

Understanding the nature and scale of urban risk in low- and middle-income countries and its implications for humanitarian preparedness, planning and response

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Prepared for Lucy Earle by David Dodman, Katie Francis, Jorgelina Hardoy, Cassidy Johnson and David Satterthwaite

[Contact: david.dodman@iied.org]

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EXECUTIVE SUMMARY

Over half of the world's population now lives in urban centres. Most of the world's urban population and largest cities lie outside the most prosperous nations and almost all future growth in the world's urban population is projected to be in low- and middle-income countries. Within these urban centres it is common for up to 50 per cent of the population to live in informal settlements: these are often located on land that is exposed to hazards, with poor quality provision for water, sanitation, drainage, infrastructure, health care and emergency services. The residents of these low-income and informal settlements are therefore highly vulnerable to a range of small and large disasters. Climate change and other factors such as violence and conflict are posing as significant contributing factors to changing and future risk in urban areas.

This synthesis review was commissioned by DFID in order to review the quality of the evidence base and to outline knowledge gaps about the nature and scale of urban risk in low- and middle-income countries; and to assess the policy implications of this for humanitarian preparedness, planning and response. It does so by analysing a wide range of academic and policy literature and drawing on a number of interviews with key informants in the field. It particularly focuses on evidence from Africa and Asia, but also draws on case studies from Latin America as many examples of good practice in this area come from this region. The review aims to help ensure that DFID and other humanitarian and development actors are able to promote urban resilience and disaster risk reduction and to respond effectively to the humanitarian emergencies that are likely to occur in cities. The review is also intended to be used to inform discussion on a possible new research programme funded through the Humanitarian Evidence and Innovation Strategy at DFID.

The review was split into six sections and the key points from each are outlined below. Its main findings are as follows:

- **There is significant variation in risk between and within cities: cities can be among the safest and the most dangerous places to live.**
- **Both 'risk' and 'resilience' can be accumulated over long periods of time, through the infrastructural planning and investment decisions made in urban areas.**
- **Effective governance that involves the accountability of local authorities to urban residents is central to building resilience and reducing risk.**
- **Treating 'humanitarian risk and response' in isolation from 'urban development' will leave the underlying drivers of vulnerability un-addressed.**
- **Risk reduction and humanitarian response in urban areas requires knowledge and approaches that are outside the existing skills of many humanitarian and aid agencies, and needs to build on long-term relationships and trust with a range of urban stakeholders.**
- **Humanitarian agencies are beginning to engage with this urban complexity – but much more can be done.**

The second section of the review addresses the factors that affect the nature and scale of (disaster) risk in urban areas (with some attention to other sources of risk), the type of hazards that may cause risk and those who are most vulnerable. It analyses how multiple hazards and vulnerabilities can overlap to generate risk in cities and explores cities where risk has been built up over time due to a number of interconnecting factors. This section finds that:

- There are a wide range of physical, biological, technological and chemical hazards within urban areas that cause or contribute to both intensive and extensive risk.
- Urban centres can be environments of extremely low or extremely high risk, depending on a number of interrelated factors of which the presence of basic protective infrastructure and the quality and capacity of local governance are usually the most important.

- Across a city some groups will be more vulnerable than others, influenced by cross-cutting issues such as income, gender, age, and health.
- Urban risk often accumulates over time as urban centres expand without the needed investments in infrastructure, services and land-use management.

The third section, entitled 'the geographical distribution of risk', assesses how risk is mapped and measured and identifies cities that are at the greatest risk and those that have been given the greatest attention in the literature. It concludes that:

- There are no disaster risk assessments for many cities, and where they do exist they frequently focus only on exposure to hazards: this and a lack of local analysis makes it difficult to compare risk between different cities.
- A significant proportion of the literature on risk focuses on flood-risks in large cities.
- There is a growing body of literature on risk from urban violence, particularly in Latin America and the Caribbean.
- There is very little data on urban risk in Sub Saharan Africa and in smaller urban centres worldwide.
- Risks in cities are generally much lower in cities in which protective infrastructure has been developed over long periods of time, and in which there are competent, accountable, adequately resourced municipal governments that work well with their low-income population.

The fourth section discusses the implications of different responses to urban (disaster) risk at a variety of scales, such as through community based initiatives and national agendas. It finds that:

- Urban risk is often created or exacerbated by local government's incapacity to act in the public good, guide urban growth and ensure infrastructure and service provision.
- There are a number of cities where risks have been greatly reduced through 'accumulated resilience', good local governance and community-based responses.
- Disaster risk reduction needs to be mainstreamed into urban and development planning for the most resilient cities.

The fifth section considers how research has been used to make projections about future risk, and the limitations of this, with the added complication of uncertainty from the risks cities face from the impacts of climate change. Its key findings are:

- Precise predictions on changes in extreme weather-related risks for cities are difficult (although more or intense extreme weather can be identified as being more/less likely).
- Few detailed risk/ vulnerability assessments have been undertaken at the city scale; those that have tend not to cover the complete spectrum of risks.
- Human induced climate change is adding an extra dimension to understanding risk.
- There has been a gradual recognition of the need to 'manage uncertainty' rather than focus on specific risks.
- Multi-hazard and vulnerability risk assessments (both present and future) need to be conducted at the city scale, using both scientific data and local knowledge.

The sixth section looks at the policy and practice implications of the above on humanitarian preparedness, planning and response, and how the sector is currently addressing urban risk and the challenges it faces. There is a growing body of thought on this, with conclusions including:

- Humanitarian actors and agencies are increasingly directing their attention to urban areas and pursuing urban policy initiatives.
- Working in urban areas is outside the comfort zone of most humanitarian agencies.
- A rural approach will not fit most urban contexts.
- Responses need to work with and be accountable to those who are most vulnerable.
- The main areas for focus are:
 - improved needs and vulnerability assessments
 - better and more appropriate applications of technology

- an understanding of housing, land and property rights at the local level in urban areas
- transferring research and policy into operational change.

The final section considers the key evidence gaps in the knowledge base for potential future research. Some of this evidence is empirical in nature, and is related to specific aspects of the physical environment and its response to particular shocks and stresses. Other elements are related to the functioning of social, financial and governance systems. Not all of these gaps are equal: in some cases, very little research has been undertaken; in others, there is a body of knowledge that is geographically limited; and for others the research has not yet been adequately linked to specific policy and implementation actions. The section proposes a set of research questions that address three main themes:

- Deepening understanding of the nature and scale of urban risk.
- Understanding the role of multiple actors in urban risk reduction.
- Assessing the potential for incorporating risk reduction in urban planning.

ABBREVIATIONS

ACCCRN	Asian Cities Climate Change Resilience Network
ACC	African Centre for Cities
ADB	Asian Development Bank
AfDB	African Development Bank
ALNAP	Active Learning Network for Accountability and Performance in Humanitarian Action
ARSDRR	African Regional Strategy for Disaster Risk Reduction
ASEAN	Association of Southeast Asian Nations
AURAN	African Urban Risk Analysis Network
CBA	Community Based Adaptation
CBO	Community Based Organisation
CLUVA	Climate Change and Urban Vulnerability in Africa Project
DAC	Development Assistance Committee
DFID	Department for International Development (UK Government)
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization (United Nations)
FDI	Foreign Direct Investment
GDACS	Global Disaster Alert and Coordination System
GDP	Gross Domestic Product
GDN	Gender and Disaster Network
GFDRR	Global Facility for Disaster Risk Reduction and Recovery
GIS	Geographic Information System
GLA	Greater London Authority
GNDR	Global Network for Disaster Reduction
GWP	Global Water Partnership
HERR	Humanitarian Emergency Response Review (UK Government)
HEWS	IASC Humanitarian Early Warning Service
HFP	Humanitarian Futures Programme
IADB	Inter-American Development Bank
IASC	Inter-Agency Standing Committee
ICLEI	International Council for Local Environmental Initiatives
ICRG	International Country Risk Guide
IDA	International Development Association
IDP	Internally Displaced Persons
IFRC	International Federation of the Red Cross
IHPD	International Human Dimensions Programme on Global Environmental Change
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
IRDC	International Research Committee on Disasters
IRIN	A Service of the UN Office for the Coordination of Humanitarian Affairs
LAC	Latin America and the Caribbean
MDG	Millennium Development Goal
MINUSTAH	United Nations Stabilization Mission in Haiti
MOU	Memorandum of Understanding
NGO	Non-Governmental Organization
OCHA	Office for the Coordination of Humanitarian Affairs (United Nations)
ODA	Official Development Assistance
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
PCNA	Post Conflict Needs Assessment
RTA	Road Traffic Accident
SACN	South African Cities Network

SADC	Southern African Development Community
UCT	University of Cape Town
UN	United Nations
UNDESA	United Nations Department on Economic and Social Affairs
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UN-Habitat	United Nations Human Settlements Programme
UNHCR	United Nations Office of the High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNIFEM	United Nations Development Fund for Women
UNISDR	United Nations International Strategy for Disaster Reduction
UNODC	United Nations Office on Drugs and Crime
UNOHCHR	United Nations Office of the High Commissioner for Human Rights
UNPBC	United Nations Peace-Building Commission
UNSC	United Nations Security Council
WCDR	World Conference on Disaster Reduction
WDR	World Development Report
WFP	World Food Programme
WHO	World Health Organization

1 INTRODUCTION

Over half of the world's population lives in urban centres and most low- and middle-income nations continue to urbanize (United Nations 2012). As this paper will describe, urban centres include among the world's safest and among the world's most risky places to live and work. Today, most of the world's urban population and most of its largest cities are outside the most prosperous nations (see Figure 1) and this is historically unprecedented. Almost all future growth in the world's urban population is projected to be in low- and middle-income countries (ibid) (although some may become high-income nations). At present, Asia is the most rapidly urbanising region followed by Africa (although Africa may be urbanizing slower than suggested in Figure 1 but this is hidden by the lack of recent censuses in many sub-Saharan African nations – see Potts 2009). It is also projected that most of the population growth will be in urban centres with less than half a million inhabitants. Although there is much concern in the urban literature about megacities (cities with ten million plus inhabitants), there are relatively few of them, they concentrate less than 5 per cent of the world's population and many of them had more people moving out than in during their most recent inter-census period. In addition, they are heavily concentrated in the world's largest economies (Mitlin and Satterthwaite 2012).

It is common for 30 per cent of the population of urban centres in low- and middle-income countries to live in informal settlements or overcrowded and deteriorating tenements; for many cities in Asia and Africa, the proportion is 50 or more per cent. These cities typically lack good quality provision for water, sanitation, drainage, all weather roads, health care and emergency services (Mitlin and Satterthwaite, 2012). Many major cities in Africa have less than 20 per cent of their population with water piped to their homes and served by sewers and drains (ibid, UNICEF and WHO 2012). It is also common for large concentrations of informal settlements to be on land at high risk from flooding or landslides (Hardoy *et al* 2001).

There is no reliable data on the number of urban dwellers living in informal settlements and lacking infrastructure and services but it is likely to be around one billion. Official UN statistics suggest that the proportion of urban population living in what it defines as 'slums' in low- and middle-income nations fell from 46.1 per cent to 32.7 per cent between 1990 and 2010, but much of this seems to be due to UN Habitat changing the definition of what constitutes the slum population (relaxing the criteria for what constitutes 'improved' sanitation). In addition, official statistics are known to greatly undercount the proportion of urban population in 'slums' or informal settlements in many nations (see for instance Agarwal 2011, Bhan 2009, and Patel 2011). There is also no recent census data available on housing conditions for many nations so figures for 'slum' populations for 2010 are based on projections.

The way disaster risks have been viewed in the past has changed greatly, from studying the direct impacts of hazards, to assessing vulnerability, to assessing responses (adaptation) and building resilience. Furthermore, any assessment of the scale and nature of urban risk depends on how risk is conceived: what hazards are included (including whether to include technological hazards, infectious diseases, violence and terrorist activity), how 'disasters' are defined and measured (and what data are available on this) and whether consideration is given to post-disaster risks. Figure 2 highlights the definitions of the key terms which are used within this report.

Many cities in Africa and Asia feature on the list of highest risk cities to both large and small scale disasters, especially in regard to mortality. Furthermore, while the financial cost of disaster events has tended to be higher in high-income countries, the costs in low and middle income countries is rising (UNISDR 2011B). But there are large deficiencies in available data about disasters and their costs. The most widely used data source for global or continental statistics (EM-DAT CRED) is known to greatly understate the number of disasters – and the lack of detail in recording spatial characteristics of disasters make it difficult to assess which disasters are primarily urban-based or include significant urban components.

Many of the largest urban disasters are caused by earthquakes and hurricanes, with large numbers of people being killed or injured, and infrastructure damaged, from 'one' event (although the interaction of multiple hazards and vulnerabilities will be discussed later on in the report). But a focus on large disasters has obscured the much more frequent but smaller disasters and their impacts. The United Nations has suggested a need to consider both intensive disaster risk (that underpins large disasters) and extensive disaster risk that takes account of disaster events where the number of people killed or the extent of destruction falls below the criteria usually set for disasters. When account is taken of these, they show that a high proportion of all disaster-related injuries, impoverishment and damage or destruction of housing, infrastructure, schools and health care centres happen in disaster events that usually go unrecorded. Studies of particular cities that took account of 'extensive risk' and 'small' disasters show how much these are concentrated in informal settlements and how the range of causes increases. Although floods and high winds feature among the most prominent causes, so too do fires (that are often particularly large scale and devastating in informal settlements, cholera epidemics (also usually concentrated in informal settlements) and traffic accidents. Many cities in low and middle income countries are also deemed to be at high risk of social hazards, such as violence and more broadly the absence of the rule of law. Millions of urban dwellers in Africa, Latin America and Asia are now also at greater risk from the direct and indirect impacts of current and projected climate change, such as an increase in floods, heat waves, extreme events and food and water shortages; these add new and complex dimensions to how risk is understood and addressed.

It is well documented that the urban poor tend to face the highest risks from everyday hazards (such as those linked to inadequate provision for water, sanitation and health care) and to both intensive and extensive disasters, although the links between disaster risks are still not fully understood. Low-income urban dwellers are regarded as among the groups most at risk largely because they have no option but to live in poor quality, overcrowded housing that lacks provision for water, sanitation, solid waste collection, drainage, street lighting and all weather roads. Much of it is in informal settlements on unsafe sites. Furthermore they often lack the means to address their hazardous homes and working environments and build resilience, such as through access to land on which they can construct housing or the political influence needed to get the deficiencies in infrastructure and services addressed. After a disaster they tend to get limited or no support from local authorities because they have no formal rights to land, rendering them at even higher risk. Particular groups face higher risks from most hazards including infants, young children, older age groups with impaired mobility, IDPs and those unable to afford sufficient food. Women may face higher risks from the allocation of tasks or resources within households or from violence and the absence of the rule of law – and all of these are often exacerbated among populations displaced by disasters. These all highlight how local level assessments that cover each neighbourhood are necessary to determine risk.

