



## HABITAT III ISSUE PAPERS

### 17 – CITIES AND CLIMATE CHANGE AND DISASTER RISK MANAGEMENT

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*(not edited version)*





## ISSUE PAPER ON CITIES AND CLIMATE CHANGE AND DISASTER RISK MANAGEMENT

The Present Issue Paper 17 on Cities and Climate Change and Disaster Risk Management for the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) is part of the focus area 5 Urban Ecology and Environment. The Issue Paper focuses on the climate change and disaster risk dimension in the urban contexts, and is complimentary to the broader discussion on urban resilience (#15) and resource efficiency (#16). The purpose of this paper is to explain how the improved understanding and progress in urban climate action and disaster risk management are influencing urbanization patterns. The paper aims to demonstrate how the principles of New Urban Agenda: compactness, connectedness, inclusiveness and integration, improve disaster risk management, contribute to climate change mitigation and adaptation, as well as unlock opportunities for sustainable development.

### KEY WORDS

Climate Change Adaptation, Climate Change Mitigation, vulnerability, disaster and climate risks, Greenhouse Gas (GHG) emissions, Short-Lived Climate Pollutants (SLCPs), low carbon development, disaster risk management, information and communication technologies (ICTs), risk-informed urban development and investment.

### MAIN CONCEPTS

**Adaptation** is the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects. (IPCCC AR5)

**Climate Change** refers to a change in the state of the climate that can be identified [...] by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, [...]. Article-1 of UNFCCC defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes. (IPCC AR5)



**Disaster Risk Management (DRM)** refers to “the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.” (UNISDR). A specific element of DRM, **Climate Risk Management (CRM)**, refers to a mechanism “to assist developing countries, especially those particularly vulnerable [or actors in these countries], in adapting to climate change by reducing climate-related risks and transferring these risks where necessary through financial mechanisms, [...]” (UNFCCC definition)

**Disaster Risk Reduction (DRR)** refers to “the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.” (UNISDR)

**Mitigation** (of climate change) is a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Mitigation (of disaster risk and disaster) is the lessening of the potential adverse impacts of physical hazards (including those that are human-induced) through actions that reduce hazard, exposure, and vulnerability. (IPCC AR5)

## FIGURES AND KEY FACTS

The world is becoming more urban - demographers estimate that 54 per cent of the world’s population now lives in urban areas. By 2050, world’s population is projected to raise to 66% (UNDESA 2014). As a consequence of this urban expansion, urban land area is expected to triple between 2000 and 2030 (from 400,000 km<sup>2</sup> to 1.2 Million km<sup>2</sup>), an enormous challenge & opportunity from the perspective of climate change mitigation, adaptation and DRM.

Cities emit significant and growing amounts of greenhouse gases (GHGs) - accounting for 37- 49 of total global GHG emissions (IPCC 2014). The International Energy Agency’s projections indicate that urban energy-related GHG emissions will rise from around 67% today to 74% by 2030 (IEA 2008). Another set of emissions, Short-lived Climate Pollutants (SLCPs) contribute to global warming, but also impact public health, food, water (CCAC 2015). The World Health Organization reports that in 2012 around 7 million people died due to exposure to air pollution (WHO 2014).



Urban areas are exposed to the impacts of climate change and disaster risks. In coming decades, climate-induced extreme events are expected to increase manifold (IPCC 2014). The World Bank (2013) projects that, in cities in developing countries, the number of people exposed to cyclone and earthquake risks will more than double from 2000 to 2050. The frequency & magnitude of disasters with large urban impacts is increasing. Past examples include the Thailand floods (loss of US\$45.7bn, [GAR 2013]) and Hurricane Sandy in New York (economic loss of US\$65bn), disrupting national and global business processes. Overall, the costs of disasters as a percentage of GDP have more than tripled in the last 40 years, with major disasters reducing real GDP per capita by about 0.6 per cent on average, rising to about 1 per cent in low-income countries, according to the International Monetary Fund.

