resilience in remote regions	Maru, Y.T.; Smith, M.S.; Sparrow, A.; Pinho, P.F.; Dube, O.P. A linked vulnerability and resilience framework for adaptation pathways in remote disadvantaged communities. <i>Glob. Environ. Chang.</i> 2014, 28, 337–350.
	Difficulty in coping strategies for climate variability for the urban poor	Jabeen, H.; Johnson, C.; Allen, A. Built-in resilience: Learning from grassroots coping strategies for climate variability. <i>Environ. Urban.</i> 2010, 22, 415–431.
	Absence of coordination across the institutions	Lebel, L.; Manuta, J.B.; Garden, P. Institutional traps and vulnerability to changes in climate and flood regimes in

Institutional Barrier		Thailand. Reg. Environ. Chang. 2011, 11, 45–58
	Absence of Coordination among the stakeholders	Dodman, D.; Ayers, J.; Huq, S. Building Resilience. In State of the World 2009;Routledge: London, UK, 2012; pp. 75–77.
Financial Barrier	Lack of Financing in the project Implementation	López-Marrero, T.; Tschakert, P. From theory to practice: Building more resilient communities in flood-prone areas. Environ. Urban. 2011, 23, 229–249.
	Municipal Barriers	Burgess, J., Clark, J. & Chilvers, J. (2005) Going 'upstream': issues arising with UK experiments in participatory science and technology assessment. Sociologia e Politiche Sociali, 8, 107-136.
Social Barrier	Problems associated with adaption to climate change and its potential across and within the society	Adger, W.N.; Agrawala, S.; Mirza MM, Q.; Conde, C.; O'Brien, K.; Pulhin, J.; Takahashi, K. Assessment of Adaptation Practices, Options, Constraints and Capacity. In Climate Change 2007: Impacts, Adaptation and Vulnerability; Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change; Parry, M., Canziani, O., Palutikof, J., Linden, P.V.D., Hanson, C., Eds.; Cambridge University Press: Cambridge, UK, 2007; pp.717–743.
	Risk associated with Voluntary Resettlement	Kita, S. Urban vulnerability, disaster risk reduction and resettlement in Mzuzu city, Malawi. Int. J. Disaster Risk Reduct. 2017, 22, 158–166.

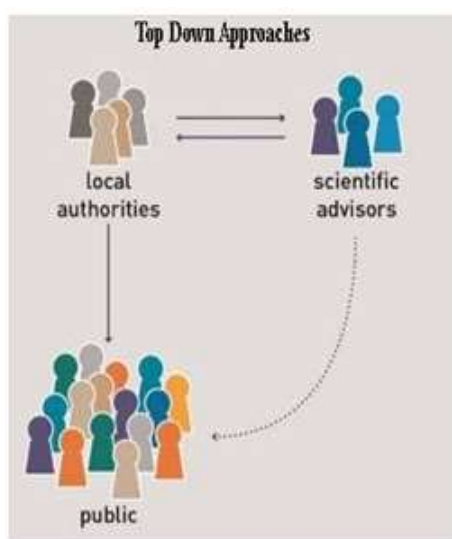
	Improper Urban Infrastructure Planning	Lamond, J. & Proverbs, D. 2009. "Resilience to flooding: learning the lessons from an international comparison of the barriers to implementation." Urban Design and Planning 162: 63-70. Dasgupta, S.et al.,2012. A megacity in a changing climate: The case of Kolkata. Climatic
Infrastructural Barrier	Problems associated with the mobility system	change Balica, S.F., Wright, N.G & Meulen, F.v.d., 2012. A flood vulnerability index for coastal cities and its use in assessing climate change impacts. Natural Hazards, Volume 64, pp. 73-105.