Rapid urbanisation and rapid city growth does not necessarily equate to higher levels of risk including disaster risk. Many of the world's largest cities (and fastest growing cities) have among the world's highest levels of life expectancy at birth and lowest levels of death from disasters. The highest levels of risk are usually associated with poor quality housing and the lack of infrastructure and services (or more broadly the lack of a competent, resourced, accountable urban government). Urbanisation is usually associated with stronger economies, higher average life expectancies and literacy rates and stronger democracies at local level. There are many agglomeration economies in cities for the infrastructure and services that reduce risk (Hardoy *et al* 2001). Many initiatives are developing which build relationships between low income communities and local government, and mainstream DRR into development policies and urban planning. These are proving key examples of how resilience can be built in urban areas to reduce the risks that have accumulated over various temporal and spatial scales and to provide a stronger basis for climate change adaptation.

As economies and populations become more concentrated in urban areas – and as noted above often risk too - so humanitarian planning, preparedness and responses must develop the capacity to work effectively in urban contexts. Up until very recently, the majority of humanitarian efforts have focused on rural areas, where the highest risks were deemed to be and the greatest need for

humanitarian work found. In addition, there are a number of challenges perceived by humanitarian actors which put them off working in urban areas, such as fragile states, high levels of violence, civil conflicts and the existence of local governments (which may or may not be effective) (Zetter and Deikun, 2012).

Figure 1: The distribution of the world's urban population by region, 1950–2010 with projections to 2030 and 2050

Urban population (millions of inhabitants)						
Major area, region, country or area	1950	1970	1990	2010	Projected for 2030	Projected for 2050
World	745	1,352	2,281	3,559	4,984	6,252
More developed regions	442	671	827	957	1,064	1,127
Less developed regions	304	682	1,454	2,601	3,920	5,125
Least developed countries	15	41	107	234	477	860
Sub-Saharan Africa	20	56	139	298	596	1,069
Northern Africa	13	31	64	102	149	196
Asia	245	506	1,032	1,848	2,703	3,310
China	65	142	303	660	958	1,002
India	63	109	223	379	606	875
Europe	281	412	503	537	573	591
Latin America and the Caribbean	69	163	312	465	585	650
Northern America	110	171	212	282	344	396
Oceania	8	14	19	26	34	40
Per cent of the population in urban areas						
World	29.4	36.6	43.0	51.6	59.9	67.2
More developed regions	54.5	66.6	72.3	77.5	82.1	85.9
Less developed regions	17.6	25.3	34.9	46.0	55.8	64.1
Least developed countries	7.4	13.0	21.0	28.1	38.0	49.8
Sub-Saharan Africa	11.2	19.5	28.2	36.3	45.7	56.5
Northern Africa	25.8	37.2	45.6	51.2	57.5	65.3
Asia	17.5	23.7	32.3	44.4	55.5	64.4
China	11.8	17.4	26.4	49.2	68.7	77.3
India	17.0	19.8	25.5	30.9	39.8	51.7
Europe	51.3	62.8	69.8	72.7	77.4	82.2
Latin America and the Caribbean	41.4	57.1	70.3	78.8	83.4	86.6
Northern America	63.9	73.8	75.4	82.0	85.8	88.6
Oceania	62.4	71.2	70.7	70.7	71.4	73.0
Per cent of the world's urban population						
World	100.0	100.0	100.0	100.0	100.0	100.0
More developed regions	59.3	49.6	36.3	26.9	21.4	18.0
Less developed regions	40.7	50.4	63.7	73.1	78.6	82.0
Least developed countries	2.0	3.0	4.7	6.6	9.6	13.8
Sub-Saharan Africa	2.7	4.1	6.1	8.4	11.9	17.1
Northern Africa	1.7	2.3	2.8	2.9	3.0	3.1
Asia	32.9	37.4	45.2	51.9	54.2	52.9
China	8.7	10.5	13.3	18.6	19.2	16.0
India	8.5	8.1	9.8	10.6	12.2	14.0
Europe	37.6	30.5	22.0	15.1	11.5	9.5
Latin America and the Caribbean	9.3	12.1	13.7	13.1	11.7	10.4
Northern America	14.7	12.6	9.3	7.9	6.9	6.3
Oceania	1.1	1.0	0.8	0.7	0.7	0.6

Source: Derived from statistics in United Nations (2012).

The majority of humanitarian agencies have been slow to adapt to work in urban contexts and those that do tend to retrofit rural methods rather than create new methods that respond to urban contexts and complexities. The recognised urban trends, combined with a number of recent urban disasters (such as the devastation in Port-au-Prince, Haiti and its surrounds from the earthquake and the number of large flood disasters in urban areas in the Philippines) and difficulties associated with the responses there, have given the sector a major shake-up. As a result, a number of agencies are starting to address urban issues, although there are serious knowledge gaps which need to be addressed.

The first section of this report addresses what factors affect the nature and scale of disaster risk in urban areas (with some attention to other sources of risk), the type of hazards that may cause risk and those who are most vulnerable. It analyses how multiple hazards and vulnerabilities can overlap to generate risk in cities and explores cities where risk has been built up over time due to a number of interconnecting factors. Section 3 addresses how risk is mapped and measured and identifies cities that are at the greatest risk and those that have been given the greatest attention in the literature. Section 4 discusses the implications of different responses on risk at a variety of scales, such as through community based initiatives and national agendas. Section 5 considers how research has been used to make projections about future risk, and the limitations of this, with the added complication of uncertainty from the risks cities face from the impacts of climate change. Section 6 looks at the policy and practice implications this has on humanitarian preparedness, planning and response, and how the sector is currently addressing urban risk and the challenges it faces. Finally Section 7 considers the key gaps in the knowledge base for potential future research.

Figure 2: Key definitions used in the report

<p>Adaptation: Actions to reduce the vulnerability of a system (e.g. a city), population groups (e.g. a vulnerable population within a city) or an individual or household to hazards</p> <p>Adaptive capacity: The inherent capacity of a system (e.g. a city government), population (e.g. low income community in a city) or individual/ household to undertake actions that can help to avoid loss and can speed recovery from a hazard</p> <p>Climate change: Changes in climate attributed to human activity</p> <p>Disasters: A situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance. To be entered into the EM-DAT database, at least one of the following criteria has to be fulfilled: 10 or more people reported killed; 100 people reported affected; a call for international assistance; and/or declaration of a state of emergency (CRED EM-DAT)</p> <p>Disaster risk: A function of exposure to a hazard (biological pathogens, chemical pollutants and physical hazards) plus vulnerability, expressed as the probability of loss of life or destroyed or damaged assets, in a given period of time (UN ISDR 2011b)</p> <p>Extensive risk: The risk of premature death, injury/ illness and impoverishment from all events whose impact is too small to be classified as major disasters (or intensive disasters – see below)</p> <p>Intensive risk: The risk from major disasters with the potential for 25 or more deaths and/ or 600 or more houses destroyed or seriously damaged in one municipality/ local government area</p> <p>Maladaptation: Actions or investments that increase rather than reduce vulnerability to hazards</p> <p>Resilience: A product of governments, enterprises, populations and individuals with strong adaptive capacity. It indicates a capacity to maintain core functions in the face of hazards, threats and impacts, especially for vulnerable populations</p> <p>Vulnerability: The potential for people to be killed, injured or otherwise harmed (suffer loss) by a hazard/s; it is usually used to include exposure, susceptibility and coping/adaptive capacity</p>
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2 THE NATURE AND SCALE OF URBAN DISASTER RISK

Key points:

- There are a wide range of physical, biological, technological and chemical hazards within urban areas that cause or contribute to both intensive (disasters) and extensive (small disaster and everyday) risk.
- Urban centres can be environments of extremely low or high risk, depending on a number of interrelated factors of which the presence of basic protective infrastructure, and the quality and capacity of local governance are usually the most important
- Across a city some groups will be more vulnerable to hazards than others, determined by a cross-cutting issues such as income, gender, age, health status etc
- Urban risk often accumulates over time as urban centres expand without the needed investments in infrastructure, services and land-use management
- There is a growing focus on building resilience within cities to a wide range of hazards

2.1 Nature and Scale of Urban Risk

As described in the introduction, risk in cities manifests at different scales and intensities. Intensive risk is the risk from major disasters while extensive risk is that of premature death, injury, impoverishment and destruction of buildings and infrastructure from all events whose impact is too small to be classified as major disasters. It is of course very difficult to draw a line between the two; there is a continuum of risk in relation to the frequency and scale of impact which can be applied to urban areas (Table 1).

Table 1: The spectrum of risk including intensive and extensive risk

Nature of event	Disasters	Small disasters	Everyday risks
Frequency	INFREQUENT (perhaps return periods of 50-100 years)	FREQUENT (often seasonal)	EVERYDAY
Scale	LARGE or potential to be large: 10+ killed, 100+ seriously injured	3-9 persons killed, 10 or more injured	1-2 persons killed, 1-9 injured
Impact on all premature death and serious injury/illness	Can be catastrophic for specific places & times but low overall	Significant and under-estimated contribution, especially for injuries and loss of property	Main cause of premature death and serious injury
Intensive or extensive	INTENSIVE RISK	EXTENSIVE RISK	

Source: Developed from Bull-Kamanga *et al.* (2003).

Both intensive and extensive urban risk comes from exposure to different environmental hazards at a variety of spatial and temporal scales. Hazards are normally divided into physical hazards, biological pathogens and chemical pollutants. Physical hazards have had the greatest attention in the past because they cause most premature death from disasters such as extreme weather, droughts, floods, fires and seismic events. Physical hazards such as floods and storms can also make up a large part of extensive risk in urban contexts in low and middle-income countries (UNISDR 2009, Dodman *et al.*, 2009). Within the spectrum of physical hazards, the most recent UNISDR Global Assessment Report (UNISDR, 2011b) has indicated that the risk from droughts is the least understood. Biological pathogens are disease causing agents, and can be spread through air (for example TB), water and food (for example diarrhoeal diseases) and disease vectors (for

example malaria and dengue). These are the cause of most premature death in relation to daily extensive risks, although epidemics can sometimes cause enough deaths to be classified within disaster risk events. Cities are also exposed to a range of technological disasters, such as transport or industrial accidents often caused by chemical pollutants. Many cities also have high risk levels from violence and conflict. The current and projected impacts of climate change are also changing the distribution of both intensive and extensive risk in urban areas as discussed in detail later on.

Intensive and extensive risks occur at different scales, from the household, to the community to the district and the city, although the impact from disasters is mostly felt at the individual or household level. The timeframe in which these risks come to play also varies. Some hazards such as drought can take many months or years to appear, and as such are deemed slow onset disasters. Others, such as earthquakes and epidemics, give very little warning and are known as rapid onset disasters.

For a disaster to be included in the most widely used database, EM-DAT, at least one of four criteria must be fulfilled: ten or more people reported killed; one hundred or more people reported affected; declaration of a state of emergency; or call for international assistance. Detailed analyses of disasters in particular cities or localities have shown how much disaster impact comes from disasters that do not meet any of these criteria or that do but still do not get included in this database. However, it is clear that deaths from the disasters that are included in international datasets are very heavily concentrated in low-income nations. Mortality risk from tropical cyclones of the same severity is 225 times greater in low-income countries compared to OECD countries when similar numbers of people are exposed (Peduzzi *et al.* 2012). Or to put it another way, high-income nations have 39 per cent of the exposure to tropical cyclones but only 1 per cent of the mortality risk; low-income nations have 13 per cent of the exposure but 81 per cent of the mortality risk (UNISDR, 2009). The Philippines and Japan have similar levels of risk and exposed populations for cyclones yet mortality rates in the Philippines from cyclones is 17 times that in Japan (UNISDR 2009).

If disaster reporting systems for nations or cities move down to include smaller disasters and a broader set of impacts (for instance beyond mortality and economic losses to include damage or destruction of housing, schools and health centres), other risk patterns emerge from thousands of frequently occurring small-scale disasters. These are associated with specific local concentrations of exposed vulnerable populations and assets spread over wide areas. The UN International Strategy for Disaster Reduction (UNISDR) has sought to better understand the significance of smaller disasters and their causes, drivers and impacts. It supported the development of national disaster datasets in 19 countries and two states in India (for a total population of 850 million) covering 40 years. This allowed an analysis of nearly 200,000 local level disaster reports. This analysis found that extensive disasters accounted for a small proportion of disaster mortality but for a much larger share of damage to housing, livelihoods and local infrastructure and impacts on low income (urban and rural) households and communities - for instance in schools, health facilities, municipal water and sewer systems and power stations damaged or destroyed. Almost all extensive risk disasters were weather-related and these accounted for 54% of houses damaged, 80% of people affected, 83% of people injured, 46% of damage to schools and 54% of damage to health facilities (UNISDR, 2011b). To give one example of the impact of these extensive disasters - in February 2009, four municipalities on the Pacific coast of Colombia were flooded. This attracted little attention in that 2 people were killed and 20 were reported missing - but 1125 houses as well as schools, health centres and roads were destroyed. More than 25,000 people were displaced and 1,400 houses damaged (ibid).

Until recently the documentation of the scale and depth of risk in urban areas of low and middle-income countries has been very inadequate, although there is much more evidence of levels of extensive risk from very poor quality living conditions (Hardoy *et al.*, 2009). What is certain however is that the understanding of the nature and scale of urban risk changes as more detailed local analyses of disasters are done (UNISDR, 2011b).

Recent reviews of disasters in urban areas (IFRC 2010, UNISDR 2009, 2011b) suggest a rapid growth in the number of disasters in urban areas with most of these being associated with extreme weather including heavy winds and rains, floods, landslides and fires. They also suggest that the number of

locations where such disasters are happening is expanding geographically. Although the factors that underpin these vary, as do their relative importance, in most instances they are linked to increases in the urban population in informal settlements, increases in run-off due to urban growth and poor land-use and watershed management, and chronic underinvestment in drainage. Here, urban expansion and development are actually generating new patterns of hazard, exposure and vulnerability that did not exist before. The extent to which countries manage (or don't manage) urban development and ensure provision of needed infrastructure has a very strong influence on the number and scale of disasters. Thus, urban disaster risk is configured in most low- and middle-income nations by the lack of infrastructure and public services, and the inadequacies of urban governance. For example, extreme weather events (and climate change) are not responsible for the growth of informal settlements in flood prone areas or the lack of investment in drainage, or for the lack of social safety nets (UNISDR, 2009).

So an interest in risk and cities today that focuses on low-income nations is faced with very incomplete data about cities and even more incomplete data about the risks faced by low-income groups or groups in particular districts (for instance the population in a particular informal settlement that lacks provision for infrastructure and services and is on a flood-plain). An interest in risk needs to combine an understanding of 'every-day' risk (for instance from inadequate provision for water and sanitation or particular diseases such as malaria) to risks that are common but not every day (for instance seasonal as in the monsoon rains) to risks that are occasional (above average intensity cyclone/rainfall that comes every few years) and very occasional (for instance earthquakes). Then there are the many increases in risk levels and the addition of new risks in nations and cities in conflict. There are also the complications of adding climate change to understandings of risk and vulnerability especially in including the fact that climate change impacts are themselves changing and in the uncertainty as to the particulars of climate change in each location.