Cities have started to take action – but more needs to be done: Today, 402 cities have publicly registered 1036 climate change commitments in the NAZCA platform (UNFCCC 2015), the 63 cities in the C40 network reported a total of 8,068 climate actions (C40 2014). However, a 2012 study on 894 major Asian cities revealed that only 29 (3%) had adopted climate change plans (CDIA 2012). In addition, more than 2,500 cities have signed up to the ‘Making Cities Resilient Campaign’, which addresses issues of local governance and urban risks. However, only about 300 of those cities reported progress on reducing disaster risks.

## ISSUE SUMMARY

Being the engines of socio-economic development, cities inevitably become concentrations of disaster risks and greenhouse gas emissions, in turn fueling Climate Change and its impacts. But some cities and people are more vulnerable than others. Per the Intergovernmental Panel on Climate Change (IPCC, 2014): “Much of the health risk and vulnerability to climate change is concentrated in [informal] settlements. Many cities include dangerous sites, such as steep slopes, low lands adjacent to unprotected riverbanks and ocean shorelines, and have structures that do not meet building codes”. Vulnerability to the impacts of climate change goes beyond mere exposure to extreme weather events. Many cities in developing countries “are caught in a ‘perfect storm’ of population growth, escalating adaptation needs and substantial development deficits created by a shortage of human and financial resources, increasing levels of informality, poor governance, environmental degradation, biodiversity loss, poverty and growing inequality” (IPCC 2014).

Disasters, many exacerbated by climate change, impede progress towards sustainable development, sometimes reversing years of advances in a single event. Evidence indicates that exposure of persons and assets in all countries has increased faster than vulnerability has decreased, with significant economic, social, health, cultural and environmental impact, especially at the local and community level (GAR 2015).



## Knowledge

Impacts of climate-related disasters are often high, dramatic, and above all, still to some extent unpredictable. Localizing, ground-proofing, and down-scaling projections through simulations, the use of historical as well as new data (co-generating knowledge) to feed directly into urban development decisions, remains an ongoing task. This necessitates collection and analysis of such data at various scales, as well as the sharing of such information among various decision-makers and stakeholders across levels of government and sectors.

While considerable advancements – through risk assessments, studies, emissions inventories - have been made in raising awareness and knowledge of urban populations' vulnerability and contributions to the impacts of climate change and disaster risk, a gap remains in translating this knowledge into practice, particularly informing planning local, regional and nations urban development policies and practices. Whether for adapting to gradual climate change or rapid onset disasters, better data access, information and service products are required. Application of information and communication technology (ICT) infrastructure can improve urban governance and enhance the resilience of urban services and systems, the built environment and infrastructure.

