Urban Risks and Resilience in India

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Summary

- Urban risk needs to be understood in the context of all socio-economic, political and environmental processes that manifest risks in urban areas, and not simply in the context of natural hazards. Indian policy and programmatic priorities are currently focused only on hazard-prone areas, and not on areas where vulnerabilities or exposure are higher or capacities to cope lower.
- Specific urban risks are not understood as well as those experienced or perceived in rural areas, e.g., climatic risks such as droughts still focus on rural areas and agricultural productivity[1] and not on access to water or water quality in urban areas.
- Emergency response is preferred over pre-emptive risk reduction. A case in point is the existence of a National Disaster Response Fund as against a National Disaster Mitigation Fund.
- All hazards are dealt with individually by distinct departments at different levels of governance, and there is a lack of a multi-hazard approach. Development Sector agencies (e.g., those working on poverty reduction, housing, water and sanitation, etc.) are still not integrating a risk reduction agenda sufficiently in their planning practices.
- There is a dearth of a diversity of and access to financial systems (e.g., low insurance penetration due to lack of comparable data) to cope with disaster conditions that could help rebuild better.
- There is a need to understand the distinct components of risk—hazard, vulnerabilities, exposure and lack of capacity to respond—as drivers of risk concentration in specific geographies, in order to direct relevant policy and risk reduction practices, and for risk reduction to be understood as an integral aspect to achieve sustainable development.
- Synergies need to be found between the four International frameworks for a consolidated Post-2015 Agenda for Resilient and Sustainable Development, and multiple actors need to work in partnership to achieve this.
- Data collection, monitoring and long-term evaluation systems need to build at the local government level for long-term sustainability outcomes of the various interventions made.

Background

By the end of 2011, 468 cities in India had a population higher than 0.1 million with most being exposed to multiple hazards, specifically earthquakes, cyclones, storm surges, droughts, floods and fires which often occurred simultaneously. Growing concentrations of people and built and economic assets in cities is increasing their propensity to disaster risk. Access to services and resources is becoming increasingly contested, worsening people's vulnerability and capacities to cope. Indeed, Indian cities are some of the more vulnerable and high-risk cities in the world (IFRC, 2010).

Despite sufficient evidence presented by the International Panel on Climate Change that there exists a strong relationship between changing climate and increasing

[1]

http://imd.gov.in/section/nhac/wxfaq.pdf

frequencies and intensities of hazards (IPCC, 2014), the level of preparedness for such events in developing countries like India is still very low (IAAD, 2012). With limited resources available to direct towards planning and resilience building, developing economies like India end up prioritising rehabilitation and rescue in the face of an event, over risk mitigation and preparedness. Lack of data, limited access to technology and lack of technical and institutional capacities makes directing informed action difficult. These challenges and poor management makes cities the locus of large- and small-scale disasters. The percentage of life and property loss is rising every year with grave consequences for the survival, dignity and livelihood of individuals—particularly the poor—and poses a severe setback to hard-won development gains. Public expenditure for immediate relief comes from a separate National/State Disaster Relief Fund, but the long-term effects of disasters on socio-economic conditions can be taxing on the budgeted social sector expenditure in successive years, making preparedness and mitigation even more pertinent.

Besides, it is extremely difficult to reduce exposure, particularly in cities where already existing concentrations of people and assets can neither be 'reduced' nor can the hazards be 'redirected' easily through hazard mitigation (e.g., changing river course). Appropriate policy directions and programmatic approaches in line with the recent international commitments to reduce vulnerabilities and improve capacities could help India achieve risk reduction and sustainable development.

After Habitat I in Vancouver in 1976 brought focus to urbanisation and its challenges as a development process for the first time, Habitat II in Istanbul in 1996 laid out a mandate for 'Adequate Shelter for all' and 'Sustainable human settlements development in an urbanising world'. While the Millennium Development Goals (MDGs) adopted in 2000 did not have a direct focus on reducing disaster risk or mitigating climatic impacts, they did progress in mandating reduction in vulnerabilities (extreme poverty, health, housing) as well as improving capacities (education, health). Much of the improvement in human development and data collection frameworks and systems could be attributed to these goals.[2]

The Hyogo Framework of Action in 2005 was a huge step forward in integrated framework for disaster risk reduction, where importance was given under that to preparedness and response as well rehabilitation. The more recent Post-2015 development include the Sustainable Development Goals (SDGs), Sendai Framework for Disaster Risk Reduction, the Paris Climate Agreement and the New Urban Agenda. While these individually define an actionable mandate for risk reduction, they are a lot more comprehensive if seen together. The challenge is in enabling institutional arrangements, finances and capacities to deliver integrated development and disaster risk reduction.