2.2 Vulnerability

It is widely acknowledged that risk in cities is distributed unevenly, both socially and spatially. When exploring who is most at risk – to everyday hazards, disasters and climate change impacts – the term vulnerability is widely used because it brings in notions of threat, risk or stress, of insecurity and of lack of power to address these (Klein 2009). It is now widely accepted (for example, by the Intergovernmental Panel on Climate Change) that vulnerability for individuals or households includes three elements: exposure to risk, susceptibility to harm when exposed, and limitations in the capacity to cope with the impacts or to adapt (to reduce or remove the risk). For example low-income households are often hit hardest by extreme weather because of greater exposure to the hazards (as only on high risk sites can they find accommodation), poor quality housing, lack of hazard-removing infrastructure, less capacity to cope with the impacts, less adaptive capacity (to reduce risks from future events), less state provision and less legal protection or insurance. But discussions of disaster risk or climate change risk also consider the 'vulnerability' of infrastructure, social-ecological systems, cities (and much else besides) although the three same elements can be applied here too even if they take different forms.

Initially, the term vulnerability was used in discussions of poverty in the late 1980s and early 1990s to highlight the "defencelessness, insecurity and exposure to risk, shocks and stress" (Chambers 1995; see also Chambers 1989) – and this discussion recognized that vulnerability was exposure (to risk, shocks and stresses), defenceless and lack of means to cope. This was also a time when the critical role for low-income households of assets in managing to avoid or better cope with stresses and shocks that can lead to impoverishment was recognized (Moser 2006). Here, much of the attention to stresses and shocks was in regard to incomes and livelihoods (Chambers and Conway 1992). There was also the seminal work of Jane Pryer in the late 1980s, looking at the vulnerability of low-income households to ill-health and to its monetary consequences (loss of income, additional costs for treatment) (Pryer 1989, 1993). In these discussions, vulnerability was discussed in regard to individuals and households and it included both exposure and susceptibility and usually lack of capacity to cope.

Vulnerability to environmental hazards was also discussed at this time and this also focused on exposure, susceptibility (with most attention here being to the particular susceptibilities of infants and young children to a range of diseases, chemical pollutant and physical hazards) and capacity to cope (Satterthwaite, 1993). Here, vulnerability is considered in regard to a specific risk rather than to the outcome of a risk (for example hunger from fall in income from illness or injury of income-earner).

Most of the literature agrees that vulnerabilities are influenced by household income and assets, age, gender and other cross-cutting factors (Hardoy and Pandiella, 2009). Women, the elderly, young children and low income are often cited as being the most vulnerable although the specific forms that this vulnerability takes and how it varies depending on the hazard (and the instances where these particular groups are not vulnerable) remain poorly understood. There are also a number of studies which point to the increased vulnerability of IDPs in cities. For disasters however vulnerability also came to be applied to specific locations – and to whole cities and nations. This also meant a greater focus on the structural causes of the risks being considered. How these multiple hazards and vulnerabilities interplay will be considered in section 2.3.

2.3 Measuring Risk

Urban centres feature among the places with the world’s highest and the lowest risks to human health (Table 2). This can be seen in statistics for life expectancies at birth for particular cities that range from below 40 years to over 85 years (UN Habitat 2008). Or in infant, child and maternal mortality rates for cities or for national urban populations that vary by a factor of twenty or more (Mitlin and Satterthwaite, 2012). Or in the proportion of children that are malnourished for instance a third or more under height among the low-income population in many urban centres (ibid). The scale of these differentials between urban centres is not clear because of the lack of data for individual urban centres; for most low-income nations, data are only available for national urban populations. However they do show the very large differences in infant and child mortality rates between national urban populations – for instance, drawing on the most recent Demographic and Health Surveys, some nations still have under five mortality rates of over 150 per 1000 live births among their urban populations which is 30 times the rate in most high-income nations (ibid).

Table 2: Ranking cities in regard to the levels of risk for premature death and ill-health for their population

Indicators relevant to scale of extensive risk	HIGHEST RISK	LOWEST RISK
Life expectancy at birth	Average life expectancy of 40-55 years; much lower for low-income groups within the city	Average life expectancy 75-85 years
Under five mortality rates	Average for city of 100-200 per 1000 live births; much higher for low-income groups within the city	Average for city of under 10 per 1000 live births
Proportion of children stunted	25-50%+ of all children under-weight	Very small proportion of children underweight
Proportion of the population in ‘slums and informal settlements’	40-70%	0
Provision for water for residential areas	Small percentage with regular, good quality piped supplies to home	100 per cent with good quality piped supplies to home 24 hours a day
Provision for sanitation for residential areas	No sewers or sewers for only a small proportion of the population; much of the population with difficult or no access to sanitary toilets and washing facilities	100 per cent with good quality toilets and washing facilities within the home served by sewers
Provision for good access to high quality health care and medicines they can afford	Most of the population lacking this	Close to 100 per cent coverage

Provision for emergency services (fire, ambulance and rapid treatment)	Most of the population lacking this	100 per cent
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Source: Dodman *et al.* (2009).

But these tell us little about the differentials in risks between urban centres within a nation or within particular urban centres - and nothing about differentials in risk within the population of particular urban centres. For the few urban centres for which there are reliable data, some have differentials in infant, child and maternal mortality rates that are much larger. For instance, in Nairobi, in 2000 infant and child mortality rates in some of the informal settlements where half the population lives were ten times the city average and likely to be 20 or more times that of high-income groups (APHRC, 2002). This study also showed how the proportion of children reported to have had diarrhoea containing blood in the two weeks prior to the interview was particularly high in informal settlements - nearly four times the average for Nairobi.

It is likely that in cities that have very low life expectancies at birth, there are large differentials in this between high and low-income groups or between those living in good quality housing well served with infrastructure and services and those in informal settlements lacking these.

There are also a growing number of studies that show the very large health burdens faced by low-income groups in urban centres or within national urban populations – including those that show how these groups enjoy little or no health advantage over low-income rural dwellers. For instance, a study of maternal health care in 30 countries found that ‘slum’ dwellers may have maternal, new born and child mortality rates as high or even higher than the rural poor (Matthews *et al.*, 2010). An analysis of Demographic and Health survey data from 11 nations found that the most disadvantaged children had rates of stunting that were on average only slightly lower than those of the most disadvantaged rural children (Menon *et al.*, 2000). Other studies also suggest particularly high levels of child stunting or child mortality rates among urban poor populations (see for instance Fotso, 2007, Kennedy *et al.*, 2006 and Ahmed *et al.*, 2007).

It is difficult to establish even a crude ranking for the most serious risks to health for the population of any city – for instance the risk of premature death from particular diseases, chemical pollutants or physical hazards. It is even more difficult to do so in ways that identify differentials within that population. Considerable progress has been made in establishing the relative contributions of different risks to mortality or to disability-adjusted life years (DALYs) but not at the level of individual cities and much less disaggregated so we know of how these differ between sections of a city’s population (for instance by income or by district). There are data for particular cities and for particular risks – for instance murder rates, air pollution levels, road traffic deaths – but not data on other risks so as to get an idea of the relative importance of different risks showing the importance of (say) violence over diarrhoeal diseases. For instance, for most cities where provision for water, sanitation and health care are known to be very inadequate, there are no data on the contribution of diarrhoeal diseases to premature death or ill-health. Where these data do exist, they may be partial – in Delhi, for example, only 45 percent of registered deaths are categorised by cause of death (Sperling and Ramaswami 2012). In addition, because there are no data on many of these for most cities, a study of a particular city showing a very high murder rate (or of the extent of violence) is often quoted as if this was representative of many or most cities.

2.4 Inadequate Governance and the Risk-Poverty Nexus

Cities figure heavily on the lists of places that have had many of the most serious disasters (IFRC 2010) and can be seen as inherently risky because of the large numbers of people, economic activities and assets they concentrate. But no-one has compiled a list of cities where few if any disasters have occurred in the past decade or more because the buildings and infrastructure can cope with, for instance, storms and floods, and because urban expansion has avoided dangerous sites. What is now being recognized are the overlapping and reinforcing factors for vulnerability and extent to which disasters in urban areas in low- and middle-income nations and intimately linked to the inadequacies of local governance there and the high proportion of urban populations living in poor quality housing in informal settlements lacking infrastructure and services (UNISDR, 2009 and

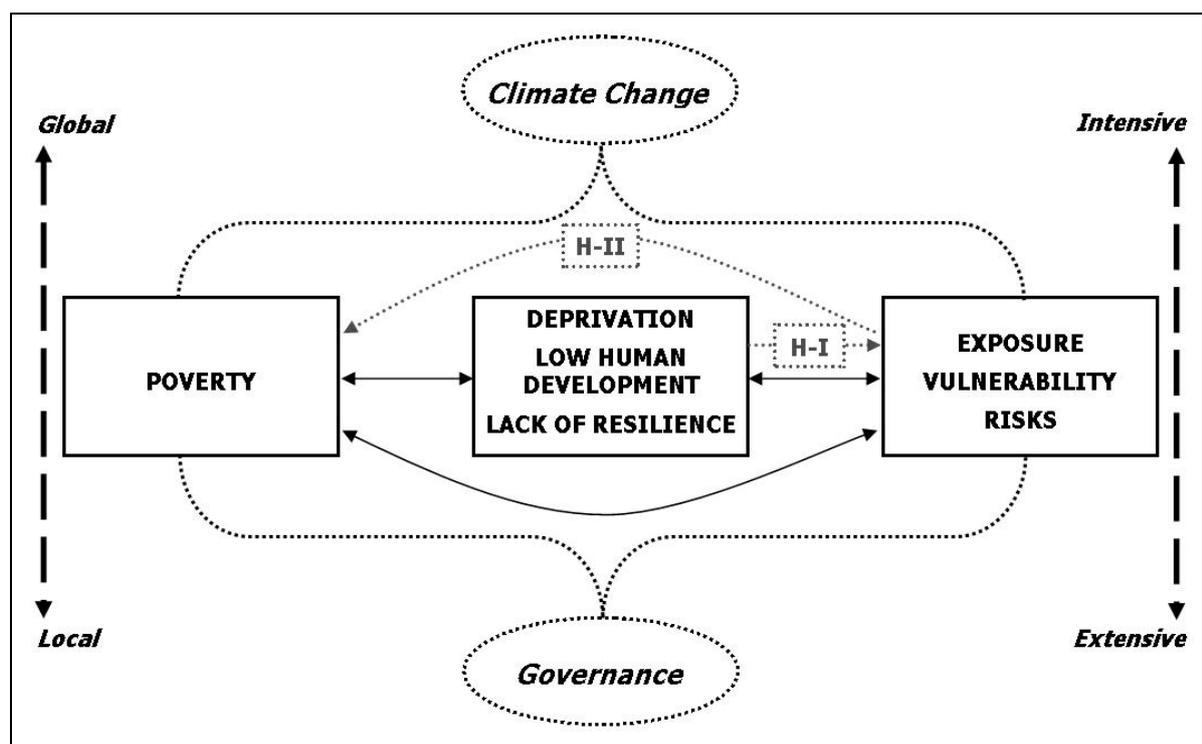
2011b). For example, it is common for a third to two thirds of the population of cities in low- and some middle-income nations to live in such informal settlements. The competence and capacity of city governments varies greatly and there are a multitude of examples where urban risk has been created or exacerbated by government incapacity to act in the public good, guide urban growth and ensure infrastructure and service provision.

Many informal settlements are on dangerous sites that are exposed to particular hazards— for instance large concentrations of informal settlements can be seen on hills prone to landslides in Rio de Janeiro (Brazil), La Paz (Bolivia), Caracas (Venezuela) and Chittagong (Bangladesh); or in deep ravines (Guatemala City); or in sandy desert as in Lima (Peru) and Khartoum (the Sudan); or on land prone to flooding or tidal inundation or under water as in Guayaquil (Ecuador), Recife (Brazil), Monrovia (Liberia), Lagos and Port Harcourt (Nigeria), Port Moresby (Papua New Guinea), Delhi and Mumbai (India), Bangkok (Thailand), Jakarta (Indonesia), Buenos Aires and Resistencia (Argentina), Accra (Ghana), Dhaka (Bangladesh) among many others (Hardoy *et al* 2001). Low-income settlements develop on such sites because the land is unsuited for residential or commercial development so those who settle there and build their homes have more chance of avoiding eviction – and these are often chosen because they are also good locations in regard to income-earning opportunities. Housing within these areas is often very dense, increasing the risk of fires for example and meaning the access for emergency services is poor. Their informal status often means local governments will not input the necessary risk-reducing infrastructure and services. Many tenants rent which places them at very high risk post disaster as they are not formally recognised by the local government. Building codes are rarely in place or enforced, and as such many of the buildings are made of materials which are not suitable to protect residents against earthquakes, flooding or other hazards. Where building codes do exist, they frequently result in construction costs that are outside the reach of low-income urban residents, thus preventing them from achieving formally recognized tenure.

Risk in many cities is therefore often being built up over time, as various decisions and actions for urban development occur (i.e. where to locate critical services, people coming and occupying high risk areas, making more dense settlements over time) and this is likely to continue as unplanned development continues, migration to cities continues, or development that does not adequately account for hazard risks continues. The recent earthquake that devastated Port-au-Prince and its surroundings in Haiti, is another example of how risky a city can be if it is poorly governed with little institutional capacity, dependent on aid for infrastructure investments, no emergency plans and much less capacity (or government willingness) to address the structural causes of vulnerability.

The impact of disasters on urban poverty both in the sense of hitting low-income groups hardest and in the sense of exacerbating poverty or creating poverty among those who before the disaster were not poor has been greatly under-estimated. In part, this is because most disasters go unrecorded in national and international disaster databases. In part, it is because the metrics used to assess disaster impact do not include many of the impacts that are most relevant to low-income groups – for instance damage to their housing, injury, disruption to their livelihoods and loss of assets. This is what new more detailed analyses of disasters and their impacts have revealed (UNISDR 2009 and 2011b) but as yet, these are only available for a limited range of nations and urban populations. What is certain however is that poverty plus urban concentration usually means both extensive and intensive risk (Dodman *et al*, 2009, see figure 3).

Figure 3: Conceptual framework: Poverty, vulnerability and risk



Source: Dodman et al. (2009).

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3 GEOGRAPHICAL DISTRIBUTION OF RISK

Key points:

- There are no disaster risk assessments for many cities, and where they do exist they frequently focus only on exposure to hazards: this and a lack of local analysis makes it difficult to compare risk between different cities.
- A significant proportion of the literature on risk focuses on flood-risks in large cities.
- There is a growing body of literature on risk from urban violence, particularly in Latin America and the Caribbean.
- There is very little data on urban risk in Sub Saharan Africa and in smaller urban centres worldwide.
- Risks in cities are generally much lower in cities in which protective infrastructure has been developed over long periods of time, and in which there are competent, accountable, adequately resourced municipal governments that work well with their low-income population.