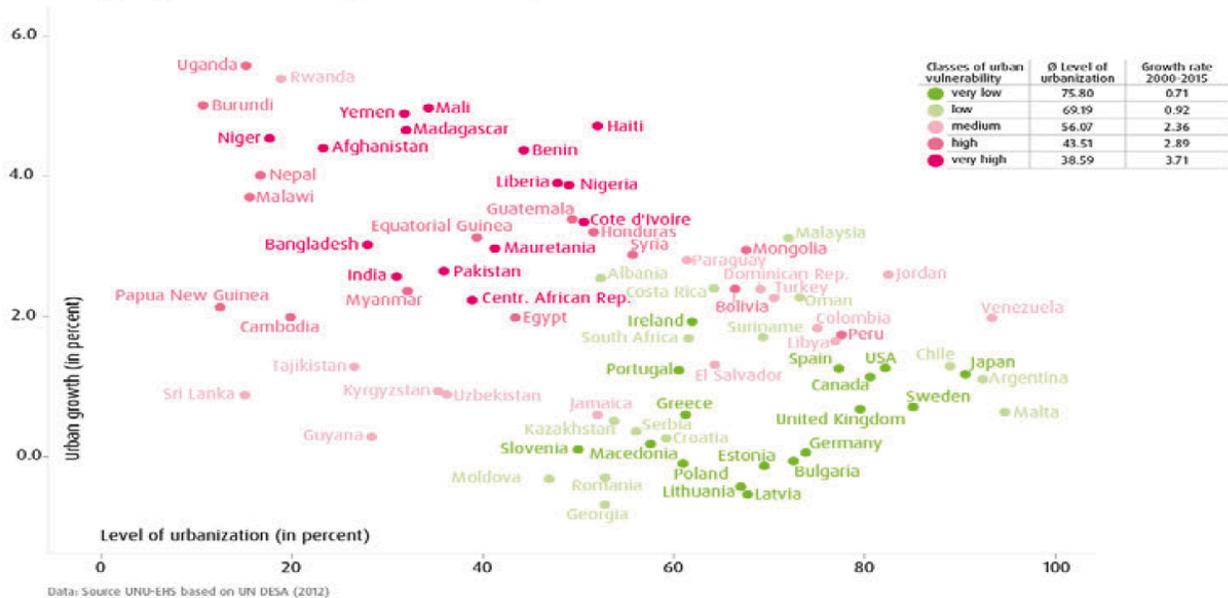
One has to look beyond climate/risk data for more optimal decision-making, for example the costs and benefits of various solution, including the so-called 'co-benefits' of alternative actions (e.g., improved health from improved air quality), as well as the costs and benefits of shifts towards renewables and less energy-intensive life-styles. Data on inequalities in the urban population should inform decision-making, to help reduce inequities in the wider context of risk/exposure assessment, preparedness and early warning vis-à-vis multi-hazards. Vulnerability to hazards in urban areas, is shaped not only by exposure and vulnerability, but also other factors including socio-economic variables (e.g., security of tenure, access to social safety nets, poverty, access to livelihoods and other urban inequities), availability of ecosystem services and so on. These critical interdependencies remain to be fully explored and understood.

While urbanization creates opportunities it also exacerbates risks, and the speed at which it is happening challenges our capacity to plan and adapt. Inadequate urban planning and ineffective governance can bring significant economic, social and environmental costs, threatening the sustainability of urban development. Illustration 1 suggests this to be most visible in countries that have low overall level of urbanization coupled with high urban growth (left upper corner), where institutions, policies, resources and capacities are still adapting to the new urban reality.



Illustration 1: Urban Vulnerability in different countries

**Where rapid growth faces high vulnerability**



Source: World Risk Report 2014

**Engagement**

Broad engagement and participation of all urban stakeholders (private, public, women, the elderly, the marginalized, civil society etc.) is necessary for an effective, accountable and transparent decision-making and implementation/action. Through global multi-stakeholder initiatives, such as the Compact of Mayors, UNISDR’s Making Cities Resilient Campaign, ITU’s Initiative on Smart sustainable Cities, C40 Cities Climate Leadership Group, the UNEP and UN-Habitat partnership for Greener Cities, and others, local government raising ambition, engaging in advocacy and providing leadership in climate action and disaster risk reduction.

Another area is engagement with the academic and private sector. Cities traditionally have served as laboratories of new technology and incubators for innovation. Today this creative environment is the space in which new climate friendly and resilience building technologies can be developed, replicated, and scaled up.



Cities and urban areas can also be vulnerable to the impacts of climate change related hazards that take place outside of their administrative boundaries, in the region and across the globe. Therefore, an ecosystem-based approach or river basin management approach to urban risk reduction is needed that accounts for upstream and downstream risk drivers.

## Policy

National Governments have recently reinvigorated commitments to reducing disaster & climate risk in an urban context, as demonstrated by the adoption of the Sendai Framework for Disaster Risk Reduction [see Issue Paper 15], which hands a clear role to local governments in mitigating and adapting to existing and emerging threats facing their cities. Similar discussions are underway under the Framework Convention on Climate Change leading up to the pivotal 21<sup>st</sup> Conference of Parties and a new global Agreement on Climate Change.