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        https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3180952/

Disaster as an indicator of lack of development

Disasters were traditionally understood as natural and as an 'act of God', but with improved research and understanding of the various manifestations of everyday risk (Bull-Kamanga et al., 2003) in urban areas owing to growing vulnerabilities, limited capacities to cope and increasing exposure of both people and economic assets, the policy focus has shifted globally from response to risk reduction. Despite the global move from a hazard-centric response approach to a more holistic risk reduction approach, India's policy, infrastructure, capacity and financing still prioritises emergency response and rehabilitation.

It is also due to this approach that risk is perceived to be higher in areas that are more exposed to extreme hazards –the Himalayan region, the Indo-Gangetic flood plains and the coastal areas, and less so in poorer states where vulnerabilities are inherent or capacities to respond low. While some of this risk is within acceptable limits—that could be dealt with locally and even at state level—there are risks that are beyond the capacities of governments, communities and other domestic and international actors to act upon. It is this excessive risk that often makes hazard impact into a disaster. Therefore, the policy and programmatic focus needs to move from the idea of 'disasters' to the concept of 'risk' which is a composite of hazards (climatic and non-climatic), vulnerabilities, exposure and capacities (Jain & Malladi, 2016).

How Chile survived a higher-intensity earthquake than what occurred in Nepal in 2015

The April 2015 Nepal's Gurkha Earthquake of magnitude 7.8 Mw and 15km depth killed over 9000 people and left the nation with a massive setback of over $10 billion (amounting to about 50 per cent of its annual GDP), whereas a much higher earthquake in Chile with a magnitude of 8.3 Mw and 20km depth in September 2015 left only 14 dead and minimal losses. While most losses in Kathmandu could be linked to poor planning, high densities of people, poor buildings and lack of preparedness, Disaster loss mitigation in the case of Chile is credited to its significant learning over the last few decades, rigorous building codes, evacuation systems and investments in preparedness.

Where is high risk concentrated in India, and why?

Jain and Malladi attempt to understand where urban risk is concentrated and the various causes of such concentration in order to direct suitable action in those areas by analysing composite risk in urban India, and showcasing the disaggregate causes of such a concentration (Jain & Malladi, 2016).

About 76 per cent of the Indian population is exposed to high-to-medium hazard risk, of which nearly 30 per cent live in the 0.1 million plus cities including many small and medium-sized towns (Jain, Jigyasu, Gajjar, & Malladi, 2015; Jain & Malladi, 2016). One of the distinct features of the Indian economic transition has been the growth of cities that concentrate population and economic activity. Along with that is also an increasing proliferation of informal settlements that are characterised by poor access to basic services and limited employment opportunities creating systemic multi-dimensional vulnerabilities.

Cities suffer an imbalance of regular functioning when faced with extreme climatic or non-climatic impacts. In developing countries such as India, the demands of urbanisation have constantly increased the gap between developmental outcomes and the growing needs of people. State and non-state actors have been responding to these ongoing challenges, but the few developmental gains made are possibly reversed at the time of these extreme events. While planning and regulations could play a big role in anticipating future risk and mitigating it, in many cases planning decisions taken towards short-term risk reduction could also accumulate risk for the people and the cities in the future. We argue here that risk is concentrated in urban India for the following reasons:

1) ***Cities are accumulating exposure***

   a) ***Cities agglomerate people and economic output in small geographies***: India's 100 most populated cities account for approximately 16 per cent of its population, produce 43 per cent of its total output and occupy 0.26 per cent of the land (Revi et al., 2011).

   b) ***More built and other physical assets in urban areas per household than in rural areas***: While increased assets may increase households' exposure to hazards such as earthquakes and floods, it may also be seen as a proxy for capacities to cope and financial ability.

   c) ***Increasing migration into cities***: Rural to urban migration in India has been increasing over the past 50 years (Revi et al., 2011). Yet, it has been observed that non-migrants in cities are more likely to be poor, than rural to urban or urban to urban migrants (Kundu, 2007).

2) ***Vulnerabilities of various forms are increasing in cities:*** The absolute number of urban poor is increasing and the extent of informality in urban employment is as high as 70 per cent (Chen & Raveendran, 2012). Forty per cent of slum dwellers live in the million-plus cities and 80 per cent of the urban poor reside in cities with populations less than one million (Revi et al., 2011).

3) ***Urban areas are not just victims, but also contributors to increasing environmental burden***: Cities in India are consuming forests, agricultural lands and water resources (Sudhira, Ramachandra, Raj, & Jagadish, 2003) causing stress on ecosystem services and contributing to air pollution and heat island effects

(Ramachandra & Kumar, 2010). Infrastructure and planning choices are also creating risks in the future.

