National Institute of Urban Affairs

11th October 2018

Key Recommendations from the Consultation Workshop on 'Urban Flood Resilience'

Ministry of Housing
and Urban Affairs
Government of India

NIUA
National Institute of Urban Affairs

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Introduction

The scale and pace of urbanization in India is unprecedented. Cities being engines of growth are estimated to support more than 40% of the country's population by 2030. National programs like Smart Cities and AMRUT focus on improving city infrastructure and service delivery to ensure that cities develop in a sustainable manner creating a livable environment for its citizens. Given the significance of India's urban development, building urban resilience plays a key role in safeguarding the interests of citizens and urban investments. Disaster like flood affects the physical infrastructure resulting in loss of lives and economic losses. The 2014 flooding in Guwahati affected over 42 lakh people reporting Rs.95 crore loss and Rs.129 crore in repairing critical infrastructure after floods. More than 300 people lost their life in the 2014 Srinagar floods and the infrastructural damage was estimated to be Rs. 6,000 crore. The Chennai floods in 2015 resulted in the loss of more than 280 lives and Rs. 9,800 crore damage to infrastructure.

At a parallel front, there have been considerable efforts initiated at both the national and regional level to better manage urban floods. For example, National Disaster Management Authority (NDMA) has prepared national disaster management guidelines for managing urban floods. The Town and Country Planning Organization (TCPO) has prepared Standard Operating Procedure (SOP) to help cities manage floods. Indian Meteorological Organization has come up with mechanisms for providing improved cyclone and city level flood warnings. Also, some cities have developed detailed city disaster management plans and early warning systems. Nevertheless, in the context of future climate variability there is a need for coordinated action to build city resilience for disasters in general and urban floods in specific.

The various missions of the Ministry of Housing & Urban Affairs, especially the Smart Cities Mission and AMRUT, can be leveraged to innovate solutions and mainstream them into urban planning, development and management. Also, capacity building efforts and deployment of new technologies can further aid the effort. However, the challenge of achieving this goal at scale across the country needs to be addressed and effective strategies need to be devised.

To scale up actions and help mainstream urban flood resilience across all Indian cities, the National Institute of Urban Affairs (NIUA) organized a high-level consultation. To deliberate on various themes and to capture relevant recommendations, world café format discussion was adopted. The key recommendations were collated and presented before the Honorable Minister of State (Independent Charge) for Housing & Urban Affairs, Shri Hardeep Singh Puri.

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Key Recommendations

A. Urban Early Warning System

The discussion focused on what cities need to implement and maintain Early Warning Systems (EWS), specially focusing on data needs, technical needs, and administrative and financial needs. The entry points for EWS under national missions such as the Smart Cities and AMRUT were also deliberated.

1. Data needs

1.1. Most of the data required for the EWS can be categorized under 'meteorological' and 'hydrological'. In order to develop effective local area EWS, a denser network of monitoring stations for both categories is required across the country.

1.2. To meet the meteorological data needs at finer resolutions, Automatic Weather Stations (AWS) may be considered. They are easy to install and not very expensive (< Rs. 50,000). Satellite based information and radar estimates of rainfall are other potential alternatives.

1.3. For cities located on the banks of river, or through which rivers flow, river discharge data is very crucial. This is required for both early warning as well as flood forecasting (fluvial floods). For most rivers, this data is not always available on a consistent basis. A network of sensors and other technologies need to be deployed to address this gap.

1.4. Certain locations in cities are more prone to flooding (hotspots) than others. These should be mapped and all the relevant information about these should be disseminated to the citizens.

2. Technical needs

2.1. It is very important to develop a systems understanding of the flooding phenomenon. Therefore, floods in cities should not be treated in isolation. Instead,

its linkages with the catchment (basin) must be acknowledged, and studied, to be able to arrive at holistic and sustainable solutions.

2.2. A precursor to early warning is assessing the flood risk. The risk would be a function of vulnerability and hazard. A comprehensive flood risk assessment (that comprises maps of risk, hazard and vulnerability) should be carried out for all cities, which can then form the basis for EWS. It will be worthwhile to develop a Flood Risk Index (FRI) for Indian cities to present a snapshot of the threat posed by floods in the country.