National governments are the lead actors in the global climate response. At the same time experience suggests that urban climate action is most successful when all levels of government have shared goals and mechanisms for vertical and horizontal integration to address disaster risk, sustainable development, environment protection and climate action. Global, national and local policy frameworks should enable and support city action. Such frameworks could follow a three-pronged approach incorporating legal, fiscal and planning components. Policy frameworks should not make local climate action an unfunded mandate. Instead, both international and national climate finance should be accessible for cities to accelerate urban climate action.

Urban institutional, policy, legislative and regulatory frameworks need to be reviewed to address the challenges posed by rapid urbanization, population growth, climate change and disaster risks. Ensuring engagement of all relevant stakeholders is necessary to engender broad-based support for risk resilience and climate action. This should take place within the broader context of sustainable urban development. Ensuring a risk-informed urban development paradigm, managing climatic impacts and disaster risks is critical to achieve the objective of resilient socio-economic development. Health and wellbeing of populations must remain as a guiding principle in disaster risk reduction plans and programmes. Coherence and integration of disaster responses, disaster risk management and climate change plans and institutional mechanisms should be continuously monitored and assessed in the context of sustainable development.



## Operations

In cities, climate change mitigation and adaptation, and disaster risk management converge and integrate within other urban planning and development actions. In the context of increasing global interdependence, concerted international cooperation, an enabling environment and means of implementation are needed to stimulate and contribute to developing the knowledge, capacities and motivation for disaster risk reduction at all levels, in particular for developing countries. Urban vulnerabilities are affected by the extent to which developers and planners understand risk and reflect it in their decision-making. Risk-informed decision-making, preparedness for response and recovery planning, operational readiness in government, business, communities entails assessing risks over different time-scales, as well as disseminating that information and incorporating it into development regulations, helps the world's leading cities to reduce disaster risks, including those that are climate-related.

Local governments must plan for low carbon and resilient urban development to avoid lock-in effects of unsustainable urban models. Such planning processes need to take into account different cities' peculiar emission and risk contexts, bearing in mind the urgent challenge of ensuring climate and risk informed development of the expected tripling of urban land cover. Local government activity in this arena is a testimony to the increased leadership of cities in climate and resilience action. Urban planning and development should support reducing emissions from major urban sectors such as transport, buildings and waste management, while at the same time building resilience of urban systems and built environment to withstand the adverse climate impacts and disaster risks.

## KEY DRIVERS FOR ACTION

There five key drivers for action to advance disaster risk management and climate change solutions in an urban context: (i) urban planning and design; (ii) governance, (iii) urban economy, (iv) participation and inclusions, (v) ICT.