Cities also offer opportunities for risk reduction

India is increasingly becoming urban. By 2050, more people in India will live in urban than rural areas, of which 138 of the 6000+ cities will have populations above 500,000 people (World Urbanisation Prospects).[3] With people increasingly living in cities, urban densities are bound to increase, and with them other assets and sources of economic output. The 2011 Census estimated that there are 8,000 urban centres and over 660,000 villages. With this growing urban share, risk will begin to concentrate in urban areas owing to the fewer numbers of such locations. It can be argued that bringing attention to these areas can reduce future risk, especially small and medium-sized towns which are yet to grow. Exiting institutional systems and planning instruments like zoning regulations and bye-laws could be put into practice to assist in mainstreaming risk reduction in urban areas.

What are the current gaps in practice and policy frameworks in India?

There are **theoretical gaps** in the understanding of risk as a composite of not just external hazard factors, but also of intrinsic characteristics which may act as vulnerabilities or capacities for systems, people, the economy, and built environment in coping with external forces. Urban risks (those that are created due to the urban processes and lack of resources or access to them) are not very well understood or enacted upon. Even hazards such as water scarcity are still understood in the agricultural/rural context and not recognised as disasters or risks in the urban. More in-depth work on this is required to define these risks, and thereby identify actions and actors.

1) Although the National Disaster Management Act 2005 and the National Disaster Management Policy 2009 both signal a shift towards **a more comprehensive risk reduction approach,** in practice, legal frameworks and funding are still limited to rescue and response and not risk reduction and preparedness. The imagination of holistic development which is resilient and sustainable is currently missing.

2) A National Disaster Response Fund (NDRF) was constituted under the National Disaster Management Act, 2005 (NDMA). It is managed by the National Executive Committee (NEC) to meet the expenses for emergency response, relief and rehabilitation, in accordance with guidelines laid down by the Central Government in consultation with the NDMA. While the Act also recommends a **National Disaster Mitigation Fund** (NDMF) exclusively for mitigation, neither has it been constituted nor have the modalities of its sources and uses of funds formulated.

[3]
       http://esa.un.org/unup/unup/p2k0data.asp as on 21 October 2016

3) There are several gaps in **planning decisions and processes**. Development location decisions are still based on political economy and/or ease of engineering, and are not directed by hazard exposure. Project and plan approval processes lack risk-mitigation expertise and clearances. Building bye-laws are still limited to a few hazard risks such as earthquakes, but not to others such as cyclones, drought and floods, which in many cities form a bulk of the hazard risk. The processes are still specific to certain hazards and not built on a multi-hazard approach.

4) United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP have long played a key role in bringing local and state level capacities for risk reduction and environmental mitigation, with vulnerability and poverty reduction at the core. They also bring with them knowledge from different parts of the world, and act as institutional memory for local governments. Some **private and non-state actors** such as Rockefeller Foundation have pioneered the building of resilience strategies under the Asian Cities Climate Change Resilience Network (ACCCRN), but the implementation of these strategies requires greater **public sector and community level participation**. Rockefeller Foundation's 100 Resilient Cities Programme lacks precedence of action, and needs to be made more contextual not just in its objectives but also in its **institutional design**. Actors such as ICLEI with agendas of achieving sustainable cities through better management of global environmental goods, municipal planning, transformation of infrastructure and policy innovation can be more involved to bring international experiences to cities.

5) An important part of resilience is how well urban societies are able to cope with the financial consequences of a disaster, which includes access to the requisite funding for relief, recovery and reconstruction (Sundermann, Schelske, & Hausmann, 2014). **Risk transfer through insurance** is one such means; yet, the gap between economic and insured losses is large because insurance and bank penetration is relatively low. Risk sharing is skewed, with more risk resting with the public (authorities and users), primarily due to disproportionate risk-sharing clauses in the contracts between public and private entities to deliver large-scale infrastructure projects (Jain, 2015). At present, insurance instruments do not provide an adequate alternative to government funding for disaster relief, especially for high frequency-low intensity disasters. For low frequency-high impact disasters, financing through insurance mechanisms may be feasible and must be enabled through market and regulation.

6) **Perception of potential risk** by the people and authorities is widely underestimated primarily because of a lack of recent experiences. Often it is driven by the lack of choice to avoid risks due to other socio-economic and political reasons. Inclusions are being made in master plans for risk reduction, but **technical and institutional capacities** in development authorities are still inadequate. There is a severe lack of expertise on critical infrastructure and its protection. Often lack of hospitals or the lack of access to them, and electricity and transportation disruptions exacerbate the risk impacts after an event. Severe **data gaps** add further road blocks to adopt risk assessments. Technical information about all hazards such as their probability of occurrence is not available, and

hence is not incorporated in planning. **Economic models to assess potential avoided losses** of first, second and third order are not easily accessible to institutions and are not put into practice.