2.3. EWS usually gives a few hours for emergency interventions to be carried out. It will be very useful if the EWS is complemented by flood forecasting models that provide a greater lead-time. The flood forecasting should provide information about flood depth, spatial coverage of floods, and anticipated damages in terms of life and property. There are good examples in Kolkata, Surat and Chennai, which have such integrated flood forecasting and EWS in place.

2.4. Early warning communications to the public must be standardized across the country. The colour-coded communications (e.g. 'red', 'orange') mean different things in different places, leading to ambiguity.

2.5. Technical capacities within organizations for EWS in fairly limited. A training needs assessment should be carried out to identify the gaps, and capacity-building programmes organized to plug those gaps.

3. Administrative and Financial needs

3.1. A comprehensive mapping of government agencies concerned with flood early warning must be carried out in cities. The mapping should clarify the role and responsibly of each of the agencies, which should form the basis for developing standard operating procedures for early warning. If required, local agencies should be incentivized to develop these procedures.

3.2. Establish a city disaster fund that will help set up an EWS, and periodically maintain it. The fund can be a separate external grant or earmarked within the existing city budget.

3.3. A dedicated web-based portal should be set up to present flood risk information, and other related aspects to the public. This portal must be up and running on a daily basis, irrespective of whether a flood is imminent.

4. Entry points for EWS under Smart Cities and AMRUT

4.1. Expand the scope of the National Urban Information System (NIUS) to all statutory towns, besides AMRUT and Smart cities. NIUS is a National Mission initiated by the Ministry of Housing and Urban Affairs in 2006 for generating multiscale

hierarchical urban geospatial database on thematic content using satellite, aerial and GPR techniques.

4.2. Leverage on, and promulgate, emerging technology. For example, the use of Smart Poles in cities is an effective way to collect real time data on major environmental and meteorological parameters required for EWS. Bhopal and Delhi (NDMC) have adopted smart pole technology successfully.

4.3. Flood related data and information should be linked with the command and control centres of Smart cities to have a centralized avenue for data interaction.

4.4. In addition to technical aspects, a robust EWS also includes social aspects, where stakeholders make timely use of the warning and respond accordingly. The involvement of citizens in the planning and implementation of EWS, therefore, cannot be overemphasized. It is important to identify champions among these groups of stakeholders, and bring them on board, in order to strengthen community engagement.

B. Urban Flood Resilience Plans (Normalcy)

The discussion focused on creating a repository of solutions that can be used to integrate flood resilience into planning processes, infrastructure development and preparedness. The recommendation points below are categorically illustrated with tried and tested city examples, where possible.

1. Master Planning

1.1. Planning and development authorities must include natural drainage basins, watersheds, rivers and other hydrological features in master planning. This requires an understanding of all systems through proper flood risk zonation and drainage basin maps.

1.1.1. Land use based planning is required to maximize environmental benefits.
1.1.2. Need to redefine planning zones/districts to match watersheds and not political boundaries.

1.2. Regional planning efforts are required as water systems transcend city/municipal boundaries.

1.3. Data from Integrated Command and Control Centers that are being developed in Smart Cities must be collected and properly collated to aid decision makers in policy making and plans.

1.4. Area Based Development in the Smart Cities Mission should be flood resilient and follow guidelines for resilient infrastructure design and flood management.

2. Infrastructure Development

2.1. Infrastructure development should be constructed with drainage and runoff estimates. For instance, Mumbai's infrastructure is being developed taking 20% extra rainfall in mind, and in Meenambakam, Chennai, cross drainage systems are being implemented to connect drains and increase capacity.

2.2. Design and resilience checklists for infrastructure are needed so that their environmental and social impact is fully understood and negative impacts are mitigated.

2.3. IPCC and climate change projections must inform infrastructure design.

2.4. Smart infrastructure can alert technicians of operational status and capacity.

2.5. Innovative infrastructure with multi-functionality is more resilient and should be used to reduce the impact of flooding. For example, underground car parking and roads are used as storage areas for excess water in floods in Rotterdam and a water treatment plant was installed at Porur Lake in Chennai to utilize the lake as a water source for the city. This reduced the lake levels, which allowed the lake to store excess rain water during the monsoon. Amother example is the current master planning team in Delhi is considering innovative storm water drainage options such as green roofs, to reduce runoff and potential flood impacts.