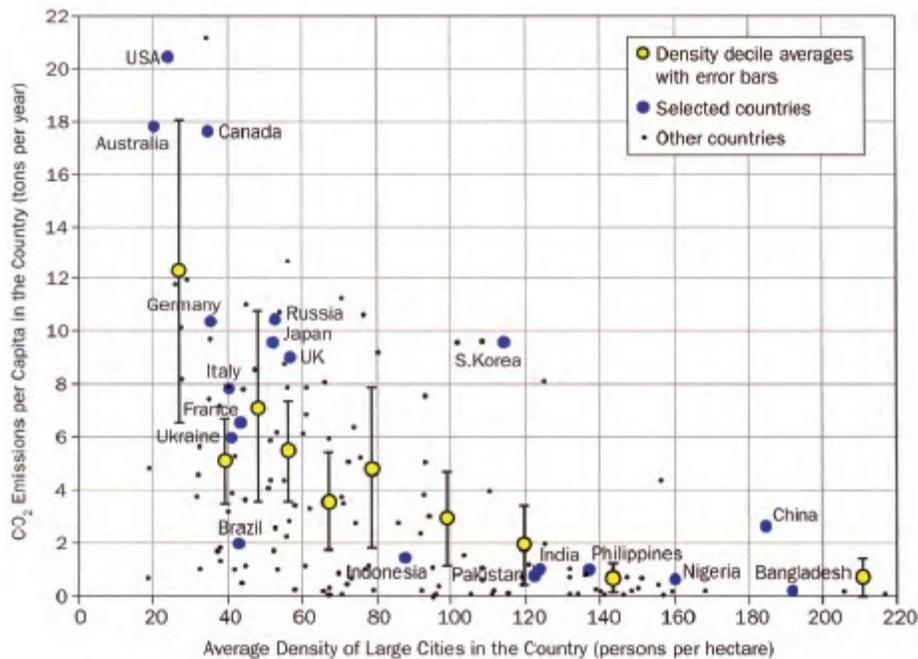
### A. Urban planning and design

Urban planning and design are key drivers for sustainable urbanization. A focus on compact, connected, integrated and inclusive cities promotes efficiency of services, systems, the built environment and resource use [see Issue Paper 8 for a more in-depth discussion]. This type of urban development model can bring about a transformative change, enabling low-carbon, energy efficient, risk-informed and resilient urban development pathways. Especially compactness is suggested to be the main driver for climate friendly



development: it can halve land used per housing unit, lower the costs of providing public services by 10–30%, decrease motor travel and associated costs by 20– 50%, and lower congestion, accident and air pollution. Moreover, compactness locks-in energy efficiency, and enables more efficient models of waste management and district heating (New Climate Economy 2014).

Illustration 2: Average urban densities in large cities and average CO<sub>2</sub> emission per capita



Source: Angel 2012 [in NCE Cities – Paper 03]

Illustration 2 shows the inverted exponential correlation between urban density and per capita CO<sub>2</sub> emissions, underscoring the argument that compact urban form is probably the most decisive factor for urban climate change mitigation and CO<sub>2</sub> reduction (WMO/IGAC 2012), yielding a wide range of positive co-benefits for adaptation, resilience and economic development [see Issue Paper 12 on Local Economic Development]. Other readily available options for mitigation are energy efficiency targeted solutions in buildings (isolation), services (waste, water & lighting) and electricity generation, with the later often being outside of city boundaries and control. Urban density, moreover, can help reducing emissions from transport, through shorter commutes and more effective public transportation (Dodman 2009).



Urban Ecosystems help to mitigate climate change, e.g. forests store high amounts of carbon (Trumper et al 2009); reduce climate and disaster-associated risks, e.g. landslide protection of vegetated slopes (Estrella and Saalismaa 2013); and adapt to a changing climate, e.g. green infrastructure like urban parks can be designed to reduce urban heat stress (Brown et al 2015), the concept of ecosystem based adaptation is further explored in Issue Paper 16.

## B. [Urban Governance](#)

Urban governance plays a crucial role in enhancing resilience, mitigating climate change, resource efficiency and thus ensuring sustainability. Institutionalizing an appropriate legislative, policy and regulatory framework can help integrate climate change and DRM into all levels and sectors of government (all-of-government) decision making. Governance can promote accountability, transparency, participation (all-of-society) and informed decision-making that actually implements risk reduction and climate action as a continuous process. This will facilitate an effective interface between government, communities, civil society, private sector and other stakeholders, ensuring participation of different interest groups in decision making.

Governance systems and mechanisms provide greater opportunities for an integrated development approach. Cities are composed of complex inter-dependent systems that can be leveraged to support climate mitigation, adaptation, risk management and sustainable development via effective local authorities supported by cooperative multi-level governance. This can enable synergies with infrastructure investment and maintenance, land use management, livelihood creation, ecosystem services protection with resilience building as an overarching objective.