What are the processes that could guide the national, state and local actions for risk reduction?
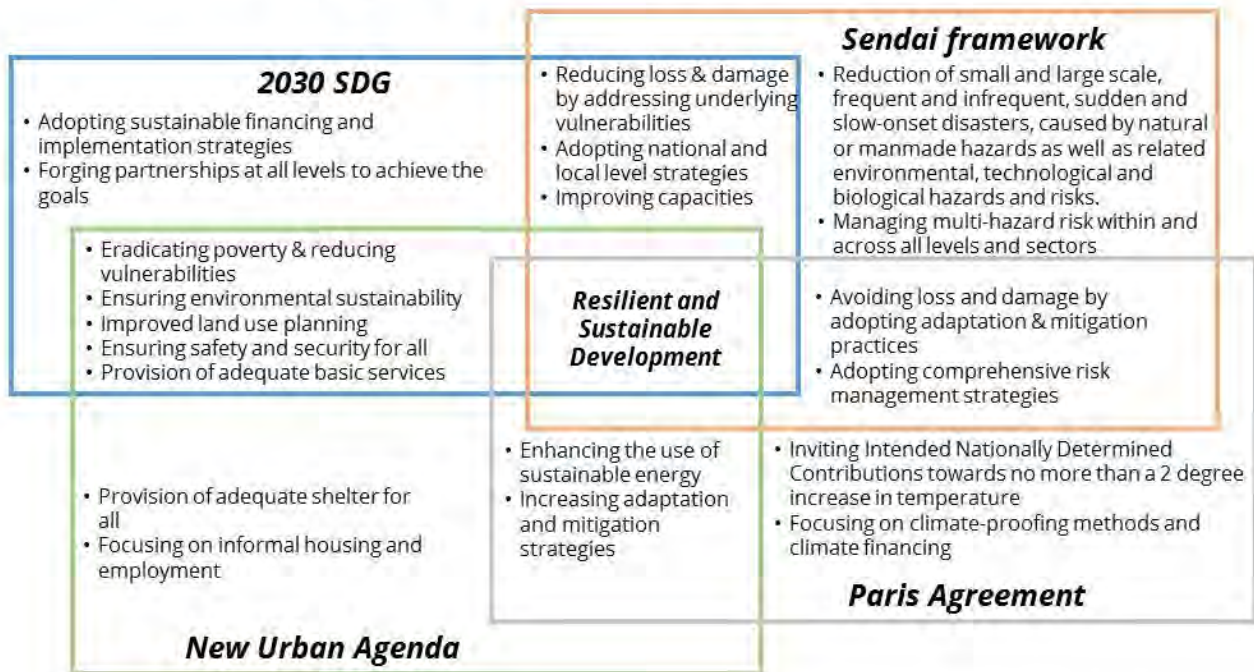
Recent international debates, processes and commitments such as the Sendai Framework and Paris Climate Agreement on reducing risks and climate commitments along with the 2030 Goals, followed by the Habitat III New Urban Agenda could offer a framework to achieve not just reduction in loss and damage and disaster risk, but also a long-term transformative development for countries such as India, but each have their limitations as is summarised below:

International frameworks for Action	Suitability analysis for action to achieve Sustainable Development, Resilience Building and Risk Reduction
2030 SDGs Agenda	• There is no stand-alone goal for disaster risk reduction unlike that for climate action (Goal 13). This has its own positives and negatives to drive action. Risk reduction can be understood as mainstreamed in all sustainable development practices, particularly in the urban (Goal 11) where SDGs aspire for cities to be resilient. But at the same time, the unique nature and conditions for disaster risk are not understood or highlighted for action, and hence could be diluted. • There are many targets that aim to reduce risk/build resilience either by focusing on exposure and reducing vulnerability of the poor, aiming to ensure resilient infrastructure and practices or improving awareness and adaptive capacities. (See Appendix 1 for details) • Yet, the actionable indicators are few and limited in view with prominence given to post-disaster losses and preparation for response rather than pre-emptive action towards vulnerability reduction, sustainable reconstruction/planning to minimise or avoid risk. Although most of these indicators are required at the national level, and not from cities. It is difficult to judge the progress of many of these in the short term. Besides, data sources for many of the life loss and economic loss are insufficient/flawed (Mitchell, 2012). Most of these are also input/output-oriented rather than outcome-oriented (see Appendix 2 for details).
New Urban	• The New Urban Agenda (NUA) is a vision document to achieve a