1.1.1 Technological Barriers

Absence of Robust Forecasting Techniques:

The Traditional "top-down" approach where responsibility rests almost exclusively on organizational shoulders and the public is perceived as passive receiver of Technical Information on risk assessment, preparedness measures, emergency plans, etc. As a consequence, risk communication has typically been conceived and presented as a one-way process, devoted to correcting the risk perceptions of people, or to transferring knowledge and information from the experts to the public. These approaches were typically deployed by government organisations specifically established with technical capacities and expertise, and with a centralised and hierarchical model of management. On-going discussions and contentions regarding many issues, ideas and processes highlight that simplistic assumptions about lay peoples interactions with the hazard environment often do not hold. These issues raise the prospect that traditional top-down, techno-centric approaches to Disaster Risk Management (DRM) might not always represent the best means of managing

disaster risk under all circumstances. (Tompkins, et al., 2003) In addition, changes in event characteristics and in society itself have significant implications for the exposure and vulnerability of society to natural hazard events. The changing interactions between stakeholders are at the forefront of the 'hurdles' to achieving people-centred outcomes. These challenges can be associated primarily with inadequate reciprocal expectations concerning responsibility, and different perspectives (thus including conflicting interests, wants and needs) concerning DRM outcomes. Aside from these limitations, the capacity to entertain alternative approaches to DRM at local and regional levels must be supported by the right conditions: adequate financial and personnel resources, an appropriate political system and climate, legislative frameworks that permit flexibility, considerations about land rights and ownership, and organisational structures that can respond and adapt to dynamic contexts and circumstances. These factors must be addressed together in order to create cultures of shared responsibility in DRM.



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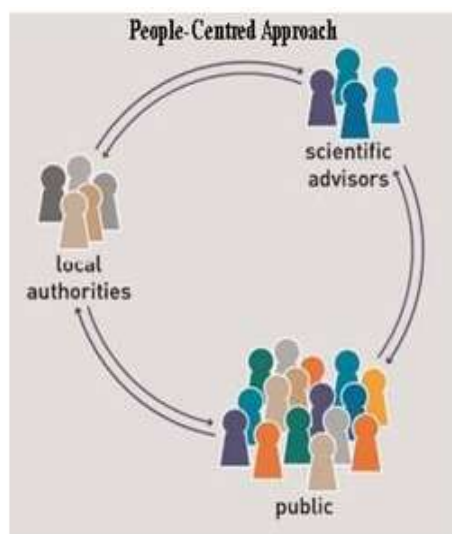


Figure:2.1.1 TopDownApproaches Figure 2.1.2 People CenteredApproach

1.1.2 Socio-economic Barriers

Absence of Linking Vulnerability and resilience in remote regions

Resilience and vulnerability may be considered as overlapping but these are separate concepts that capture emergent properties of a socio-economic system as it deals with internal stresses and external perturbations such as climate change. The Link builds on two common and seemingly paradoxical narratives about people in remote regions. The first is recognition that people in remote regions demonstrate significant resilience to climate and resource variability, and may therefore be among the best equipped to adapt to climate change. The second narrative is that many people in remote regions are chronically disadvantaged and therefore are among the most vulnerable to climate change impacts. These narratives, taken in isolation and in extremis, can have significant maladaptive policy and practice implications. From a systems perspective, both narratives may be valid, because they form elements of latent and dominant feedback loops that require articulation for a nuanced understanding of vulnerability-reducing and resilience-building responses in a joint framework. Through literature review we are able to identify the potential to assist dialogue about adaptation pathways in remote marginalized communities. In an adaptation pathway view, short-term responses to vulnerability can risk locking in a pathway that increases specific resilience but creates greater vulnerability in the long-term. Equally, longer-term actions towards increasing desirable forms of resilience need to take account of short-term

realities to respond to acute and multiple needs of marginalized remote communities (Tanton et al. 2012)

Difficulty in coping strategies for climate variability for the urban poor

Significant lessons can be drawn from grassroots experiences of coping with extreme weather for reducing the vulnerability of the urban poor to flood resilience. It is to be taken into consideration that the use of physical, economic and social means to reduce risk, reduce losses and facilitate recovery from flooding and high temperatures shows how grassroots adaptation differs according to the level of risk from flooding. Also it is to be noted that how local planning and governance mechanisms aimed at adaptation can support these coping strategies, including mainstreaming them into adaptation plans that can be scaled up to the citywide level. Different types of coping strategies, some of which correspond to strategies used by the urban poor are as follows:

- I. Modifications to the physical and built environment: Physical and Built Environment which basically includes modifications within the house or at the neighbourhood levels such as retaining walls, drainage facilities or sandbags.
- II. Building up stores of food and saleable assets: storing food may be more common in rural areas, but urbanites living in a cash-based economy may use similar strategies such as keeping items of value that can be sold if necessary.
- III. Diversifying income sources: In cities this may mean illegal or quasi-legal work, such as

street-hawking and waste-recycling. Having more than one, or sometimes several, income earners in the family also allows for diversification. This sometimes means taking children out of school to help generate extra income. If families have contributed to savings groups, this can offer a form of income during hard times

IV. Development of social support networks: Defines network to be developed within the Household, between extended family members, within neighbourhoods and with wider groups that have a shared identity. The main objective behind this is to bridge

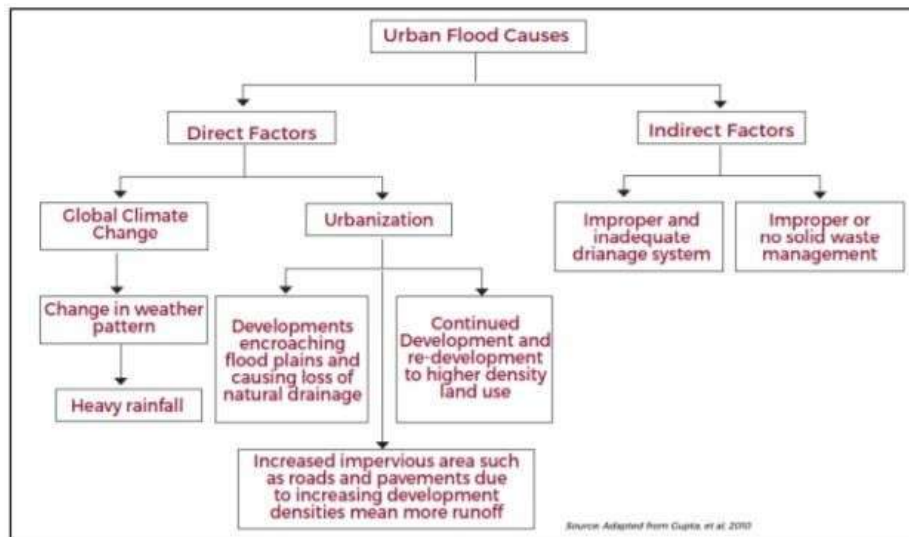
the ability to call on the resources of others during difficult times. Assistance can come in many forms – financial help, emotional support, shelter in time of need, or physical help of any kind. These types of networks may be less prevalent in urban settings due to the erosion of traditional systems that govern social interactions. Also, transience is quite common in urban settings, so families may not have the opportunity to establish these important networks.

1.1.3 Infrastructural Barriers

Improper Urban Infrastructure:

Urban floods are generally caused by the effects of deficient or Improper land use planning. While there are existing laws and regulations to control the construction of new infrastructure and the variety of building types, they are often not enforced properly owing to economic or political factors or capacity or resource constraints. This leads to obstruction in the natural flow path of water, which causes floods. The interaction of floodwater with concentrated population centres, buildings and urban infrastructure is characteristic to urban flooding and requires a specific set of solutions. Urban Floods usually occur as a result of extreme local rainfall in combination with the Improper Infrastructure Planning such as blockage of drainage system (Balica, et al., 2012). Due to urban floods a lot of damage is incurred by buildings, utilities, household assets, Loss of Income in trade and Industries, Interruption to transport system and loss of employment to temporary workers and daily earners. Several natural events as well as anthropogenic activities accentuate the occurrence of Urban Floods, some of the issues that contribute to it are listed below

Fig:2.1.3 Infrastructural Barrier acting as a major factor Source: (Dasgupta et al, 2010)



Problems associated with the mobility system :

Urban Flood has an adverse affect on different modes of transportation, During flood water

accumulates on roads making movement difficult there by disrupting the Transportation badly. In general all modes of traffic are adversely affected by Harsh weather but the most damaging one is flooding. It can cause heavy damage to the economy and human lives and cuts people off from their basic necessities of life. To reduce losses from this type of Disasters which are unavoidable in general, Some effective measures on proper Infrastructure Planning should be taken. Mobility Behaviour on roads is found out to be more affected by existing conditions rather than on weather forecast, Government officials seeking to assist drivers in their road behaviour only give local or technical advice. Looking at weather condition and Traffic parameters, It is assumed that an individual can modify their mobility pattern accordingly. The findings of the studies conducted earlier has a very minute focus on understanding the mobility pattern of the poor under such harsh conditions.