## C. [Urban Economy, finance and investment](#)

Low carbon and resilience oriented urban development requires public and private investment, possible more than \$1 trillion per year is needed to finance the climate-infrastructure gap in low- & middle-income countries, according to the World Economic Forum. The World Bank estimates that about half of the total cost for "climate-proofing" infrastructure will be for urban-specific infrastructure investments. Public funds, Climate finance including emission based incentives can support bridging this investment gap. National governments and international organizations will need to (seed-) finance significantly towards adopting a comprehensive, holistic strategy encompassing governance, capacity development, urban systems, services and resource efficiency. This investment, if targeted well, can ensure development of cities as engines of 'green' socio-economic development, and build resilience and sustainability from climate change and avoid



large future costs. Moreover, concentrations of people, economic activities, and infrastructures contributes to income growth, poverty reduction, enabling people to be in a better position (resilient) to deal with disasters. In Cities there is an inter-connected economic and resilience/climate benefit from infrastructures (i.e. drainage, sanitation, electricity and transport systems and services that contribute to adaptation).

#### D. [Inclusion & participation](#)

Recognizing that a city is as vibrant as its citizenry, adopting an inclusive and participatory approach will be a principal element of the urban sustainability paradigm. Participation and inclusion of all groups and communities in planning and implementing climate change, DRM and broader sustainable development actions; raising their quality, viability, impact and longevity (Ayett 2013). Broad based coalitions empower the sharing of data, information, knowledge and solutions to raise the ambition of local climate actions and to integrate climate change in a wider sustainable urban development framework.

#### E. [Information, data and knowledge management](#)

Data and information will be central to designing, building, operating and safeguarding efficient and healthy urban environments. This will require a wide range of long-term and continuous observations, advanced use of information and communication technologies (ICT), and the transparent sharing of data in a seamless manner to allow for the advances discussed in the science of cities section. ICTs have the potential to play a leading role in climate change adaptation in cities and support: (i) development of effective climate and disaster risk management and early warning systems; (ii) urban planning, by providing high quality data and information to help build resilient cities; and (iii) facilitation of communication and exchange of information between the relevant stakeholders for informed decision making (ITU 2015). Smart sustainable cities' [see Issue Paper 21 on Smart Cities] use ICT infrastructure to reduce GHG emissions and build resilience, especially in the context of increasingly interconnected and interdependent systems. At the same time, ICT based innovations can be utilized to improve disaster preparedness and reduce vulnerability to disasters.

In conclusion, an urban development approach rooted in effective urban governance mechanisms can adopt a holistic and multi-dimensional perspective to identify key needs and priorities. Building urban resilience and ensuring sustainable development requires a closer interface between and integration of urban governance, climate and risk-sensitive development planning, coherence of systems, services and resources along with a whole-of-government and all-of-society approach emphasizing the linkages between mitigation and adaptation as well as the multiple economic, social, environmental development co-benefits of urban climate action.



## PLATFORMS AND PROJECTS

- One UN response to climate change - <http://www.un.org/climatechange/>
- UN Secretary General's Climate Summit, with several multi-stakeholder 'city' initiatives - <http://www.un.org/climatechange/summit/action-areas/#cities>
- Knowledge Centre on Cities and Climate Change - <http://www.citiesandclimatechange.org/>
- UNISDR Global Platform for Disaster Risk Reduction - <http://www.unisdr.org/we/coordinate/global-platform>
- Climate and Clean Air Coalition CCAC - <http://ccacoalition.org/>
- WMO GURME: WMO GAW Urban Research Meteorology and Environment (GURME) project - [mce2.org/wmogurme](http://mce2.org/wmogurme)
- UN-Habitat Cities and Climate Change Initiative (CCCI) - [www.unhabitat.org/ccci](http://www.unhabitat.org/ccci)
- ITU – Forum on Smart Sustainable Cities; Focus Group on Smart Sustainable Cities; Green Standards Week; Symposium on ICTs, Environment and Climate Change-<http://www.itu.int/en/ITU-T/climatechange/Pages/default.aspx>
- UNDP's Arab Cities Disaster Resilience Programme
- UNDP's Enhancing Capacity, Knowledge and Technology to build urban disaster and climate resilience in Armenia, Macedonia and Moldova
- UN CC:Learn - [www.uncclearn.org](http://www.uncclearn.org)

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