3.1 Mapping Disaster Risk at the City Scale

How best to map disaster risk for a city generally depends on the existing information base. 'When a city government has complete information about all households, buildings, neighbourhoods and enterprises within its jurisdiction and all these have basic infrastructure and services, these can provide the basis for mapping disaster risk... especially if there are accurate, detailed, location-specific records of the impacts of extreme weather and other events that caused accidental deaths and injuries' (Satterthwaite 2011b). However most urban centres in low- and middle-income nations do not have such an information base, particularly in regard to informal settlements. Very few have recent or satisfactory census information on which to draw; national statistical offices usually fail or are unable to provide local government with the census data for their jurisdiction in a form that allows its use in identifying risk and vulnerability. Furthermore, the great range of hazards and the changing nature and scale of hazards and vulnerabilities in urban areas and complex interconnections between them makes it highly problematic to compare risks across urban areas and label certain cities or regions within cities as being more 'at risk' than others.

There is data on deaths (and often economic losses) from disasters that give some idea of risks but as noted earlier, the official dataset used to monitor global trends in disasters is known to be very incomplete in logging the deaths and economic losses from disasters and to have limitations in spatial locators – for instance to allow an analysis of disaster impacts in urban centres or on a particular urban centre.

Despite the lack of data, there is wide recognition of the importance of local-level risk and vulnerability assessments involving households and community organisations. This is due to the influence of 1) the social context (e.g. gradients in wealth, housing style, risk perception, purchasing power) and 2) environmental conditions (e.g. ground quality and liquefaction potential, infiltration rate, gradient, microclimate) on the construction of risk. There is a huge variety of risk assessments, with the majority assessing exposure to specific physical hazards (Mehrotra *et al*, 2009): indeed, "most existing analyses investigate only the physical vulnerability of cities to the direct impacts of weather and climate events" (Hallegatte and Corfee-Morlot 2011, p5).

More sophisticated risk and vulnerability assessments are being developed and carried out, such as those assessing multi-hazards, adaptive capacity (for example the Adaptive capacity index), vulnerability (e.g. Climate change vulnerability index, Community vulnerability index, see Birkmann *et al*, 2009) and underlying risk factors (such as the Governance effectiveness index and Institutional robustness index). Despite the growing number of risk and vulnerability assessments, there are relatively few which are specifically urban, although the World Bank (2010b) has recently developed an urban risk assessment which has been piloted in four cities (Mexico City, Jakarta, Dar es Salaam

and Sao Paulo) and the IFRC is working on adapting its Vulnerability and Capacity Assessment (VCA) tool to urban areas (interview with Pablo Suarez, Red Cross/ Red Crescent Climate Centre). Many of these approaches to risk data gathering and analysis use high quality scientific data and Geographic Information Systems (GIS), although many are now recognising the value of combining these with ground-truthing that involves the inhabitants of informal settlements with the buy-in of the city and sub-city authorities (Satterthwaite, 2011b, Livengood and Kunte 2012). Because of different perceptions and priorities around risk, it is also generally agreed that this, in combination with scientific data, could be the most effective approach to map risk (interview with Melanie Duncan).

3.1.1 Cities most at risk

A number of studies have attempted to rank urban centres most at risk. For example Munich Re Group (2005) created an Index for cities taking a multi-hazard perspective. Analysing 30 large cities in low and middle income countries and 20 in high income nations, the report rated Tokyo as the city at highest risk, followed by San Francisco. Of course this is because it defined risk as the value of exposed assets, which will be greater in high income countries.

Other studies analyse how resilient a community is, whereby the least resilient areas are the most at risk. For example, the U.S. Indian Ocean Tsunami Warning System Program (2007) developed a guide to address coastal hazards and reduce risk to vulnerable communities. The assessment process is intended to easily fit into the development plans of any coastal area (including urban), and highlights the gaps in resilience that can be addressed by the community together with government agencies, nongovernmental organizations (NGOs), private sector, and other stakeholders. There have also been a growing number of studies highlighting those cities most at risk to specific hazards and the impacts of climate change (e.g. WWF 2009, Nicholls *et al*, 2009) which will be discussed later.

Another assessment for cities at risk could be the proportion of residents residing in informal settlements. As has been discussed in previous sections, these areas tend to have poor quality and overcrowded housing (often rented) combined with inadequate infrastructure and services, which increases the resident's vulnerability to hazards such as floods, landslides and biological pathogens and places them at high risk of fire, violence and epidemics. In many of the cities with high proportions of the population in informal settlements, local governments are often weak and ineffective in building resilience (through enforcing land use policies and building standards for example), often due to not having the power to implement change, are unaccountable to their populations and rarely allow them to participate in decision making. This is a particular problem in cities where the urban population is rapidly expanding.

While there is clearly no one size fits all assessment for urban risk, there are some cities which attract far greater attention in the literature than others. Furthermore, within these cities there is often a greater focus on specific types of risks, with few case studies addressing the range of underlying causes which create risk and how to build resilience within these centres.

The vulnerability of many African cities to disasters compared to other continents has been recognised in recent years, due to a number of shared characteristics and underlying socio, economic and cultural factors which have led to the accumulation of risks (Pelling and Wisner, 2009). However, Latin American and more recently Asian cities, who share many of these characteristics, have received far greater representation in the literature. This may be partly attributed to the fact that until recently Africa was considered to be largely rural and thus the greatest attention to risk reduction placed in these areas. In addition, many more cities in Asia have caught the world's attention with larger scale disaster events such as the many cities heavily impacted by the 2004 Indian Ocean tsunami. The 2005 floods in Mumbai, several large floods in Manila and other cities in the Philippines this year and in recent years and the flooding in Thailand that so impacted Bangkok in 2011 (and more recently) have promoted a greater interest in following successful and integrated DRR strategies. Many cities in Asia are also at a higher seismic risk than any other continent (the highest concentrations of volcanoes are in Southeast Asia).

3.1.2 Cities at risk from the impacts of climate change

The impacts of climate change are and will be highly localised, although the scale of climate change risk in the majority of African, Asian and to a lesser extent Latin American urban centres is largely unknown due to a lack of local analysis (IPCC 2007, Kithiia 2011). The IPCC (2007) report has identified, with varying degrees of certainty, regions (and therefore cities within them) that will be the most vulnerable to the impacts of climate change, and recognised Africa as the continent most vulnerable due to the multiple stresses described above.

A number of studies have attempted to rank cities according to their vulnerability and risk to the impacts of climate change, with varying outputs again dependent on the indicators used to determine 'risk'. For example a WWF Report (2009) looked at the risks of climate change to ten Asian Cities, concluding that the most vulnerable cities, Manila, Dhaka and Jakarta, were those with both the highest exposure and the lowest adaptive capacity. In another study, the OECD (Nicholls *et al*, 2009) looked at the exposure (of population and assets) of 136 port cities with over 1 million people to one-in-100 year surge induced flood events. The Index showed that cities in Asia have the highest absolute population exposure now and in the future in addition to asset exposure by the 2070s. Cities that were deemed to experience the highest percentage population exposure increase in future were mainly in sub Saharan Africa, such as Luanda and Mogadishu, with cities such as Dhaka and Chittagong experiencing the highest absolute exposure, putting them at risk of larger-scale flooding disasters.

3.1.3 Cities in the Low Elevation Coastal Zone (LECZ)

While of course there is variation in regional predictions, much of the literature focuses on cities within low lying coastal areas which have been recognised as being at greatest risk to flooding from sea level rise (to a lesser extent in Latin America), storm surges and extreme events and are already starting to be impacted (McGranahan *et al* 2007, Nicholls *et al* 2007, Balk *et al* 2009a, Hunt and Watkiss 2009, UN Habitat 2011a). Cities in these areas are also at high risk of flood related health problems, particularly the poor (Balk *et al*, 2009a, Kovats and Akhtar 2008). As can be seen in table 3 a significant proportion of Africa and Asia's urban population is concentrated within the LECZ (low elevation coastal zone). Asia in particular has 91 cities of more than one million persons within the LECZ, Africa 22 (Dodman *et al*, 2011). Within Africa, cities such as Alexandria and Banjul (Bigio, 2003) and Lagos are at high risk of flooding, in addition to many cities along the East African coast. Cities located within deltas such as the Ganges-Brahmaputra (including Dhaka), Mekong, Yangtze, Nile, Niger and Senegal are also likely to have large numbers of urban populations at risk to sea level rise and changes in run off (IPCC 2007). Within Asia many cities are also in cyclone-prone coastal areas, such as Mumbai, and therefore at high risk of storm surges and an increased frequency and intensity of extreme weather. There is also some evidence that hurricanes will become more frequent and intense, and that the hurricane belt will shift south. This will affect many cities in coastal Vietnam, Bangladesh and India (particularly the East coast) for example, as well as cities in Central America such as Mexico (Krishnamurthy *et al* 2011) and Honduras.

African cities which are greatly covered in the literature regarding addressing the risk from flooding, often associated with climate change, are Cape Town (Mukheibir and Ziervogel 2007, Pelling and Wisner 2009), Lagos (Douglas *et al*, 2008, Adelekan, 2010, Hanson *et al* 2011), Maputo (Douglas *et al*, 2008), Mombasa (Awuor *et al* 2008, Kithiia and Dowling 2010, Kithiia and Lyth 2011, Kithiia 2010), Djibouti, Monrovia, Tema, Walvis Bay, Port Elizabeth, Buffalo City, Saint Louis (Diagne 2007, Pelling and Wisner 2009), Dakar (Simon, 2010), Accra (Douglas *et al*, 2008, Pelling and Wisner 2009) Cotonou (Dossou and Glehouenou-Dossou 2007, Simon, 2010), Beira, Algiers, Durban (Carmin *et al* 2012, Roberts 2008 and 2010), Dar es Salaam (Pelling and Wisner 2009, Kithiia 2010) and Nairobi (Douglas *et al*, 2008).

Within Asia, Dhaka (Alam and Golam Rabbani 2007, Banks *et al* 2011), Jakarta (Bigio, 2003), Manila (Padolina 2012), Calcutta/Kolkata, Phnom Penh, Ho Chi Minh (Storch *et al* 2009), Danang, QuyNhon (DiGregorio *et al* 2012), Shanghai (De Sherbinin *et al* 2007), Cuttack (Livengood and Kunte 2012), Bangkok (Bigio, 2003), Kuala Lumpur, Mumbai (De Sherbinin *et al* 2007, Hallegatte *et al* 2010, Ranger

et al 2011), Colombo (D’Cruz *et al* 2009, Kanchana 2008) and Singapore (Shaw and IEDM Team 2009, Surjan *et al* 2008) have all received significant attention, with smaller studies having been carried out in area such as Semarang, Indonesia (Sutarto and Jarvie 2012) and Kurnool in India (Ramachandraiah 2011).

A smaller percentage of Latin America’s urban population lives within the LECZ. Of those that do however, there has been a similar focus on the risks from flooding, sea level rise, storm surges and extreme weather. Cities such as Cartagena, Tumaco, Buenos Aires (Ciudad de Buenos Aires 2010, Barros *et al* 2005), Chetumal (Hardoy *et al*, 2013), Mexican Caribbean (Manuel-Navarrete *et al* 2010), Rio de Janeiro (De Sherbinin 2007, D’Almeida Martins and da Costa Ferreira 2011), Quito (Carmin *et al* 2009), Caracas (Czulewsky *et al* 2006, World Disasters Report 2010), Georgetown (Pelling 1999) and Sao Paolo (D’Almeida Martins and Leila da Costa Ferreira 2011) have all received much attention.

Table 3: Population and land area in the Low Elevation Coastal Zone (LECZ) by Region – 2000

<i>Region’s populations and land areas in low elevation coastal zones</i>					<i>Shares of region’s population and land in low elevation coastal zones</i>			
<i>Region</i>	<i>Total Population</i>	<i>Urban population</i>	<i>Total Land</i>	<i>Urban Land</i>	<i>Total Population</i>	<i>Urban population</i>	<i>Total Land</i>	<i>Urban Land</i>
	(millions)	(millions)	(thousand km ²)	(thousand km ²)	(per cent)	(per cent)	(per cent)	(per cent)
Africa	56	31	191	15	7	12	1	7
Asia	466	238	881	113	13	18	3	12
Europe	50	40	490	56	7	8	2	7
Latin America	29	23	397	33	6	7	2	7
Australia and New Zealand	3	3	131	6	13	13	2	13
North America	24	21	553	52	8	8	3	6
Small island states	6	4	58	5	13	13	16	13
World	634	360	2 700	279	10	13	2	8

Source: McGranahan *et al.* (2007).

Urban areas within drylands will also be differentially impacted and are likely to be at risk of low, unpredictable, and erratic precipitation (IPCC, 2007). According to McGranahan *et al* (2005) 45% of these areas are urban. Drylands are home to about half of Africa’s urban residents irrespective of city size and, in India, even greater percentages—ranging from 54 to 67 per cent. Much lower percentages of urban-dwellers live in drylands in South America and China however. Particularly in the dryland areas where rivers are currently fed by glacier melt, the flows from this source will eventually decrease as the glaciers shrink, rendering flows in some rivers seasonal (Kovats and Akhtar, 2008). As such much of the literature has focused on the retreat of glaciers in South America, causing many Andean cities, such as Huancayo, Peru and Quito, Ecuador, to face water shortages in the dry season. This is often combined with a higher risk of floods from melting of glaciers combined with intense rainfall, such as in Quito (Carmin *et al*, 2009). Cities dependent on these sources of water—such as in the Andes and in the areas fed by the Ganges and Brahmaputra Rivers—will eventually need to find alternatives.

Many cities within Latin America and the Caribbean, particularly in the Pacific fire belt and Andean region, are at an incredibly high risk from geological hazards such as earthquakes and volcanic eruptions and the associated impacts. Cities such as Managua, Nicaragua (González Vásquez 2006, World Bank 2010b) have had much attention in relation to this, especially with regard to how geological hazards combine with extreme vulnerability associated with precarious, low quality housing and lack of services.

Climate change may also lead to a change in certain disease vectors, such as malaria for example which in Africa may shift to include some of Zimbabwe's cities, highland Kenya, Ethiopia, Burundi and northern South Africa which were previously unaffected (IPCC, 2007). As such there is a growing breadth of literature on the impacts of climate change and risk to health (see Kovats and Akhtar 2008 for example).

3.1.4 Cities inland

It is widely recognised that cities inland face different risks to coastal cities, from floods, to heat islands, desiccation, desertification, fresh water supply, diseases and food security, and that the impacts of climate change will also differ (IPCC 2007). For example, Kano, Bulawayo, Dodoma and Naivasha are all at risk of chronic water shortages and food shortages (Simon, 2010). However, many of these inland urban centres have been largely ignored in the literature and there is an extreme lack of data regarding risk in these areas. This is particularly apparent in Central Africa whereover 70% of their urban populations live in slums (UN Habitat 2011c) putting them at an even greater risk. Furthermore, according to the UN Habitat (ibid) populations in cities such as Bamako, Abuja, Kinshasa, Ouagadougou and Sana'a may double in about 17 years, and where policies that increase resilience do not exist, very high risk will prevail for a large number of their populations.