Agenda (UNSG, 2016)	sustainable, equitable, safe, inclusive and resilient future for all people in all cities, but it lacks priorities and specific guidelines to help with implementation. • There are six thematic areas, 10 policy units and 22 issue papers that form the basis of this NUA of which the policy unit on 'Urban Ecology and Resilience' recognises the uncertain future ahead in the context of changing climate and increasing urbanisation, and brings attention to the '70% of urban infrastructure that will exist in 2030 that does not exist yet' as an area of opportunity.
Sendai Framework (WCDRR, 2015)	• This offers seven global targets that need to be developed into national and local targets and indicators. While four of the seven indicators focus on reduction of losses (lives, damage, economic loss and infrastructure), three are aimed at the adoption of national strategies for action, increased international cooperation and improved access to early warning systems (See Appendix 3 for details).
Paris Agreement (UNFCCC, 2015)	• While this was a landmark agreement between 191 nations on achieving climate change mitigation, adaptation and financing, this fell short of demanding INDCs towards a 1.5-degree Celsius future (needed as per scientific recommendations such as IPCC 2014). • It also lacks enforcing the commitments by the national governments

While there are gaps in each individually, together the four international frameworks could have synergies which can be understood as follows:

Post-2015 Agenda for Resilient and Sustainable Development

2030 SDG
- Adopting sustainable financing and implementation strategies
- Forging partnerships at all levels to achieve the goals
- Eradicating poverty & reducing vulnerabilities
- Ensuring environmental sustainability
- Improved land use planning
- Ensuring safety and security for all
- Provision of adequate basic services
- Provision of adequate shelter for all
- Focusing on informal housing and employment

Sendai framework
- Reducing loss & damage by addressing underlying vulnerabilities
- Adopting national and local level strategies
- Improving capacities
- Reduction of small and large scale, frequent and infrequent, sudden and slow-onset disasters, caused by natural or manmade hazards as well as related environmental, technological and biological hazards and risks.
- Managing multi-hazard risk within and across all levels and sectors

Resilient and Sustainable Development
- Avoiding loss and damage by adopting adaptation & mitigation practices
- Adopting comprehensive risk management strategies
- Enhancing the use of sustainable energy
- Increasing adaptation and mitigation strategies

Paris Agreement
- Inviting Intended Nationally Determined Contributions towards no more than a 2 degree increase in temperature
- Focusing on climate-proofing methods and climate financing
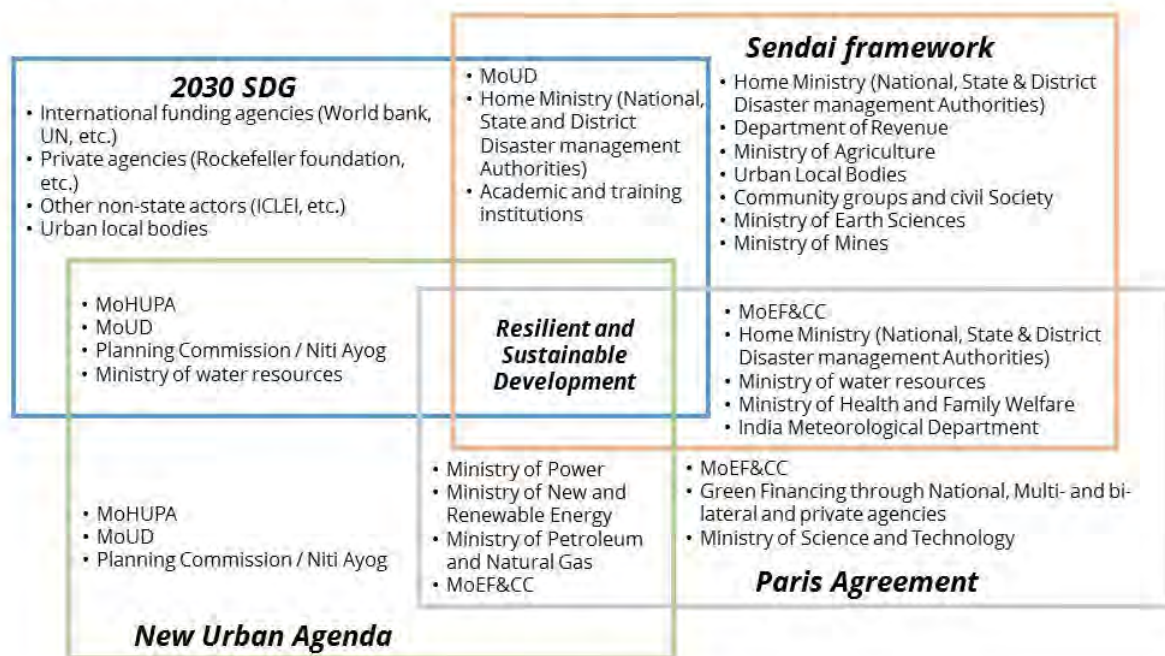
New Urban Agenda

Who can act, and how can disaster risk reduction, greater resilience and overall sustainable development outcomes be achieved?