3. Waste Management

3.1. Sewerage and waste management systems must be designed to avoid the mixture of waste and storm water during high rainfall events. For example, Surat has covered open drains to prevent the mixing of waste with storm water runoff.

3.2. Decentralized waste systems are needed so that during flood events, if one treatment plant is not operational, others are still functioning.

4. Vulnerability Assessments

4.1. Specific reasons for vulnerability need to be identified, for instance blocked drains, absence of storm water drains etc., and appropriate action need to be taken. Flood action plans must be informed by sub-ward level vulnerability analysis. This will allow for evidence based interventions. For example

    4.1.1. Chennai government officials conduct location wise vulnerability analysis and mapping. This has led to the creation of local strategies catering to the risks for specific areas.

    4.1.2. Silchar, Majuli, Jorhat and Dibrugarh are conducting LIDAR analysis to understand disaster vulnerability.

4.2. Vulnerable communities within a city need to be identified and their capacity needs to be built to enable them to address floods on their own.

5. Emergency Facilities

5.1. Sites for emergency facilities (hospitals, shelters) must be identified and mapped.

5.2. Backup plans for emergency communication (satellite phones), operations and health services must be in place. Srinagar stored backup fuel supplies for ten days, which were used during the floods.

5.3. Water ambulances will be required post flood. Partnerships can be built in advance to serve this purpose.

6. Finance

6.1. Cities must allocate a separate budget head for disaster management for all relevant departments. This must not rely on funding from SDMA.

6.2. To ensure fiscal autonomy, a funds pool from relevant stakeholders or multiple cities in a region could be developed.

7. Training and Capacity Building

7.1. Training is required across all departments related to disaster management to develop skills for management of floods and resilience building.

7.2. Students should be engaged through coursework and offerings that promote the discipline of disaster risk reduction.

7.3. Interdisciplinary studies will help produce practitioners that have the capacity to build urban resilience.

8. Other

8.1. Cities must safely keep backups of documents and city records to ensure that data is not lost during floods. Ahmedabad issued a set of guidelines for banks that required lockers, ATMs and any cash storage mechanisms to be higher than the ground floor.

8.2. Mandatory health care and relevant vaccination programmes for ground workers.

C. Strengthening coordination among stakeholders

The theme discussion focused on ways to strengthen coordination among various government agencies and deliberated on ways to ensure efficient coordination between city authorities and other city stakeholders.

1. Coordination Centre

1.1. The Command and Control Centres having access to live information can take up the role of coordinating with various government agencies.

  1.1.1. Maps are beneficial for guiding preventive measures/actions. To aid this, cities need to be mapped on gis with various layers. This will enable intelligent decision support system.

  1.1.2. Web based applications can be used to share information between government agencies.

  1.1.3. Apps can be used to share live information on flood condition.

1.2. In the absence of a Command and Control Centre, a district control room can become the key coordination centre. An emergency coordinator at district level or the special deputy collector (in-charge of disaster management) can be the key coordinator.

1.3. In Assam, young professionals are selected and placed in every government agency to coordinate with the SDMA. Similarly, a coordination team can be set-up to collect information from all government agencies. The collected information can be analyzed for inter-government agency work (normalcy and during flood).

2. Coordination strategy

2.1. A mandate from the Ministry of Communications and Information Technology aiding the preparation of communication plan during disasters, especially flooding is required.

2.2. Maintaining communication channels during floods is key to effective response and relief measures and also a major challenge as all centralized systems typically fail in case of disasters. For instance, wireless was the only mode of communication that was functional in the recent Chennai floods. Therefore, decentralized communication channels with decentralized energy supply backups are needed. Mandatory storage of diesel for back-up purpose and raising of communication towers above ground needs to be enforced.

2.3. SOP for communication plan (normalcy, during flood and post flood) for each department with detailed role for each person is required. Need for an institutional framework to support the preparation of comprehensive communication plan.

2.4. It is mandatory for Disaster Management Authority to conduct regular meetings. To strengthen this coordination and to ensure they are carried out according to protocol, monitoring and evaluation of the meetings are required.