1.1.4 Financial and Social Barriers

Lack of Financing in the project Implementation

Financing plays a major role in enhancing resilience in communities which in turn requires: support for social learning by building on existing knowledge; stressing the importance of developing a diverse set of flood management options; and promoting effective linkages and collaborations between community members and emergency managers to encourage collective flood management. For this to happen, however Financial gap, mutual distrust, lack of confidence and other obstacles must be overcome. Engineering intervention that requires large amounts of financial resources and government coordination for the most efficient flood management strategy. In order to enhance community resilience to floods following

consideration should be taken into consideration: (Lopez Marrero et al., 2011)

I. Build upon existing knowledge about floods, particularly in relation to the multiple types of floods and to the potential influences of human activity on floods

II. Increase awareness of the potential risks associated with technical measures in the area and emphasize the importance of developing and implementing non-technical strategies for flood management to complement technical

measures

III. Develop partnerships and collaborations for flood management. This last point requires overcoming barriers that at present undermine the effective building of such partnerships and collaborations.

Municipal Barriers

Municipalities are subject to a host of challenges and barriers to action, revealing the critical need for sophisticated participatory processes in support of municipal decision making under conditions of considerable uncertainty. The basic objective is to examine a new process for envisioning local climate change futures, which may use an iterative, collaborative, multi stakeholder approach for future in the flood-prone municipality. The process may appear to forge communicative partnerships which may improve the legitimacy and effectiveness of the flood management and climate change response discourse in the municipality, and may lead to locally-specific and integrated flood management and climate change response strategies. (Burgess et al., 2005). In the context of municipal action on climate change, the critical finding is that humans often operate on the basis of routines and standard operating procedures rather than according to a rational calculus of costs and benefits which forces a shift in attention away from making a logical, scientific case for the avoided costs yielded by climate change action. Instead there is a need to identify and embed new norms and values associated with climate change action and integrated flood risk management throughout the familiar and established practices and procedures of an institution.

Risk associated with Voluntary Resettlement

For most developing countries at risk of disasters and climate change, adopting structural measures to reduce disaster risks remain a challenge. There are multiple vulnerability factors, including unsafe construction practices, poor drainage systems, unregulated solid waste disposal, institutional incapacity, inadequacy of land, settlements in high risk areas, deforestation, siltation of rivers and national disaster risk reduction policies that neglect urban areas. It is to be noted that the emphasis on resettlement is obscuring the key drivers of vulnerability, while simultaneously exposing both resettled and those left behind to further risks. It therefore calls for caution when planning and implementing disaster risk reduction policies that have the potential to create new forms of vulnerability to hazards or exacerbate them. For most developing countries, structural disaster

mitigation measures may remain out of reach. Where protective options are limited, resettlement of population from high risk areas could be the most convenient option. Resettlement can be an effective way of preventing future disasters as it can entirely eliminate the likelihood of a disaster (Balica, et al., 2012)

1.1.5 Institutional Barriers

Absence of coordination across the institutions

Formal and informal institutions help shape exposure, sensitivity and capacities to respond of individuals, social groups and social-ecological systems. Several institutional traps which need

to be overcome if vulnerability is to be reduced, namely capture of agendas by technical elites, single-level or centralized concentration of capacities, organizational fragmentation and overemphasis on reactive crisis management. Possible responses are to expand public participation in managing risks, build adaptive capacities at multiple levels and link them, integrate flood disaster management and climate change adaptation into development planning, prioritize risk reduction for socially vulnerable groups and strengthen links between knowledge and practice. Responses like these could help reduce vulnerabilities under current climate and flood regimes.