The National Disaster Management Plan 2016 outlines a new Risk Governance Framework as noted below, and lists the potential lead central agencies as well as state agencies for each (NDMA, 2016):
1. Mainstream and integrate Disaster Risk Reduction and institutional strengthening
2. Develop capacity
3. Promote participatory approaches
4. Work with elected representatives
5. Grievance redress mechanism
6. Promote quality standards, certifications, and awards for disaster risk management

While all key central and state actors are linked with these actions, linkage with the Urban Local Body (ULB) is limited. The lead agencies must take a leadership role to create platforms for other key actors such as community groups, civil society and the private sector to engage and participate both in disaster prevention as well as recovery and response.

Mapping Actors for the Post-2015 Agenda for Resilient and Sustainable Development

2030 SDG
- International funding agencies (World bank, UN, etc.)
- Private agencies (Rockefeller foundation, etc.)
- Other non-state actors (ICLEI, etc.)
- Urban local bodies

- MoUD
- Home Ministry (National, State and District Disaster management Authorities)
- Academic and training institutions

Sendai framework
- Home Ministry (National, State & District Disaster management Authorities)
- Department of Revenue
- Ministry of Agriculture
- Urban Local Bodies
- Community groups and civil Society
- Ministry of Earth Sciences
- Ministry of Mines

- MoHUPA
- MoUD
- Planning Commission / Niti Ayog
- Ministry of water resources

Resilient and Sustainable Development

- MoEF&CC
- Home Ministry (National, State & District Disaster management Authorities)
- Ministry of water resources
- Ministry of Health and Family Welfare
- India Meteorological Department

- MoHUPA
- MoUD
- Planning Commission / Niti Ayog

- Ministry of Power
- Ministry of New and Renewable Energy
- Ministry of Petroleum and Natural Gas
- MoEF&CC

- MoEF&CC
- Green Financing through National, Multi- and bi-lateral and private agencies
- Ministry of Science and Technology

Paris Agreement

New Urban Agenda

What are the National Programmes that could integrate risk reduction practices for a more sustainable outcome, and how?

The National Action Plan for Climate Change (NAPCC) and its eight National Missions along with the recently announced National Disaster Management Plan 2016 (which is aligned with the Sendai Framework), already provide a framework of action for risk reduction. The latter is an ambitious plan and provides a short-, medium- and long-term action plan for various actors to work to achieve comprehensive risk reduction and thereby sustainable development. Other than these, mainstream development programmes such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Smart Cities Scheme, Pradhan Mantri Awas Yojna (PMAY) and Swachh Bharat Mission Urban (SBM-U) could play a leading role in building resilience in the identified cities and states through their programmatic designs as well as assessment, monitoring and evaluation frameworks, but currently give limited attention to resilience building or risk reduction.

Key National Programmes	Current gaps in recommendations with respect to sustainable development, resilience building and risk reduction
AMRUT	500 cities have been identified for improvement under AMRUT with a focus on the following: improving water supply, sewerage and septate management, storm water drains to reduce flooding, pedestrian and non-motorised transport facilities and green spaces by reforms management and capacity building.

	• The AMRUT guidelines recommend that each Service Level Implementation Plan (SLIP) be prepared by the ULBs to include resilience 'particularly for the vulnerable and the poor' as an aspect of design although with the 'primary purpose of covering all households with water supply and sanitation' only. • Changing climate and correspondingly increasing disaster risk, has not been recognised in the mission statement and guidelines for action.
Smart Cities Scheme	100 cities will be identified under this scheme 'to promote cities that provide core infrastructure and give a decent quality life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions and then for them to act as examples for other cities'. • While many of the features recommended could mutually benefit both vulnerability reduction and climate mitigation, these actions are not understood specifically in those contexts. • 'Sustainability' is understood only in the context of the environment or financial continuity of the proposal, but not as overall urban sustainability of socio-economic conditions that are inclusive and that which offer inter-generational equity. • 'Resilience' is also understood only in the context of extreme disaster events and not everyday risks.
PMAY	This Mission seeks to address the housing requirements of the urban poor using 'slum rehabilitation with participation of private developers using land as a resource; promotion of affordable housing for weaker sections through credit-linked subsidy; affordable housing in partnership with public and private sectors; and subsidy for beneficiary-led individual house construction/enhancement.' • The lands under consideration for housing redevelopment/development could be exposed to high-hazards or environmental risk but this is not often recognised at the time of planning. Therefore, additional structural and non-structural measures must be undertaken to ensure its stability. • The Technology sub-mission is charged with the task of incorporating 'green and efficient technologies including in the context of climate change' and 'deploying disaster resistant and environment friendly technologies', but it doesn't clarify how and in what time frame these challenges will be looked into. • While it recognises that untenable slums have to be dealt with 'other strategies available under Mission', it does not clarify the definition of 'untenable' and what these alternate strategies could be.