2.5. Coordination efforts between stakeholders is required to counter dam-induced flooding, possibly through an action plan. For example, the Surat Climate Change

Trust was developed after the 2006 floods that killed more than 120 people and cost the city Rs. 22,000 crores in damages. The damages were partially attributed to poor dam management that led to flooding. The trust now manages the dam to ensure water release is conducted strategically.

3. Coordination with Resident Welfare Associations (RWAs) and schools

3.1. Creating Awareness
 3.1.1. Mock drills for children at schools can be conducted. Schoolchildren carry this information back to their families and this method can be useful for creating awareness. The Municipal Corporation or interested NGOs can be identified to carry out mock drills. A network of schools (can begin with government schools) can be created to create awareness and to conduct mock drills.
 3.1.2. Community radio can be used to create awareness and to share live information on flood situation.
 3.1.3. Awareness on innovative ways to deal with flooding at home, schools, commercial enterprises is required.
 3.1.4. Awareness on health precautions to be taken post flood is required.

3.2. Last mile governance and management can be done through RWAs. RWAs in Delhi regularly coordinate with Municipal Corporation regarding maintenance of services. Purvi Delhi – coalition of west Delhi RWAs regularly communicate through whatsapp. Such systems can be identified and leveraged to create a coordination chain.

4. Training and capacity building to enable efficient coordination

4.1. Identification and capacity building of local level leaders who are below the top urban managers is important. Top urban managers may be reposted after few years and it will be beneficial to have a trained team or a trained expert available in risk areas all the time.

4.2. Identification and training of first responders from every ward. They can be the key coordinator on ground who will support in minimizing response time and helping in relief distribution.

4.3. Training to government officials on the use of CDMA phones and various other communication methods.

5. Engagement with all stakeholders post flood to prepare a quick strategic plan learning from the experience.

D. Urban Flood Management (During and post flood)

The theme discussion focused on highlighting the best practices within urban flood management, especially during and post flood. The following recommendations are based on the practical examples from Chennai, Mumbai, Coorg, Srinagar and Kochi floods.

1. During Floods

1.1. Minimizing time lag in response and relief is a key component for effective management during floods. It is therefore important to have robust inter-departmental coordination systems with a clear chain of command; SOPs; evacuation plans; and manpower, materials, equipment, ambulances, etc. on standby on a regular basis during and around the monsoon period, ready for immediate deployment/ mobilization.

1.1.1. Volunteers play an important role during relief distribution. A common centre where relief items are received, repackaged and distributed based on requirements need to be identified. Volunteers can easily coordinate through such centres.

1.2. First responders and disaster marshals from the community itself will help in minimizing response time during floods. It is equally important for the local community to know, who these marshals/ responders are, to be able to approach them in the time of disaster. This could be done through information dissemination during preparatory phase or some form of dress code, badges, caps etc.

1.3. Real time monitoring of situation using ICT-based surveillance systems, dashboards, apps, etc. can go a long way in quick and effective response, rescue and relief measures. Kerala rescue portal of Govt. of Kerala is a good example of such an initiative.

1.4. Appropriate arrangements for access to safe water and sanitation, medicines, medical support etc. is another important aspect that needs to be ensured during floods to minimize the risks of water-borne diseases and epidemics.

2. Post Floods

2.1. As seen from multiple practical examples including Srinagar floods, debris and carcass management has to be the first priority for minimizing water borne diseases and odor control. As has been learnt from Srinagar Experience (flood 2014) , once the flood level reaches a critical stage i.e. crosses 10 ft or first floor gets under the deluge, the life support infrastructure/commodities -kitchen /storage areas, and also the community /domestic septic tanks , soakage pits get intermixed . This results in an devastating deadly stench / offensive smell / that makes practically impossible, to carry on rescues and restoration work including removal dead animal carcasses, rotten food and other decomposable material. Liberal use of anti odour formulations like Sanitreet (for dry to semi dry

conditions) and herbocel (for liquid slurry like STP's) has been rewarding in terms of the results. For fast decomposing of buried animal carcasses at the higher elevations, active bio-agents like Bioculum is indispensable. Capacity building of the ULBs is highly recommended. Vaccinations of the workforce is the first call for launching rescues and restoration work. Availability of portable water through convenient method is advisable.