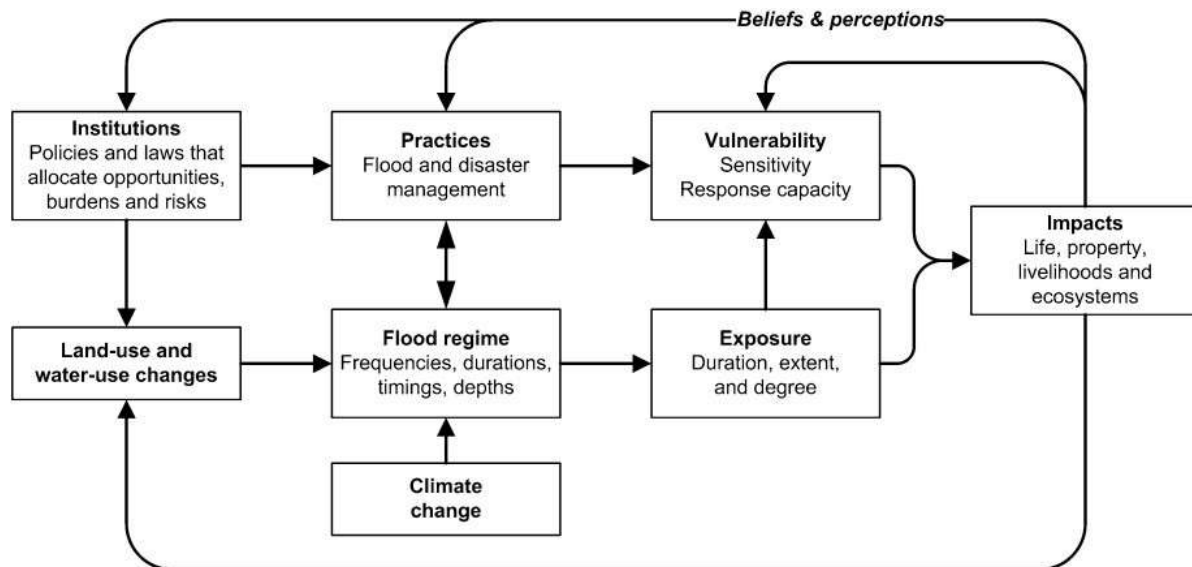


Fig:2.1.5 A conceptual model for vulnerability to changes in floods regimes and possible adaptive institutional responses

Source: (L. Lebel et al. 2011)

Absence of Coordination among the stakeholders
 It is to be noted that the coordination among the stakeholders has got two main purposes:

- I. To review the quality of the evidence base and to outline knowledge gaps about the nature and scale of urban risk in low- and middle-income groups.
- II. To assess the policy implications for humanitarian preparedness, planning and response. It does so by analysing a wide range of academic and policy literature and drawing on a number of interviews with key informants in the field.

It is required to analyse the coordination gap among the stakeholders and how resilient a community is, whereby the least resilient areas are the most at risk. For example, the US Indian Ocean Tsunami Warning System Program (2007) developed a guide to address coastal hazards and reduce risk to vulnerable communities. The assessment process is intended to easily fit into the development plans of any coastal area (including urban), and highlights the gaps in resilience that can be addressed by the community together with government agencies, nongovernmental organisations (NGOs), private sector and other stakeholders. There have

also been a growing number of studies highlighting those cities most at risk to specific hazards and the impacts of climate change (WWF 2009; Nicholl et al., 2008).

12 Research Gap

The Research has been organized in the following manner with chapter 1 giving a brief introduction, including the research framework, Chapter 2 reviews Literature review related to the different kind of barriers and its impact in both global and National Context, thereby establishing the Research Gaps and helping to frame the study. One of the major Findings was the Link between Poverty and Mobility which is almost common in all the barriers. There are many interrelated aspects of Poverty and one of them is Transportation, which determines the crucial links between housing and labour markets (Narayan, et al., 1999). It has been extensively studied how the poor struggle for their survival in Urban Areas through measures such as attaining tenure security for housing through patron-client relationship or by mobilizing the community for the right to shelter through different schemes. The concept of Urban Informality then comes into picture. It is being defined and based on various parameters such as Institutional Barriers, Financial Barriers, Technological Barriers, Infrastructural Barriers or as a system of Spatialized Practices such kind of Informality thrives in the Gaps generated by formalized Institutions such as Governments, Market and Societies. However Integrating the informal, Legal and planned sectors policy interventions might not necessarily solve the Problem. The Urban poor have adjusted to their own way of life, making use of such informalities, coming up with their own ways of mobility to provide access for themselves. Due to this Research Gap and other overlapping parameters such as social barrier, Economic barrier, Infrastructural barrier there is a need of the Vulnerability Assessment.