Of those cities inland, Kampala (Mallet 2010, Kamungi 2010, Lwasa 2010, Refstie *et al* 2010, Decorte and Tempra 2010), Khartoum (Brumat 2010, Pantuliano *et al* 2011) and Kathmandu (Kirsch-Wood 2012) are given the greatest attention in the literature, with some understanding of risk in Lusaka, India (Revi 2008, Sharma and Tomar 2010, Singh & Wajih, 2011) and Malawi (Brown, 2011). Within these, most of the research again focuses on the risk from flooding.

As mentioned previously, a far higher proportion of Latin American cities, especially the larger urban centres, are actually inland. Many of these cities however are located near large bodies of water, and are having major impacts from climate change, so again the literature focuses on risks from flooding, mud and landslides. Cities with much written on them are Manizales (Velásquez Barrero 2010, Hardoy *et al* 2013), Bogotá (Rubiano, L. 2009), Medellín (Hardoy *et al* 2011), Santa Fe (Santa Fe 2011, IFRC 2010, Hardoy *et al* 2011), Rosario (Hardoy and Ruete 2013), San Antonio de Areco (IFRC 2010), Motozintla (Chiapas Mexico), Quintana Roo (Hardoy *et al*, 2013), Mexico City (Romero-Lankao, 2010, Aragón-Durand 2007) and Santiago. The Yucatán peninsular, which has many urban centres both inland and on the coast, has also received much attention (Wilkinson 2012).

3.1.5 'Megacities' versus the majority

Many of the cities mentioned above are their countries capitals or larger urban areas and key economic centres, which encourages them to attract a great deal of attention in the literature in regards to building resilience (APN 2009, De Sherbinin *et al* 2006). Indeed McGranahan *et al.* (2007) report that larger urban settlements tend to be more concentrated in low elevation coastal zones, and that around 65% of cities with populations greater than 5 million are located in these zones. Larger cities are also more inter-connected regionally and globally, causing a greater vulnerability to disruptions of supply chains and are seeing very large-scale construction at high density often occurring. However, as can be seen in table 4, the majority of Africa, Asia and Latin America's urban populations live in smaller urban centres with fewer than 1 million inhabitants (Satterthwaite, 2006b, Dodman *et al*, 2011). There are only 2 'mega cities' (cities with ten million plus inhabitants) in the whole of Africa (Cairo and Lagos) and while there are more in Asia (13 out of the world's 23 megacities in 2010) they still make up a small proportion of Asia's total urban population.

Furthermore, most of Africa and Asia's urban population living in the LECZ are also in small urban centres (Dodman *et al* 2011).

Table 4: Population distribution between different size categories of urban centres and rural areas in 2005

Nations and regions	Percentage of the total population in 2005 in:					
	Rural areas	Urban areas with fewer than 500,000 inhabitants	Urban areas with 0.5 to 1 million inhabitants	Urban areas with 1 to 5 million inhabitants	Urban areas with 5 to 10 million inhabitants	'Mega-cities' with over 10 million inhabitants
Africa	62.1	22.1	3.3	9.5	1.7	1.2
Asia	60.3	19.7	4.0	8.9	3.2	3.9
Europe	28.1	48.8	7.0	11.4	3.3	1.4
Latin America and the Caribbean	22.5	37.9	7.9	16.2	4.7	10.9
Northern America	19.3	29.7	8.5	25.8	7.4	9.3
Oceania	29.5	28.6	1.5	40.4	0.0	0.0
World	51.4	25.4	4.8	10.9	3.3	4.1
High-income nations	26.0	39.9	6.7	16.2	4.0	7.2
Low- and middle-income nations	57.3	22.1	4.4	9.7	3.2	3.4
Least developed nations	73.0	15.8	2.2	6.4	0.9	1.6
China	59.6	17.4	5.6	12.7	2.8	1.9
India	71.3	14.7	2.8	4.9	2.2	4.2

Source: Derived from statistics in UNDESA (2008). These statistics need to be interpreted with caution. Obviously, the proportion of the population in 'rural areas' and 'urban centres with fewer than 500,000 inhabitants' is influenced by how urban areas are defined. Additionally the proportion of the population in larger cities is influenced by how these cities' boundaries are defined.

Although in absolute terms more people will be affected in the large and mega-cities, populations within these smaller urban centres are likely to face much higher extensive risks (Dodman *et al*, 2011, Zetter and Deikun, 2012). This is due to often weaker municipal authorities, poorer provision of services and infrastructure and lack of technical knowledge. However they may be at less risk of larger scale disasters, as much of the intensive risk in large urban areas is due to people being forced onto dangerous sites. Furthermore, while the majority of sources argue that smaller urban centres are at highest risk, according to the UN Habitat (2011c) slums are in fact more easily improved in smaller than in larger cities, due to fewer social, cultural and economic barriers to urban development and thus there is greater potential to reduce risk in these areas if there is the will.

The lack of data on risk in smaller urban centres is starting to be recognised, and a number of studies are being undertaken to address this. For example the UNISDR Regional office for Africa in Nairobi (2012a) has recently undertaken a pilot project in Narok, Kisumu (Kenya) and Moshi (Tanzania) to find out what disaster prevention activities are being undertaken and make a preliminary assessment of city resilience according to the 10 Essentials framework for cities to improve their resilience capacity. Pelling and Wisner (2009) also look at Kisii and Kisumu as cities at high risk,

analysing their history of urbanisation and disasters and processes that lead to the accumulation of risks. The IFRC recently initiated a report on the smaller towns and centres in Africa, what their characteristics and make up are and the risk within them (interview with Pablo Suarez, Red Cross/Red Crescent Climate Centre), and Shah and Ranghieri (2012) analysed the risks faced in three Vietnamese cities of varying sizes (Hanoi, Dong Hoi and Tho).

3.2 Good Governance

As can be seen from the above, the majority of the literature focuses on the risk of cities to specific hazards, of which flood risks have been most widely analysed. The impact of disasters in urban areas and their relationship to urban governance has been widely recognised in Latin America however, and there are a number of good practice examples coming from nations or cities there where citizen pressures and political reforms have been making local governments more accountable and responsive to their citizens. Examples include cities that implemented participatory budgeting that allows residents in low-income communities more influence on infrastructure priorities within their district (Cabannes, 2004), the provision of land for housing with infrastructure to avoid the formation of illegal settlements, through the joint work of government with community organizations for example in Ilo (Peru) (Díaz Palacios *et al* 2005), improvements in the public transportation system (Curitiba, Brazil), and the integrated urban development process implemented in Manizales (Colombia) (Hardoy *et al*, 2011). While there is growing interest in this area in Asia, there has been little attention to this in Africa and amongst African researchers and urban specialists. This becomes apparent when looking at which cities have signed up to the UNISDR 'making cities resilient campaign' (2011a) which requires local governments to sign up to reducing risk; 11 in West Africa, 12 in East Africa, 8 in Southern Africa and none in Central Africa. Within Africa, Durban is widely discussed as a leading city on building resilience to a wide range of hazards, including measures at a community level. There is also more attention to integrating DRR and climate change adaptation into urban planning in the literature in Latin American cities (Hallegatte and Corfee-Morlot 2007, Hardoy *et al*, 2011 and 2013) although again Asia has an increasing body of literature on this.

3.3 Urban Violence

There has been a growing body of literature on the risk from violence in urban areas and how it manifests in different contexts (see Moser 2004). The general conclusion among academics and practitioners is that crime and violence, and the accompanying fear, are more severe in urban than rural areas, compounded by their rapid growth, and that in many large urban centres every-day violence is now endemic (UN Habitat, 2007b). However, as per all the other hazards discussed, cities have the potential to be centres of extremely low risk from violence (World Bank, 2010c).

While there is no agreed definition of urban violence, the majority of the literature breaks it down into four types; social (e.g. gender based violence), economic (street crime such as mugging and robbery and crime linked with drugs and trafficking), institutional and political (Moser, 2004, IFRC 2010). As can be seen, the focus is predominantly on physical forms of violence with more psychological forms being largely ignored (*ibid*, 2006). In general, the most vulnerable groups to violence are agreed to be the poor (Winton 2004; Briceno-Leon and Zubillaga 2002, cited in World Bank, 2010c). However, there are also clear gender dimensions to the experiences of violence. Globally, male homicide rates for all age groups are approximately double female rates and more men commit acts of violence (WHO 2008, cited in World Bank 2010c). The rates of nonfatal victimization by violence are more equal by gender however, and women are at a higher risk of sexual and domestic violence than men (World Bank, 2010c).

Additionally the majority of reports agree that there are a number of interconnected factors which make cities and their residents at risk from violence. These include socioeconomic factors such as high levels of deprivation and poverty (a high proportion of a city living in informal settlements), inequality and exclusion (deemed to be more strongly associated with violent crime than poverty) and demographics (such as high proportions of young males and youth unemployment) in addition to political-institutional factors under the umbrella of weak governance (such as the lack of financial

resources to recruit and equip police and poor capacity to investigate crimes and enforce laws) (IFRC 2010, UN Habitat 2007b). Recent studies have found that there is no direct relationship between the growth rate of a city and violence (see table 5), but that “many of today’s cities—especially those that are growing very quickly—experience a convergence of factors that increase the risk for destabilizing levels of violence if they are not appropriately addressed” (World Bank, 2010c xii) In general, risk from urban violence is assessed by the levels of homicide, assault, sexual violence and robbery, although some multi-dimensional frameworks are emerging that attempt to explain different thresholds of urban violence (Muggah, 2012).

Table 5: City population and homicide rates for cities: City-agglomerate population and homicide rates, 2005–06

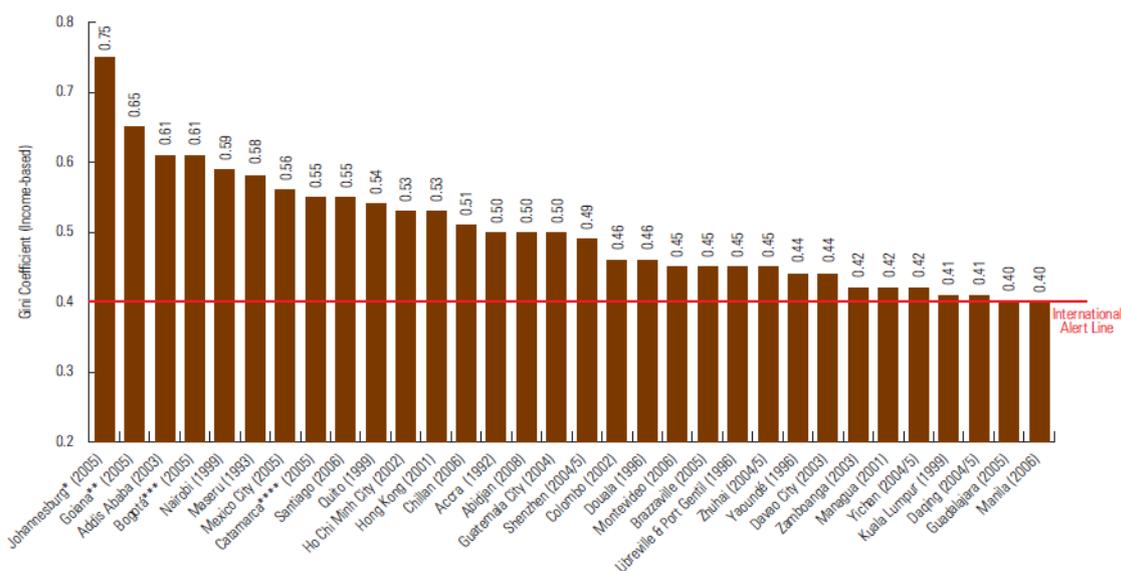
	Cityagglomerate pop.	Change incity pop.(%)	Homicide ratefor 100,000 (ave.)
Algiers	2561992	2.99	0.645
Buenos Aires	3018102	1.16	4.07
Baku	1829000	0.67	3.70
Dhaka	13485000	4.02	2.13
La Paz	839 594	1.89	5.36
San Jose	2000000	3.29	6.40
Santo Domingo	984373	2.12	33.27
Quito	2008819	3.2	12.495
Cairo	11893000	1.73	0.395
San Salvador	2198193	2.16	18.135
Mumbai	16370000	2.47	1.38
Amman	1528687	0.68	1.67
Almaty	1226433	0.82	13.535
Nairobi	2815838	4.43	7.945
Bishkek	820 200	1.2	14.205
Kuala Lumpur	1556200	1.47	3.725
Mexico City	8720916	0.78	7.68
Ulaanbaatar	965300	2.3	15.775
Casablanca	3181000	0.62	1.49
Kathmandu	895000	4.71	18.885
Managua	1380339	0.5	12.915
Panama City	813097	2.51	30.69
Bangkok	5,658,953	0.78	5.64

Source: Adapted from the World Bank (2010c). Office of Drugs and Crime of the United Nations Secretariat, Tenth United Nations Survey of Crime Trends and Operations of Criminal Justice Systems, covering the period 2005–2006. Note: *Both city population and homicide rates are based on UNODC data on homicides.

According to the UN Habitat (2007b) over 60% of urban populations in many low- and middle-income country cities have been victims of crime, increasing to 70% in many parts of Latin America, the Caribbean and Africa. Homicide rates are extremely high, and growing, in many cities in Latin America, the Caribbean and Africa, but far lower in Asia (other than Kabul and Karachi where everyday violence prevails) (ibid). For example, the homicide rate in Rio de Janeiro has tripled since the 1970s, while the rate in São Paulo has quadrupled. The victimization rates for robbery are much higher in Latin America and Africa than in other regions of the world and the highest reported levels of burglary are found in urban Africa, with victimization rates of over 8 per cent of the population (ibid). In general, the literature mainly focuses on cities in Colombia, South Africa, Jamaica, Mexico, Guatemala, Colombia, Nigeria, Kenya and Venezuela as being at the highest risk to the majority of violence (UN Habitat 2007b, Moser, 2006).

Most studies have recognised that while poverty interacts with violence, in general it is cities with the highest levels of inequality that have the greatest risk of violence. This is particularly apparent in cities in Latin America, the Caribbean and Sub Saharan Africa (which has the most unequal cities in the world), such as Johannesburg, Nairobi, Mexico City, Bogota, Quito and Kingston (IFRC 2010, UN Habitat 2011c) (see figure 4). According to the UN Habitat (2011c) however income inequality in cities in Latin America and the Caribbean is actually declining. It is worth noting that these figures for inequality are based on income, and there are fewer studies on gender inequality and its relationship to urban violence.

Figure 4: Most unequal cities (income based Gini) in the developing world (1993-2008)



* In addition to other seven South African cities: East London (0.75), Bloemfontein (0.74), East Rand (0.74), Pietermaritzburg (0.73), Pretoria (0.72), Port Elizabeth (0.72), Durban (0.72) and Cape Town (0.67)

** In addition to other six Brazilian cities: Fortaleza (0.61), Belo Horizonte (0.61), Brasília (0.60), Curitiba (0.59), Rio de Janeiro (0.53) and São Paulo (0.50)

*** In addition to other three cities in Colombia: Barranquilla (0.57), Cali (0.54) and Medellín (0.51)

**** In addition to other two cities in Argentina: Buenos Aires (0.52) and Formosa (0.44)

Source: UN Habitat (2009a).