| SBM-U | This Mission aims to eliminate open defecation, eradicate manual scavenging, incorporate scientific solid waste management techniques, effect behavioural change and improve awareness of public health issues regarding sanitation. It is also slated to augment capacities of ULBs and create an enabling environment for private sector participation by 2019 in all statutory towns.
• Many of these actions could have vulnerability reduction outcomes by reducing many everyday risks to people's health and the environment, yet long-term sustainability of these interventions must be considered. |

Potential approaches for cities to act

(Derived from UNISDR's Ten Essentials for Local Governments for making Cities Resilient : An operational Framework from Sendai[4])

I. **Organise for Disaster Resilience**
    a. Establish and strengthen the local level institutional and coordination capacity
    b. Build alliances and networks at local, regional, national and international level
    c. Mobilise a legislative framework and action mechanisms for resilience
II. **Identify, Understand and Use Current and Future Risk Scenarios**
    a. Identify the most probable and most severe scenarios, including scenarios of future urbanisation and climate variability (in short-, medium-, and long-term)
    b. Make use of the knowledge from risk scenarios for development decisions
III. **Strengthen Financial Capacity for Resilience**
    a. Recognise the opportunities where building resilience contributes to a sound economic strategy
    b. Ensure a budget for investing in building long-term resilience
    c. Disseminate risk information and apply to development decisions
IV. **Pursue Resilient Urban Development and Design**
    a. Place urban planning and land-use management at the core of urban resilience
    b. Conduct systemic and specific vulnerabilities mapping
    c. Mainstream resilience into on-going urban master plan updates and sectoral strategies
V. **Safeguard Natural Buffers to Enhance Ecosystems' Protective Functions**
    a. Raise awareness of the impacts of environmental change and degradation of ecosystem on disaster risk
    b. Promote better management of critical ecosystems
    c. Strengthen existing ecosystem management based on risk scenarios assessments
VI. **Strengthen Institutional Capacity for Resilience**

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http://www.unisdr.org/campaign/resilientcities/home/toolkitblkitem/?id=1

a. Identify the specific nature of each vulnerability and map against the respective institutions
b. Build local capacities and strengthen participation in disaster management and resilience improvements
c. Ensure the consistency of data and disaster risk information among the stakeholders (including people, insurance companies, etc.)

VII. **Understand and Strengthen Societal Capacity for Resilience**
a. Establish well-equipped response units at local level
b. Integrate disaster risk reduction and resilience into formal education and other orientation programmes
c. Improve public education and awareness through dissemination of information through business sector and media
d. Build and maintain open-access data for disaster preparedness and response

VIII. **Increase Infrastructure Resilience**
a. Assess the capacity, adequacy and life-cycle of the critical infrastructure
b. Strengthen and retrofit the vulnerable infrastructure
c. Establish alliances with environmental managers and the private sector
d. Recognise the relevance of priority services and operations during and after a disaster

IX. **Ensure Effective Disaster Response**
a. Create and improve preparedness plans
b. Strengthen an early warning system
c. Upgrade the city's emergency response services

X. **Expedite Recovery and Build Back Better**
a. Ensure that recovery is undertaken for various aspects essential for a dignified life (shelter, food, water, communication, psychological needs, etc.)
b. Include the affected population in defining needs and recovery plans
c. Use recovery as an opportunity to build back better, but ensuring justice and human rights of the affected people
d. Seek resources, strengthen alliances and ensure sustainability

Appendix 1: Post-2015 SDG agenda select targets related to risk and/or resilience

o Building resilience of the poor (Target 1.5: By 2030, build resilience of the poor and those in vulnerable situations and reduce their exposure to climate-related extreme events and other economic, social and environmental shocks and disasters).

o Ensuring resilient agricultural practices (rural) (Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production; that help maintain ecosystems; that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters; and that progressively improve land and soil quality).

o Developing resilient infrastructure (Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure including regional and trans-border infrastructure to support economic development and human well-being, with a focus on affordable and equitable access for all).