2.2. Missing and Found registers for rescue and rehabilitation measures. Kerala rescue portal of Govt. of Kerala is a good example of such an initiative. In Srinagar, Internet based services were not available for almost one month. Even SMS service was not restored after the mobiles started working. Disaster Resilient communication platform is a high priority and CDMA phones could be a possible solution.

2.3. Setting up of recovery fund and prioritizing critical areas and marginalized populations in rehabilitation and recovery, and in allocating and distributing compensation is important for addressing the most vulnerable first.

2.4. Learning from the disaster experience and initiating effort for better management in case of future flood situations:

2.5. Vulnerability Mapping and risk profiling – mapping of vulnerable hotspots, populations and infrastructure assets for risk reduction, preparedness and community resilience building. MIT's urban risk lab is a good example of such an initiative.

2.6. Systems – SOPs, evacuation plans, and inter-departmental task forces with clear chain of command and coordination channels, preferably headed by apex level authorities at the state level – CM or CS.

2.7. Capacity building – Augmenting skilled manpower for response, relief and recovery measures, building capacities of local communities (first responders and mock-drills), leadership building to manage flood situations.

2.8. Promoting social entrepreneurship and community engagement for flood management – identification of disaster wardens/ first responders in communities, promoting social entrepreneurship and role of private sector in flood resilience. For instance, a joint initiative by Fortis Hospitals and Uber in Delhi-NCR was launched in 2017 for providing reliable rides in case of medical emergencies. Similar initiatives can be very useful for risk reduction in flood situations.

2.9. Identification of resources –financial and non-financial – ready to be mobilized in flood situations.

2.10. Setting up and promoting flood insurance measures for home and property can go a long way in rehabilitation and recovery of the affected communities. Legal

protection by way of associating the legal authorities in creating awareness and sensitivity. The judgements of the division bench headed by Justice Kumar, during and after the flood, Srinager 2014, have been globally reported and can be referred.

2.11. Directive/ guidelines for city level functionaries from MOHUA – This will help in mainstreaming flood resilience measures in urban planning and governance processes. The guidelines could also be included as part of the reform agenda under smart cities and AMRUT to ensure enforcement.

2.12. The Srinagar model of monitoring, coordination, supervision and direction (rescues, relief and restoration) may be followed during the Urban flood situations. It was headed by the Chief Minister and for one complete month two meetings (without break) were held daily at 9 am and 7 pm in the evening. At 9 am meeting the review of the happenings and developments of the night operations was undertaken, while in the evening meeting at 7 pm, operations and derv elements of the day, was deliberated and decisions taken. These was virtually a state cabinet meetings attended by all CABINET MINISTER , CHIEF SECRETARY, Union Home Secretary (first 10 days), DGP, GOC 15 core, Regional Airforce Chief, All Principal Secretaries, state Intelligence Chief, Divisional Commissioner, Commissioner SMC , VC LAWDA, All Chief Engineers, including irrigation and flood control.

2.13. Providing of legal and administrative framework for rebuilding of the collapsed infrastructure, commercial properties and homes.

2.14. From the Srinagar experience, it was highlighted that dewatering in the post flood scenario becomes a huge challenge because many low-lying areas trap huge water volume and without any any outlets. Special high capacity pumps had to be airlifted and at number of place, wide road cuts were given to make way for water flow into nearest stream and river. Intercity city and outside state linkages have to be strengthened by way of capacity building and exchange of men machinery, through formal arrangements between stakeholders including manufacturers and corporate houses.

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Consultation participants

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To support the Ministry of Housing and Urban Affairs (MoHUA) in scaling up actions and help mainstreaming urban flood resilience across all Indian cities, the National Institute of Urban Affairs (NIUA) organized a high-level consultation on 'Urban Flood Resilience' on 11 October 2018. More than 30 experts from key developmental organizations including Ex- City Commissioners who have addressed urban floods, Chief City Resilience Officer, Asian Bank Development, 100 Resilient Cities, DFID, AIILSG, National Disaster Management Authority, Oxford Policy Management, Tata Trusts, IIT Delhi, IIT Bombay, GIZ, Indian Meteorological Department and Town and Country Planning Organization participated in the workshop.