Rio de Janeiro, Kingston, São Paulo, Mexico City and Caracas account for the majority of the violent crimes in their respective nations, and in Africa cities such as Lagos, Johannesburg, Cape Town, Durban and Nairobi also account for a large proportion of their nation’s crime (UN Habitat 2007b). However, bigger cities are not always more violent than smaller ones (World Bank, 2010c). Despite this, the literature on risk and urban violence almost always focuses on large cities or capital cities, such as Lagos, Johannesburg, Kingston and Sao Paolo, and there are very few studies on risk from violence in the smaller urban areas where the majority of the world’s urban population resides. In particular there is almost no literature on violence in cities in sub Saharan Africa and its smaller urban centres. A further gap in the literature on urban violence is the risk from gender based

violence in the home. In addition the links between climate change, human insecurity and risk of violent conflict are also not well understood (Romero Lankao and Dodman, 2011)

There is also a small but growing literature on the impacts of good governance and of community policing on violence (and more broadly crime). Many cities have succeeded in reducing risk from violence, especially cities where there is meaningful citizen participation and infrastructure and services provided to all areas. There is also a growing interest in how urban violence can be reduced through community based initiatives (Roy *et al* 2004, The World Bank 2010c) and mainstreaming conflict and violence in development debates (Moser and Rodgers, 2012). For example in Medellin and Bogota in Colombia, homicide rates have fallen since their municipal governments have been given greater authority and risk to other hazards has also fallen (Muggah 2012). Other strategies such as community policing in Mumbai and Rio (World Bank 2010b), promoting social capital and community organisation in Lima (Ploger, 2012) and slum upgrading in Nairobi (Moser and Rodgers, 2012) have all reduced the risk from violence. Furthermore Durban has effectively reduced crime and violence through its pro poor city government (UN Habitat 2007b). These methods to reduce the risk of violence in cities have similarities to other risk reducing strategies which fall under the umbrella of good urban governance, and will be discussed in the next section.

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4 RESPONSES TO URBAN DISASTER RISK

Key points:

- **Urban risk is often created or exacerbated by local government's incapacity to act in the public good, guide urban growth and ensure infrastructure and service provision.**
- **There are a number of cities where risks have been greatly reduced through 'accumulated resilience', good local governance and community-based responses.**
- **DRR needs to be mainstreamed into urban and development planning for the most resilient cities.**

Actions that are taken by individuals, households, communities, urban authorities, national governments, and international agencies can all contribute to reducing urban risk in low- and middle-income countries. These responses can be specifically targeted to reducing risk, or they can be more general development activities that contribute to the building of resilience (through reducing exposure to hazards, reducing sensitivity to the effects of these, and building the capacity to respond). The IPCC Special Report on Extreme Events (2012) gives a strong conclusion that "the most effective adaptation and disaster risk reduction actions are those that offer development benefits in the relatively near term, as well as reductions in vulnerability over the longer-term."

Of course, the most spectacular reductions to urban risk have occurred over decades where there has been substantial investment in urban infrastructure and increases in the real income of low-income citizens. In high-income nations, a web of institutions, infrastructure, services and regulations protect almost all urban populations from extreme weather and limit risks for other disasters. Much of this can be termed "accumulated resilience" – the process and outcomes of long-term social, political and infrastructural change with the aim of reducing mortality and morbidity to a range of stresses and shocks. This includes investment in drainage, transportation, shelter, public health infrastructure, and education; as well as strengthening of citizen rights and social safety nets.

4.1 Resilience

Discussions of disaster risk reduction and of climate change adaptation for cities increasingly discuss resilience (UNISDR 2012a). In part this may be a response to the evident lack of resilience in many cities to disasters both in the deaths, injuries and damage and in the limited capacity to recover (often termed 'bounce back'). Resilience also implies a capacity to cope with unexpected or uncertain risks which makes it useful for climate change adaptation in cities where the particular local impacts of climate change and how these are changing or will change are also uncertain. The discussion of resilience rather than adaptive capacity may also have been encouraged by the recognition of cities' dependence on goods, services (including ecosystem services) and financial flows from outside their boundaries and beyond the jurisdiction of their governments.

Resilience is understood as the ability to anticipate risk, adapt to reduce risk or exposure, absorb (cope with risk) and recover. Many papers suggest key components of resilience for cities – for instance flexibility (ability to change, evolve, try new solutions), redundancy (spare capacity to accommodate increasing demand or extreme pressures), resourcefulness, safe failure, responsiveness, capacity to learn, reliability, etc. (Tyler *et al* 2011, Brown *et al* 2012); or identify a range of sectors (e.g. governance, risk knowledge, emergency response) in which resilience is required (Figure 5).

Figure 5: Indicators to determine how resilient a city is



Source: US. Indian Ocean Tsunami Warning System Program (2007).

For a city facing flood risks, greater resilience could be achieved by increasing flood defences, flood preparedness (those at risk including those more susceptible moving to safe sites), acting to reduce volume and speed of floodwaters (including watershed management and flood-water management within the city), implementing land-use management policies that over time reduce flooding and exposure to flooding, supporting the construction or improvement of more resilient buildings and acting to reduce greenhouse gas emissions (which does contribute to long-term global solution but does not reduce current or near future flood risk).

Resilience depends on an appropriate financial, institutional and governance framework. Most cities in high-income nations and some in middle-income nations have a resilience to extreme weather and other shocks that have been built by political processes by which those who lack resilience, voice and influence got their needs addressed – for instance through the universal provision for water piped into homes, for good quality sanitation and drainage, health care and emergency response services and social security safety nets; also almost all buildings meet building standards and most households have insurance for their assets. This does not mean that such a city is resilient to changing risks but it provides a financial, infrastructural and institutional foundation that makes it much easier to build resilience. One of the most difficult issues to address in cities in low- and most middle-income nations is the very large deficits in basic infrastructure (for instance it is common for 50-90 per cent of the population in cities not to have water piped to their homes, sanitation and effective drains, all weather roads and to live in poor quality houses) and the lack of a local capacity to invest in these.

4.2 (Disaster) Risk Reduction

One of the most important criteria for success in development is reducing risk – especially for those who are most exposed to risk (typically those with the lowest incomes) or most susceptible to it (infants and young children, mothers during pregnancy and during childbirth, the elderly, those with chronic diseases). Most of the Millennium Development Goals (MDGs) and their associated targets are directly or indirectly reducing risk. But as noted above, there is very limited data available on the range of risks facing particular populations, their relative importance and the most effective means to reduce the most serious risks. For most urban centres in low- and middle-income countries, there is also very limited data available on the extent of provision for key health determinants – for instance provision for water and sanitation to standards that greatly reduce risks from faecal-oral diseases.

However, we do know that the risks of injury, ill-health and premature death have been dramatically lowered in urban centres in high-income nations and some middle-income nations. We also know that this was achieved by a range of measures, most of which came from local governments and

most of which were achieved through political changes that included pressure from those previously ill-served by these and the organizations they were part of. There is debate about the relative importance of different measures in reducing risks (or reducing mortality rates) but these included the universal provision of water piped into each dwelling unit, good quality sanitation, drainage, solid-waste collection, health care, emergency services and minimum incomes for those unable to earn an income (including pensions). The improvement in housing quality and the application of building standards and land-use management also reduced risks from extreme weather – as can be seen by the reduction in the number and scale of extreme-weather disasters on cities in high-income nations (although of course with some dramatic exceptions). These and many other measures (including insurance for buildings and possessions), and improved occupational health and safety reduced risks. City and municipal governments that were competent, accountable and supported by higher levels of government were key in achieving this reduction in risk. Low-income groups in Manchester in the middle of the 19th century faced very low life expectancies at birth (and very high infant and child mortality rates) – and probably rates that are very similar to those faced by low-income groups in many cities in low-income nations.

4.3 The Role of Local Governments in Reducing Urban Risk

Local government capacities and actions can play a significant role in shaping the nature and scale of urban risk in low- and middle-income countries. Firstly, urban authorities have direct responsibilities for a range of activities related to the built environment, infrastructure and services that can contribute to long-term protection, pre-disaster damage, immediate post-disaster recovery, and long-term rebuilding efforts (Table 6). Secondly, although their direct role in contributing to new investment is frequently small (particularly in comparison to investments by households and private enterprises), their planning and regulatory framework and infrastructure investments can profoundly influence the scope and location of other investors: from large enterprises to small informal entrepreneurs; from large property developers to low-income households seeking land on which to build. In particular, urban planning and land use decisions can help to shape the overall exposure of the city and urban activities to particular hazards, while development of appropriate building standards (that retain the possibility for incremental improvement and do not further contribute to the exclusion of low-income groups to formal housing) can reduce the susceptibility of households and businesses to harm. City authorities around the world are gradually experimenting with different approaches to reducing risk, recognizing that this is an emerging policy domain with few clear and tested approaches (Anguelovski and Carmin 2011, Birkmann *et al.* 2010, Bulkeley and Castan Broto 2012, Carmin and Dodman in press).

The city government of Rosario (the third largest city in Argentina) has greatly reduced a range of risks, especially for low-income groups. Various government departments have taken actions that have reduced the frequency and impacts of flooding. The *Dirección General de Hidráulica* (Department of Hydraulics) has established new risk thresholds based on the analysis of historical and recent precipitation records. These have been used to establish areas where construction is not permitted, areas with restrictions, and areas where construction is allowed taking special considerations into account. As areas on the margins of rivers and streams are cleared, they are converted into green spaces that act as buffers in the event of floods. In addition, the city government has set up an effective and inclusive health care system (Hardoy and Ruete 2013) which reduces the health impact of many hazards. Many other examples of local government actions to reduce risk have been recorded. In Latin America, these include Manizales (Colombia) (Velasquez 1998, Hardoy *et al.* 2011), Ilo (Peru) (Díaz *et al.* 1996; Miranda and Hordijk 1998), Santa Fe (Argentina) (Hardoy *et al.* 2011), and Medellín (Colombia) (Hardoy *et al.* 2011). In Africa, Cape Town (South Africa) has developed a Municipal Adaptation Plan (Mukheibir and Ziervogel 2007), while the ‘Governance and Flooding Programme’ in Saint Louis (Senegal) involves elected officials from the local authority, technical bodies, and economic interest groups alongside community-based organizations and district associations (Diagne 2007).

City governments in Port Louis (Senegal), Walvis Bay (Namibia), Dar es Salaam (Tanzania) and Maputo (Mozambique) have taken specific risk reduction actions under a programme of work

developed by ICLEI Local Governments for Sustainability (ICLEI 2012). In Asia, actions being taken in cities in India, Indonesia, Thailand and Vietnam under the Asian Cities Climate Change Resilience Network (ACCCRN) involve both civil society and local authority responses to build resilience (see Brown *et al.* 2012, da Silva *et al.*, 2012, Moench *et al.* 2011). The UNISDR *Making Cities Resilient Report (2012a)* highlights actions being taken by local governments in more than 40 cities around the world, identifying the following four most frequently taken actions to reduce risk (although it should be noted that the fact they are taken most frequently does not necessarily mean that they are the most important actions to be taken):

- Considering DRR in new urban planning regulations, plans and development activities
- Establishing councils / committees / disaster management structures dedicated to DRM, and engaging in multi-stakeholder consultations
- Constructing or enhancing hazard mitigating infrastructure
- Establishing education / awareness / training programmes

As well as the importance of local governments engaging in a meaningful way with citizens for risk reduction, it is also essential to recognize the importance of interactions between local governments and national governments. Risk is created through processes that take place at local, city-regional, national and global scales, and comprehensive risk reduction activities must also take place at different levels (Adger 2001, Bulkeley 2005, Corfee-Morlot *et al.* 2011). National governments set the broad parameters within which city authorities can plan and budget, while growing international governance architecture has the potential to mandate both financial flows and responsibilities to sub-national levels of government. Furthermore there is the need for coordinated activity between sectors, in order to prevent further ‘cascading failures’. Some of the city governments noted above as being effective risk reducers were supported by supportive national laws and decentralization of revenue raising powers.

4.4 The Potential and Limits of Individual and Community Responses

There are many actions taken by individuals, households and communities that also serve to reduce risk. These can be behavioural changes to reduce short-term risk (e.g. through sending children to stay with nearby friends or relations during times of flood), investments in the quality of individual dwellings to reduce impacts (e.g. through constructing barriers that prevent the entry of floodwaters into homes), community organization to increase adaptive capacity (e.g. through savings groups), or through partnerships between local organizations and NGOs to implement small-scale infrastructural improvements that benefit the community as a whole (Dodman *et al.* 2011). There is also a growing recognition of migration as a strategy for reducing risk, either through moving away from sites that are exposed to particular hazards or through creating more diverse sources of household livelihoods (Adamo 2010, Tacoli 2009, Warner 2010).

Coping strategies for local adaptation to floods have been documented in Africa (Douglas *et al.* 2008), as have a wide range of individual households coping strategies to waterlogging and high temperatures in Dhaka (Bangladesh) (Jabeen *et al.* 2010). At a community level, there is a growing record of local organizations integrating climate-related hazards into their projects and programmes, particularly through boosting the resilience of local livelihoods (Rojas Blanco 2006). Small infrastructure works can often be undertaken at a community level, such as small-scale landfilling to reduce risk in the Philippines (Dodman *et al.* 2010), the building of small bridges and increasing community knowledge of evacuation facilities in Caribbean cities (Pelling 2011). Archer and Boonyabancha (2011) describe similar partnerships in Thailand and Myanmar where urban communities have developed collective responses to disaster risk that provide a stronger basis for negotiating with state agencies in the process of rehabilitation, to ensure that it is driven by their needs, and to build collective capacity for action and engagement with other stakeholders over the longer term.

Table 6: The role of city / municipal governments in disaster protection and response

Role for city / municipal government*	Long term protection	Pre-disaster damage limitation	Immediate post-disaster response	Rebuilding
Built environment				
Responsive, appropriate and enforced building codes	High		High**	High
Land use regulations and property registration	High	Some		High
Public building construction and maintenance	High	Some		High
Urban planning (including zoning and development controls)	High		High**	High
Infrastructure				
Piped water including treatment	High	Some	High	High
Sanitation	High	Some	High	High
Drainage	High	High***	High	High
Roads, bridges, pavements	High		High	High
Electricity	High	Some?	High	High
Solid waste disposal facilities	High	Some?		High
Waste water treatment	High			High
Services				
Fire-protection	High	Some	High	Some
Public order/police/early warning	Medium	High	High	Some
Solid waste collection	High	High***	High	High
Schools	Medium	Medium		
Health care/public health/environmental health/ambulances	Medium	Medium	High	High
Public transport and transport management	Medium	High	High	High
Social welfare (includes provision for child care and old-age care)	medium	High	High	High
Disaster response (over and above those listed above)			High	High

*The actual allocation of responsibility and of access to funding between city/municipal governments and other institutions will obviously differ between countries; the intention of this table is to make clear the many roles city/municipal governments should have in disaster protection and response. High denotes that they have the sole or main responsibility; medium indicates that they have substantial responsibility; some means some role or responsibility but with other institutions having the main responsibilities.