13 Analysis Methods

Vulnerability Assessment

Vulnerability is defined as “the degree to which a system is likely to experience damage from exposure to a hazard or stressor, where a hazard is a single event and a stressor continues over time” (Turner, et al., 2003). Vulnerability is commonly associated with poor economic and Health status, but has other overlapping factors such as occupation, housing, quality of public services, marital status, gender, Disability and ailments. (Ministry of health and Family welfare, 2017)

The Different criteria for measuring vulnerability are as follows:

- I. Physical Vulnerability : which includes persons/ Households who are vulnerable because of the residential location and type of housing. These include persons who are homeless, mobile (migrants), Living in kutcha/ temporary houses, shanties, facing Insecurity of tenure, quality of basic public services like sanitation, clean drinking water etc.
- II. Social Vulnerability : It is generally faced by people who are discriminated based on their social status, is Their caste, class, ethnicity, religion, gender, age, disability or illness etc. such vulnerabilities are faced by women, transgender, senior citizens, child headed households, disabled persons, Persons suffering from debilitating illness like HIV/AIDS, leprosy, TB, Mental Illness, Persons belonging to scheduled castes and scheduled tribes, migrant workers, religious minorities etc.
- III. Economic Vulnerability : It is basically faced by persons/ households who are without access to regular employment, susceptible to significant periods of unemployment, as well as those who face occupational hazards due to unsafe working environment

III. PROPOSALS AND RECOMMENDATIONS

14 Introduction to Disaster Risk Reductions

DRR in Short can be defined to be the “Concept and Practice of reducing disaster risk through systematic effort to Analyse and manage the causal factors of Disaster including through reduced exposure to hazards, Lessened vulnerability of People and Property, wise management of land and the environment and improved preparedness of the adverse events” (United Nations 2009). Primarily such strategies consist of Risk and Vulnerability assessments in addition to a large amount of operational abilities and Institutional capacities. The Barrier assessment of the critical Infrastructure, Socioeconomic facilities, effective use

of early warning system and the implementation of several categories of technical, scientific and other skilled abilities are important components of Barrier free cities.

15 Solution for Mitigation Action

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters,

Mitigation is taking action now before the next disaster to reduce human and financial consequences later.

In order to mitigate the risk of disasters, the following steps in the process of mitigation action are proposed:

- I. Reducing Natural hazard impact especially Floods, These Includes actions such as: Restoring Wetlands, Building Green Infrastructure, Improving the Forest coverage and green areas in towns and Villages.
- II. Protection against Hazards, These Include actions such as : Building Embankments and flood barriers, Repairing and maintenance of flood channels, Construction/ upgradation of flood shelters in risk prone areas, Construction/upgradation shelters/ sheds, bus stands with proper cooling provisions.
- III. Regulating land use, These Include Actions such as : Introducing Building Regulations, Removing Structures from High-Risk Zones, Retrofitting Existing Structures.
- IV. Raising awareness and preparedness, These Include action such as: Early warning system, Evacuation Plans, Outreach programs and Technical assistance program.
- V. Mitigating Residual Risk, These Include actions such as: Emergency Response Funds, Recovery Plans.

1.6 Nature Based Solution to reduce the Flooding Risk

Nature-based solutions (NBS), or "nature-based infrastructure" is an approach that uses natural systems to provide critical services, such as wetlands for flood mitigation or mangroves to reduce the impact of waves, storm surge, and coastal erosion.

Nature-based solutions, such as **conserving forests, Coastal wetlands and coral reefs**, can help communities prepare for, cope with,

and recover from disasters, including slow-onset events such as drought.