- o Reducing number of disaster related deaths and economic losses (Target 11.5: By 2030, significantly reduce the number of deaths and people affected, and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters including water-related disasters, with a focus on protecting the poor and people in vulnerable situations).
- o Adopting integrated policies in line with the Sendai framework (Target 11.b: By 2030, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels).
- o Strengthening resilience and adaptive capacities (national) (Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries).
- o Improving awareness (Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning).

Appendix 2: Post-2015 SDG agenda select indicators related to risk and/or resilience

- o Reducing post-impact life loss (1.5.1 / 11.5.1 / 13.1.2: Indicators for measuring number of deaths, missing persons and persons affected by disaster per 100,000 people)
- o Reducing post-impact economic loss (1.5.2 / 11.5.2: Indicators for measuring direct disaster economic loss in relation to global gross domestic product (GDP) including disaster damage to critical infrastructure and disruption of basic services)
- o Promoting national level strategies (1.5.3 / 11.b.2 / 13.1.1: Indicators for measuring number of countries with national and local disaster risk reduction strategies)
- o Promoting city level strategies and implementation (11.b.1: Indicator measuring proportion of local governments that adopt and implement local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030)
- o Promoting national level awareness education (13.3.1: Indicator measuring number of countries that have integrated mitigation, adaptation, impact reduction and early warning into primary, secondary and tertiary curricula)
- o Promoting national level capacity building (13.3.2: Indicator measuring number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions)

Appendix 3: Seven global targets agreed in the Sendai Framework for action

- o Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005–2015;
- o Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 in the decade 2020–2030 compared to the period 2005–2015;

- o Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030;
- o Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030;
- o Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
- o Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030;
- o Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

References

Bull-Kamanga, L., Diagne, K., Lavell, A., Leon, E., Lerise, F., MacGregor, H., . . . Reid, H. (2003). From everyday hazards to disasters: the accumulation of risk in urban areas. *Environment and Urbanization, 15*(1), 193–204.

Chen, M.A., & Raveendran, G. (2012). Urban employment in India: Recent trends and patterns. *Margin: The Journal of Applied Economic Research, 6*(2), 159–79.

IAAD, (2012). Report of the Comptroller and Auditor General of India on Performance Audit of Disaster Preparedness in India. Ministry of Home Affairs, Government of India.

IFRC. (2010). World Disasters Report 2010–Focus on Urban Risk. International Federation of Red Cross and Red Crescent Societies, Geneva.

IPCC. (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York: Cambridge University Press.

Jain, G. (2015). The role of private sector for reducing disaster risk in large scale infrastructure and real estate development: Case of Delhi. *International Journal of Disaster Risk Reduction*, *14,* 238–55.

Jain, G., Jigyasu, R., Gajjar, S.P., & Malladi, T. (2015). Cities provide transformational opportunity to Reduce Risk Accumulation. RF-IIHS Paper on Indian Urban Risk and Resilience, 80.

Jain, G., & Malladi, T. (2016). Understanding risk concentration in urban India. International Conference on Urban Risk 2016, 43–51.

Kundu, A. (2007). Migration and urbanisation in India in the context of poverty alleviation. Paper presented at the International Conference and Workshop on Policy Perspectives on Growth, Economic Structures and Poverty Reduction, Beijing, China.

Mitchell, T. (2012). Options for including disaster resilience in post-2015 development goals. The Overseas Development Institute.

NDMA. (2016). National Disaster Management Plan (NDMP). Government of India.

Ramachandra, T., & Kumar, U. (2010). Greater Bangalore: Emerging urban heat island. *GIS Development, 14*(1), 86–104.

Revi, A., Idicheria, C., Jain, G., Anand, G., Sudhira, H.S., Seddon, J., . . . Srinivasan, S. (2011). Urban India 2011: Evidence. Indian Institute for Human Settlements.

Sudhira, H., Ramachandra, T., Raj, K. S., & Jagadish, K. (2003). Urban growth analysis using spatial and temporal data. *Journal of the Indian Society of Remote Sensing, 31*(4), 299–311.

Sundermann, L., Schelske, O., & Hausmann, P. (2014). Mind the risk: A global ranking of cities under threat from natural disasters. Swiss Re.

UNFCCC. (2015). Conference of the Parties Twenty-first Session: Adoption of the Paris Agreement.

UNSG. (2016). The Habitat III New Urban Agenda.

WCDRR. (2015). Sendai Framework for Disaster Risk Reduction 2015–2030.

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