** Obviously it is important that these do not inhibit rapid responses

*** Clearing / desilting drains and ensuring collection of solid wastes has particular importance just prior to extreme rainfall; many cities face serious flooding from extreme rainfall that is expected (for instance the monsoon rains) and this is often caused or exacerbated by the failure to keep storm and surface drains in good order

Source: Developed from a table in Satterthwaite (2007).

Of course, there are limits to what community organization can accomplish for risk reduction in urban centres (Hardoy *et al* 2001, Allen 2006, Dodman and Mitlin 2011). Community action and organization alone cannot ensure good management of land use for expanding cities and cannot put in place building codes and standards (Satterthwaite 2011). But it can form a basis for encouraging and supporting local authorities to address these issues (Soltesova *et al.* 2012). Much greater progress is made through partnerships between grassroots organizations and local authorities: where individual and community responses are most effective, they also act to achieve broader political changes, through influencing local authorities to provide additional investment in protective infrastructure or to allocate land to low-income groups (Dodman and Mitlin 2011). Community mapping and enumeration processes increases the visibility of low income, marginalised groups within a city, while highlighting potential risk factors at the community level and drawing on the local knowledge of residents. The Homeless People’s Federation of the Philippines has developed a set of responses that include community-rooted data gathering, trust and contact building, support for savings, the registering of community organizations, and identifying needed interventions – that are intended to show local government the capacities of their member organizations and that have achieved substantial success in cities such as Iloilo (Carcellar *et al.* 2011, Rayos Co 2010).

Taken together, these examples show a growing body of knowledge and experience about the roles of different actors in reducing risk, and also in addressing the underlying drivers of vulnerability for low-income urban residents. It is also evident that the boundaries between ‘development’ and ‘risk reduction’ in urban areas are rarely clear, with interventions to strengthen livelihoods and improve the provision of basic services making significant contributions to the abilities of individuals, households and communities to weather shocks and stresses of various kinds.

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5 FUTURE RISK

Key points:

- **It is not possible to predict precisely how extreme weather related risks for cities will change, although it is possible to build into city development a resilience to more intense or frequent extreme weather.**
- **Few detailed risk/ vulnerability assessments have been undertaken at the city scale and for most of those that have been undertaken, they do not cover the complete spectrum of risks (including every-day risks and small disasters).**
- **Human induced climate change is adding an extra dimension to understanding risk.**
- **There has been a gradual shift in focus to managing uncertainty (through developing resilience) rather than focusing on specific risks.**
- **In order to plan effectively, multi-hazard and vulnerability risk assessments (both present and future) need to be conducted at the city scale, using scientific data and local knowledge.**

Urban risk is being shaped, and will continue to be shaped, by broader local and global changes. Most important among these are the growing proportion of the world's population living in urban areas, the shifting geographical focus of urbanization, the limits in local government capacity to address risk for much of this population, and environmental changes (particularly as a result of anthropogenic climate change). But the precise scale and nature of urban risk – particularly at the local scale – is under-examined and under-estimated. Much of the literature can only provide indications of general trends rather than precise indications of current and future risks.

5.1 Urban Change and Urban Risk

A detailed review of the scale and nature of urban population growth is outside the scope of this paper. However, there are several aspects of this process that are relevant to understanding and addressing risk. Firstly, the rate of growth in urban populations means that a much larger number of people are concentrated in towns and cities – with consequences both for the creation of risk and methods to respond to this. Actions to reduce risk need to pay greater attention both to the total number of people living in urban areas as well as to the global proportion. Secondly, there is a rapidly growing proportion of the world's urban population and its largest cities in Africa and Asia: three-quarters of the world's 100 fastest growing large cities (in terms of population growth rates between 1950 and 2000) are in these continents. Most of these cities began expanding from a limited infrastructural and institutional base, which would have had implications for risk even if populations had not grown rapidly. Thirdly, this increased urbanization has been driven by the growing concentration of new investment and employment opportunities in urban areas. In almost all nations, the increase in the proportion of the population living in urban areas tracks the increase in the proportion of economy generated by industry and services and the proportion of workforce in industry and services (Satterthwaite 2007). Low-income nations with stagnant economies generally do not urbanize (ibid; see also Potts 2009). But there is a considerable mismatch between expanding populations and the institutional and governance capacities of most cities. Because of this, much urban expansion – of housing, services, and economic activities – has occurred outside official planning and economic frameworks, with large numbers of people living on land that is exposed to environmental hazards of various kinds. As stressed already, it is common for a third of the population of cities to live in informal settlements with inadequate or no provision for water piped to homes, sanitation, drainage, solid waste collection and health care. Research also indicates the intensification of risk in many cities (UNISDR 2009, 2011b).

Of particular importance is the growing number of people living in smaller urban centres: indeed a quarter of the world's population (and half its urban population) lives in urban centres with fewer than half a million inhabitants (Satterthwaite 2006b). These centres (and for many their growing deficits in infrastructure and services) are often overlooked by national governments and

international agencies. Another global trend is the growing concentration of urban populations in coastal areas, including in Low Elevation Coastal Zones which cover 2 per cent of the world's land area but contain 13 per cent of the world's urban population (McGranahan *et al.* 2007). Although local conditions vary significantly, coastal locations will be exposed to the consequences of sea level rise induced by climate change and extreme weather events whose intensity and/or frequency is exacerbated by climate change.

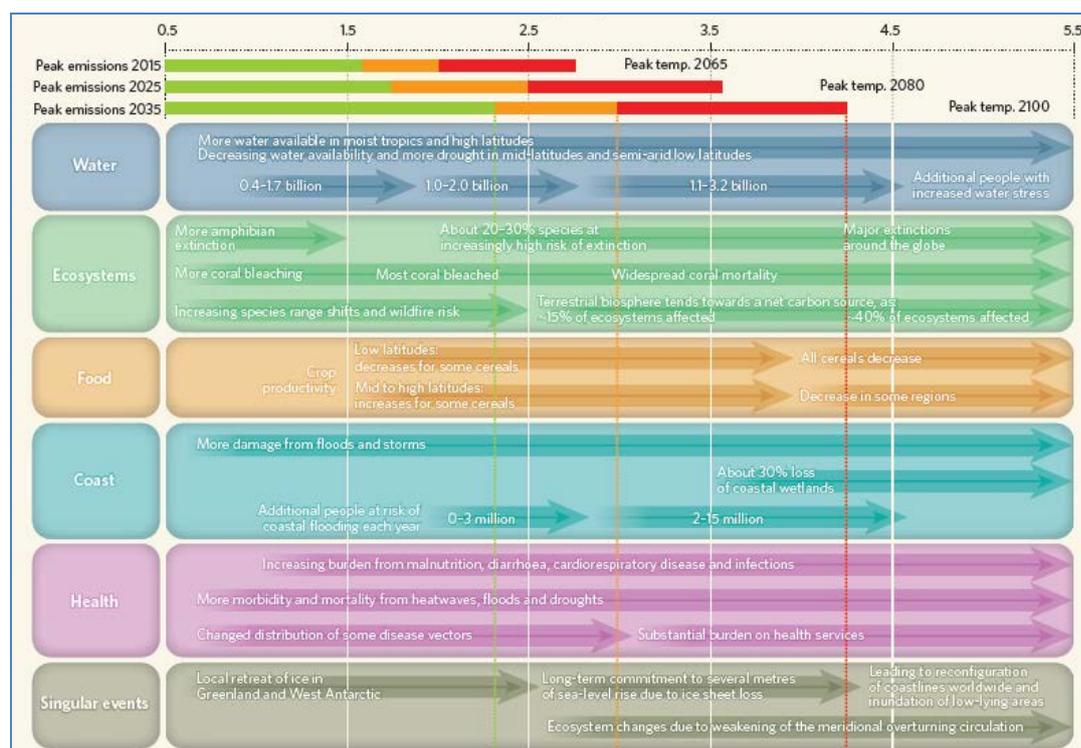
Another aspect of urbanization that can shape risk is population concentration. Densely populated urban areas may contribute to the spread of vector-borne diseases due to higher rates of person-to-person contact (Campbell-Lendrum and Corvalán 2007) particularly under conditions of inadequate infrastructure and health care services. This can also mean that a large number of people are exposed to hazards in a limited geographical area. However, the scale and nature of risk in urban centres is heavily influenced by the quality and capacity of their governments and their willingness (or not) to work with low-income groups. Many dense cities have low risks levels. There are also various approaches that can improve the quality of living conditions while maintaining (or even increasing) density. In Thailand, the government's national Baan Mankong programme has greatly improved housing, infrastructure and services to informal settlements through a participatory upgrading approach - maintaining or increasing density while improving resilience through in situ improvement, re-blocking or land sharing (Boonyabantha 2005), and similar planning efforts have taken place in Karachi (see www.urbandensity.org). This can simultaneously improve the cost effectiveness of service provision and the provision of risk-reducing infrastructure.

5.2 Climate Change and Urban Risk

There is a growing recognition that the impacts of climate change will be felt severely in urban centres around the world, as emphasised by the changing focus of the Assessment Reports of the Intergovernmental Panel on Climate Change (IPCC). The IPCC's Fourth Assessment (2007) contained a single chapter on Industry, Settlement and Society, which concluded that vulnerabilities to climate change depend considerably on specific contexts, with these being particularly severe in certain "high-risk" locations, and stated that "rapid urbanisation in most low and middle income nations, often in relatively high-risk areas, is placing an increasing proportion of their economies and populations at risk". The Fifth Assessment Report, to be published in 2014, contains a greater focus on urban areas, examining these from the perspective of impacts, adaptation and vulnerability to climate change, as well as their role in climate change mitigation. Various other high profile reports have also addressed the links between climate change and urban risk in considerable detail, including the UN Habitat (2011a) Global Report on Human Settlements (*Cities and Climate Change*) and the First Assessment Report on Cities and Climate Change (ARC3) (Rosenzweig *et al.* 2011).

It is increasingly recognized that climate change will affect a range of sectors, including water supply, ecosystems, food supplies, coastal systems and health (Figure 6): all of which are highly relevant in urban areas. By examining which urban systems are most under pressure as a result of climate change, it is then possible to identify those groups which are most vulnerable to direct and indirect impacts from climate change. Specific changes that are likely to affect urban areas are increased risks from flooding (both inland and coastal) (Douglas *et al.* 2008, Dossou and Glehouenou-Dossou 2009, Lwasa 2010, Ranger *et al.* 2011), water scarcity, increased air pollution and heat waves. In addition, there is a growing acceptance of the potential for 'dangerous' global temperature rise (generally recognized as being more than 2°C above pre-industrial temperatures (Betts *et al.* 2011) if global agreement is not reached soon on needed emissions reductions and for sea-level rise to be greater than predicted in the IPCC Fourth Assessment Report (Nicholls *et al.* 2011).

Figure 6: Effects of climate change at given rises in global average temperature



Source: Parry *et al.* (2009a).

5.3 Urban Risk and Migration

Migration to urban centres can be seen both as a key contribution to and response to risk, although the causal links between these are not well understood. Well governed cities in upper-middle and high-income nations have also shown that rapid in-migration need not result in higher risks. It is widely cited that cities which have experienced disaster events can trigger mass migration to other regions and are often the most common destination of migration inflows from other areas (Adamo, 2010). However there are studies which note that disasters do not cause as much mobility as was previously thought (Paul, 2005). Furthermore, the majority of studies that do exist still see migration in urban areas as a problem when in most instances it is a response to changing patterns of economic opportunity. This suggests a need for policy changes that understand and accommodate mobility in urban areas and their surroundings (Adamo, 2010). As such there has been a growing debate regarding the links between disasters and migration in urban areas – see for instance the special edition of *Forced Migration Review* entitled ‘adapting to urban displacement’ in 2010.

From past evidence it seems that short term and short distance movements will probably increase, and take place within national boundaries. In particular, the risks arising from the direct and indirect impacts of climate change will lead to changes in mobility and population distributions (although it is likely they will not be as high as many alarmist predictions initially stated) (Deshingkar, 2011, Tacoli, 2009). Many coastal cities are already receiving high level of net migration, excluding those who have been influenced by violence and conflict, and this trend is likely to continue (Dodman *et al.*, 2009). This could render these cities even more vulnerable if their governments lack the capacity to plan and manage growth. There is growing evidence however that population mobility allows income diversification and is thus an important adaptation strategy for reducing vulnerability, increasing resilience and enabling individuals to accumulate assets (Tacoli, 2009, Deshingkar, 2011). Despite this, in many cases the very poor and vulnerable will be unable to move, rendering them at even higher risk than previously (Tacoli, 2009).

Projections for mobility as a result of the impacts of climate change and the causal links between climate change and migration are not well understood (Tacoli, 2009, Romero Lankao and Dodman, 2011). There are also very few studies on migration within national boundaries of low and middle income countries, and relatively little is also known about the make-up of migrants in urban areas

(Tacoli, 2009, Forced Migration Review, 2010). As such how humanitarian agencies engage with IDPs after a disaster in urban areas is particularly challenging (Forced Migration Review, 2010).

5.4 Future Risk Modelling

There is wide agreement that there needs to be more accurate, detailed, local-level knowledge of hazards and vulnerabilities in order to plan effectively for risk reduction and for resilient cities. There are also case studies of cities where far more detailed local assessments of disasters and their impacts have shown the need to change approaches to risk reduction. The majority of the literature also stresses the importance of drawing on scientific data and local knowledge to better predict how risks will change in the future – while acknowledging the difficulties in doing so.

Stochastic simulation models of risk can be produced although the demand for these is being driven by insurance companies for the calculation of premiums (see section 5.6). This means that the outputs of these models are seldom publicly available, and that their production is concentrated in countries and locations where investments are insured. But only a very low proportion of urban households in low- and most middle-income nations have insurance – either for their houses or their possessions (Hoeppe and Gurenko 2007). Estimates of the costs of disasters are often based on costs to insurance companies, which therefore excludes costs borne by the informal sectors of society who do not have access to insurance services, and yet are often the most vulnerable.

Catastrophe risk modelling is expanding rapidly, with various actors (including the World Bank and the UN-ISDR) building models that are likely to be widely available (interview Robert Muir-Wood, RMS). For example the UNISDR has developed a global disaster risk model which is deemed to provide the 'best information available on likely economic losses as climate change kicks in'. The Global Assessment Report (UNISDR 2011b) pointed to a number of innovative approaches being taken to risk modelling, whereby the full spectrum of extensive and intensive risks are measured to illustrate the magnitude of recurrent and future (maximum) disaster losses. These also allow governments to visualise the trade-offs and costs and benefits that may occur, to ensure they make building resilience and Disaster Risk Reduction an immediate priority.

Predicting risk from limited data can create its own problems, and there are various examples where action has been taken in uncertain conditions to reduce risk and actually led to increased vulnerability. For example many humanitarian agencies in Haiti prior to the earthquake focused their efforts on reducing the risk to hurricanes, which led to a greater sensitivity to earthquakes (da Silva, 2012). Another example is Japan, whereby models had predicted that the greatest risk to the country was from earthquakes. As such the government invested heavily in earthquake proof infrastructure, ensured construction adhered to strict building codes and created high resilience to earthquakes. The risk from tsunamis however was deemed to be much lower and therefore sea walls were built to a level that could not protect against the tsunami that struck in 2011. Da Silva (2012) shows the limits in using past disasters to predict current and future risk in Quy Nhon, Vietnam. The city experienced unprecedented floods in 2009, and in response, elevated roads were built and houses raised very rapidly up to two metres above the ground. However, this has transferred flood risk to other areas of the city as the elevated roads and houses block natural drainage channels through the city, and this risk is likely to increase as rainfall increases in intensity during the rainy season.