The nature based solutions, which helps to reduce the flooding:

CONSERVATION & RESTORATION OF COASTAL WETLANDS—Wetland restoration and preservation is an important component of a comprehensive flood protection strategy. Coastal wetlands on the floodplains along waterways can mitigate the impacts of floods by absorbing excess water and retaining it or returning it to the water table. Coastal wetlands serve as storm surge protectors when hurricanes or tropical storms come ashore. For example

– Preservation and restoration of Coastal wetland Lakes of brackish water (Salt and Fresh Water Mix) 1) Ashtamudi Lake, Kerala- 61400ha. (R) 2) Chilika Lake, Orissa- 1,16,500ha- Largest brackish water lagoon in Asia for the flood protection strategy.

1.7 Sustainable Urban Drainage System

Sustainable Urban Drainage System also known as SUDS is designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges. It

is often used in urban centres or other areas where rainfall is prevented from entering soil or

water sources by impermeable surfaces. There is a need to consider three types of events- Normal rain events design storms and cloudbursts. It is Particularly efficient for solving everyday rain challenges but can also substantially solve problems related to design storms and cloudbursts. Faced with rapid urbanization and Increasing Population Growth, measures such as rainwater harvesting and recycling can allow a city to maintain its overall water balance.

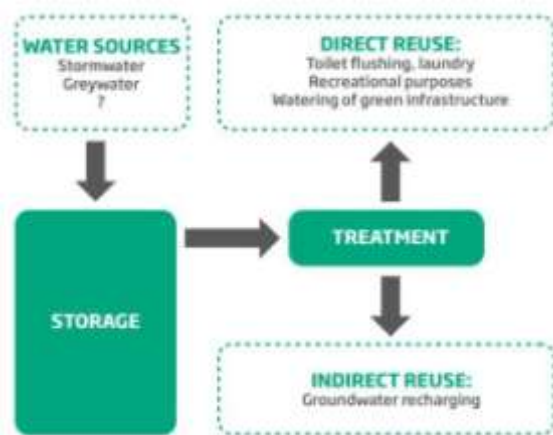


Fig:3.4 Using SUDS for Recirculation of Rainwater

IV. WAY FORWARD AND CONCLUSION

This study set out to understand the main features of community flood resilience in urban settings. The findings have important implications for guiding the development of urban flood resilience strategies, particularly in terms of resource allocation and priority settings. This study can help decision-makers to identify the potential partnership glue factors by better understanding the commonalities and differences between the barriers. Preparedness Planning establishes the capacity to respond to a range of different disasters

that may affect the region through the establishment of a broad set of preparedness measures for example this may include measures such as early warning systems, Hazards risk and vulnerability assessment, capacity building of communities, creation, maintenance and stockpiling of humanitarian supplies and goods for effective implementation of plans. It is crucial that all participatory actors must be significantly involved in the development process. Some of the preparedness and awareness measures are as follows:

Table 2 Parameters for Flood Resilience and its management strategies

Description	Activity	Responsibility	Parameters
Understanding Disaster Risk Preparedness	Floodplain Mapping/ Zoning	Translates Flood Data into operable maps that communicate risk and the consequences of current and forecasted Flooding.	Solutions can be achieved for both Technological Barrier, and where there is absence of Robust Forecasting Techniques.
	Establishment of Early Warning System	Coordinate with IMD in setting up EWS	Solutions can be achieved for both
	Hazard Risk	Undertaking HVRA as	socio-economic

	vulnerability assessment	Part of Preparation of revisions of DM plans periodically	barriers and Institutional Barriers
Capacity Development to mitigate Residual Risk	Awareness Generation	Promoting the use of insurance for risk transfer	Solutions can be achieved for both Social Barrier and Municipal Barrier.
	Community Based Disaster Management	Strengthening ability of communities based on multi hazard approach for managing and coping with disasters	
Establishment of Resilient Cycle Tracks, Rain Gardens	Basically for the cost benefit factors thorough reduced need of repairing potholes	Better Infrastructure for such tracks also encourages cycling and can enable probable modal shift.	Solutions can be achieved for Infrastructural Barriers, Social Barriers and also Socio-economic Barriers.

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