5.5 Managing Uncertainty of Future Risk

The impacts of climate change on particular urban areas are difficult to predict. There is uncertainty about estimates of future greenhouse gas emissions, uncertainty about how the global climate system will respond to these, and uncertainty about how these global changes will be manifested at the local scale (Mastrandrea *et al.* 2010, Oreskes *et al.* 2010, and van Vuuren *et al.* 2011). In addition, understanding risk and vulnerability needs a detailed local understanding not only of who is likely to be exposed but also who is particularly susceptible and who has a capacity to cope and to adapt. Also, the quality and capacity of responses by local governments and other local actors will shape future risk.

Therefore there is also a growing body of literature on managing uncertainty rather than scenarios, in combination with the use of scientific and community data sources (Dodman and Carmin, 2011). According to these authors the most effective way to go about this is to build positive relationships between sectors in a city and ensure projections and assessments are regularly updated in an iterative process. For example in Durban the municipal authorities are working with consultants to model impacts from climate change scenarios.

5.6 The Role of Insurance in Managing Urban Risk

The unprecedented levels of urbanism and associated risks are causing interesting and new challenges for the insurance industry, and as such there is increasing interest in the role of insurance in cities by banks (Lloyds, 2012), insurance and re-insurance groups (for instance Munich Re), risk modellers (RMS) management consultants (McKinsey) and other interested parties. On the one hand many cities, particularly in 'emerging markets' (such as Shanghai and Sao Paulo) are housing a great number of new insurance customers as GDP per capita rises and there is a boom in the demand for infrastructure (McKinsey). "Growth in cities and the related rise in consumption directly correlate to an increased demand for insurance," commented Kent Chaplin, Head of Asia Pacific and Managing Director at Lloyd's Asia in a recent online article (Lloyds, 2012). On the other hand, the concentration of risk in many cities is proving problematic for many insurers; increasing upward pressure on premiums and in some cases leading to a reduction in coverage (IPCC, 2007).

In almost all cities in low- and middle-income nations, formal insurance has little role as only a small proportion of the population has (or can afford) insurance. Climate change is likely to mean more people are excluded from accessing affordable insurance policies (Wamsler and Lawson, 2011); insurance works well for low-income groups when risks can be minimized and so premiums kept low. But insurance is not possible where risks are high and capacity to afford insurance payments very low. Some insurers are recognising this, and are addressing their role in helping urban communities. The role of micro insurance for low income households has received growing attention in the last few years (Mechler *et al*, 2006), although there is still debate regarding how viable this is. There seems to be a large potential for scaling up, however challenges arise in providing coverage for those who cannot afford risk-based premiums while creating systems which can sustain major events, and create favourable market conditions to serve more wealthy middle income clients (Linnerooth-Bayer and Mechler, 2009). A number of other studies have considered the role of NGOs in risk financing where insurance companies don't provide the assistance needed to build urban resilience (Wamsler and Lawson, 2011). The provision of cash transfers by NGOs post disaster is a growing area of research, although the benefits of this are not well understood yet either and will be discussed in the next section. In Thailand, urban poor community groups have collectively formed community development funds (CDFs) at the city level, which in certain cases include funds for disaster rehabilitation for individual households, as a response to the devastating floods of 2011 (Archer, 2012).

There is also growing interest in public/ private partnerships between governments and insurance companies, and where innovative insurance programmes are offering an alternative to reliance on post disaster donor aid. The municipal government in Manizales for example has established an insurance programme for buildings that provides coverage for low-income households (Hardoy *et al*, 2013). As 30 per cent of insurable buildings in the city participate in the insurance scheme, insurance coverage extends to buildings owned by low-income groups or that house organizations working for the public good. The municipality has also developed other financing mechanisms such as tax reduction for those that include measures to reduce housing vulnerability in areas at risk from landslides or floods (*ibid*).

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6 POLICY IMPLICATIONS FOR HUMANITARIAN PREPAREDNESS, PLANNING AND RESPONSE

Key points:

- Humanitarian actors and agencies are increasingly directing their attention to urban areas and pursuing urban policy initiatives.
- Working in urban areas is outside the comfort zone of most humanitarian agencies
- A rural approach will not fit most urban contexts.
- Responses need to work with and be accountable to those who are most vulnerable.

6.1 Difficulties for Humanitarian Agencies in Urban Areas

In the last couple of years there has been a surge of research related to humanitarian preparedness, planning and response in urban areas. This has been driven by an increasing number of large disasters within urban areas, including some that get global media coverage. Humanitarian organisations have found themselves increasingly working in urban settings (including large city settings) where they have been confronted with a number of challenges that are unique to these environments.

6.1.1 Complex urban dynamics

Urban environments have complex dynamics, and up until now humanitarian organisations and the system of humanitarian aid, have not been well equipped to work within these. These complexities take many forms; for example in almost all urban settings, land is valuable, access to it is contested and its use is subject to a range of local norms and standards. As noted earlier, it is common for a considerable proportion of the population to live in settlements on land that is illegally occupied and to which government agencies are reluctant to provide infrastructure and services or may be bound by law not to do so. Many urban areas (especially larger ones) have different agencies at different levels with overlapping jurisdictions. There are varieties of networks of actors and leadership, both governmental and non-governmental all with their own unique power relations. The larger and more dense the population, the more the need for high quality infrastructure – but existing infrastructure systems and urban services are of varying degrees of quality and geographical distribution. Social vulnerability takes on different forms in urban areas which may not be easily recognisable; livelihoods may be highly varied and dependant on many of the above aspects. All of these dynamics are interconnected, and may be completely different across neighbourhoods within the city. In particular, it has been widely recognised that the kinds of difficulties humanitarian organisations are finding in urban areas include:

- Engaging with the wide range of urban actors and daunting governance structures that must be understood and then supported (Zetter and Deikun, 2010). ‘The scale of urban disasters makes the need for effective partnerships more vital’ (Sanderson *et al*, 2012).
- Understanding and responding to vulnerable urban populations: ‘Marginalised and vulnerable people may be excluded from targeting or the receipt of goods and services by a desire to remain invisible to the authorities and/or by lack of identification document’ (Sanderson *et al* 2012, p 9).
- Housing, land and property rights bring a number of challenges; considering renters and squatters in urban areas (restoring lease agreements, supporting repair and reconstruction of rental housing, strengthening tenure rights of informal land holders etc.).
- Having people with the right expertise for urban areas, for example urban planners with expertise in negotiation and diplomacy (Sanderson *et al*, 2012) and with experience of engaging marginalised groups in development processes.
- Supporting local existing markets for goods and services, and especially not undermining the local markets by providing humanitarian aid outside of the market system

- Responding to urban-based complex emergencies. ‘In particular, the links between conflict – or violence induced displacement and acute vulnerability have been poorly addressed’. (Pantuliano *et al.*, 2012, 52)
- Confusion over the legal context of humanitarian interventions and implications for urban areas (IFRC legal context).

6.1.2 Adapting to the urban complexity

Due to this complexity and interconnectedness, the type of sectoral responses that humanitarian organisations are used to working within may not be feasible or effective (Pantuliano *et al.*, 2012, ALNAP, 2012a and b; Zetter and Deikun, 2010). There has been a failure to adapt approaches that have worked in camps and other displacement settings to urban areas (Zetter and Deikun, 2010). One recent review commented on humanitarian organisations’ failing to invest sufficient time and resources in understanding the dynamics of the urban environment, the complex nature of urban vulnerability and displacement and how they can respond best (ALNAP, 2012a and b). There is a need to be open to change and uncertainty, sometimes to design interventions with only partial information and to ‘design responses around theories of change which encompass the complexity and diversity of the city, and do not simply propose a linear logic between an input and a result’ (ALNAP, 2012a, 20).

While there is knowledge around what the issues are in urban areas, the major question that still remains is whether humanitarian organisations can change their practices and operations sufficiently to effectively address urban complexity. Pantuliano *et al.* (2012) comment that ‘the humanitarian sector is developing a better understanding of the dynamics of urban displacement and the implications for its own strategies and programmes. Ideally, this cumulative knowledge and learning should already have led to improved humanitarian policy and operational practice, but innovation in the sector so far has not kept pace’. They suggest that translating past learning into more effective humanitarian responses is related to two challenges: 1) failure to absorb and build on existing knowledge of how vulnerability and displacement interact in urban contexts and 2) slow progress made by humanitarian agencies in innovating and adapting their responses to the particularities of urban environments.

6.1.3 Humanitarian agencies & urban actors

There is recognition in the literature of the importance of engaging with the wide range of urban actors and it is widely understood that humanitarian operations must ultimately aim to strengthen local government and local governance (so civil society and local government work together). This includes strengthening partnerships and coordination with municipal and state actors, with local civil-society actors, including neighbourhood level, and community-based organisations in order to create long-term engagement and trust. Zetter and Deikun (2010) recognise that this is perhaps the biggest challenge for humanitarian actors – and also a major opportunity – to *develop ways of working* with the existing institutional framework of municipal and civil society organisations in urban areas. There are many interesting examples from humanitarian organisations of their efforts to integrate within local governance structures. Yet, overall the cluster system, and humanitarian organisations in general, are still being criticised for failing to integrate local and national state actors, particularly due to insufficient analysis of local structures and capacities before cluster implementation (Kate Crawford interview). Sometimes humanitarian agencies may also need to play an advocacy role for groups not well represented, for instance the landless (Turkey) and those affected by government policies (i.e. inhabitants and communities unable to move back to their settlement because of government defined buffer zone in Sri Lanka and Banda Aceh after the Indian ocean tsunami).

Grünewald (2012) provides an example of the failure of international aid agencies to engage the municipal government in Mogadishu: ‘While some of the NGOs working in Mogadishu have tried to establish Memorandums of Understanding with the Ministry of Health, they have bypassed the municipal level and gone down to the district commissioner level, which is responsible only for law-and-order control functions rather than urban planning. The reasons why there has not been

engagement with municipal authorities include fear of politicization, the risk of corruption, and, more broadly, ignorance about their roles, if not reluctance to work with these urban actors'. This approach effectively eliminates the potential of international assistance to strengthen public systems and institutions, which, in turn, means less impact for affected populations (Pantuliano, 2012).

Medecins Sans Frontiers has tried to address this challenge by ascribing dedicated staff to the task of networking for its urban operations, and they see this as critical in maximising the efficacy and impact of their projects, as in the case of Lagos, Nigeria where it has been conducting operations (Lucchi, 2012).

6.1.4 Humanitarian agencies & existing urban markets

There is also a recognition in the literature that the private sector is a crucial stakeholder to engage with and that 'working within existing economic systems by locally sourcing aid delivery, aid supplies, human resources, and information collection and distribution can have a number of benefits' (Sanderson *et al*, 2012), including increased support to local livelihoods. However, others argue that the private sector is often neglected or dismissed by humanitarian actors (Pantuliano *et al.*, 2012). Clermont *et al.* (2011) warns that NGOs should take care not to compete unfairly with the local private sector, giving the example that providing free health care can actually provide a duplication of services and undermine the existing health-care system.

There are also examples of the use of public-private partnerships for doing recovery projects, for example outsourcing urban planning and building permits during reconstruction periods (Sanderson *et al*, 2012). In addition there is 'growing evidence that cash is one of the most effective and appropriate forms of assistance in urban contexts' (Cross and Johnston, 2012, xviii), although this again comes with challenges that have not been thoroughly researched or identified. For example, programmes ought to be aware of the risks of inflation (Collins, 2008) and there are issues regarding getting donors to fund this type of assistance. In addition, while income supplements can provide families with much needed help, they do not support community or collective capacity to rebuild

6.1.5 Long-term development

Most advances in what humanitarian agencies in cities have done within DRR are related to early warning, preparedness and immediate response. This is because these actions and programs are more easily isolated from urban development issues and all its messy complexities. Thus, they can be seen to have a much more direct (immediate) impact that also relates to the agencies' primary goals. Institutionally it is simpler as you engage different government areas/sectors at specific times and under specific protocols, while disaster risk reduction and development issues need constant coordination/interaction with all its problems and implications that are so hard to overcome. Likewise the time-frame and chances of developing an early warning and appropriate response mechanisms, even institutionalizing them, are much shorter than what is needed for development and addressing the underlying causes of vulnerability and risk (Hardoy and Ruete, 2013).

Yet, there is a strong consensus in the literature that bridging development and humanitarian relief and recovery work constitutes a vital contribution to meeting humanitarian challenges in urban areas, as urban dwellers are usually exposed to a range of risks and hazards, many of which are likely to re-occur. Metcalfe, Pavanello with Mishra (2011, p. 33) state with respect to the situation in the slums of Nairobi, that, '[s]ince a chronic lack of development is the principal driver of urban vulnerability, resolving this development crisis is key to addressing vulnerabilities more broadly, and those relating to displacement specifically'. Nevertheless, the mapping of transition from chronic conditions of vulnerability to a crisis and then early recovery is poorly developed. Yet, these transitions have crucial importance for defining the entry and exit points for humanitarian actors (Zetter and Deikun, 2010; Lucchi, 2012; Pantuliano *et al.*, 2012; Sanderson *et al*, 2012).

Pantuliano *et al.* (2012, p14) provide a detailed explanation and example:

“In many situations, donors fund according to their priorities without coordinating or streamlining these investments with the long-term plans of local governments or according to the advice of urban systems experts. The cluster system makes this donor preference more convenient by defining sectors that can be funded discretely, typically without consideration of the impact on the highly interdependent urban system. This results in investment with no continuity. An example is a donor with a priority to support women’s health issues that funds an agency to build a women’s clinic. While this is certainly a laudable and very specific need, these facilities ultimately are often abandoned as they are not integrated into public health care systems, or they lack a viable business model. Programming with sensitivity to the whole urban system is not simple; however, in the time between emergency events, donors and implementing organisations do have an opportunity to develop policy frameworks that appropriately guide operations in complex urban scenarios, that draw on urban systems expertise, or create internal capacity, and that strategically leverage short-term humanitarian programming for longer-term gain.”

6.2 Where Humanitarian Agencies Need to Focus Efforts

New policies and ways of working at both agency and inter-agency levels may be required for urban areas. The literature review and interviews conducted for this report point to some key areas where more work needs to be done to assist humanitarian actors to adapt new ways of working for urban environments. Several organisations have been working to develop guidelines for urban operations¹. However, many agencies are currently responding on a case-by-case basis and there is a clear need for training and more systematic, mainstreamed urban-based interventions (Zetter and Deikun, 2010, p5). Furthermore, few academic studies on humanitarian assistance in urban areas have been able to disaggregate their research subjects, provide controls, or conduct longitudinal investigations (Pantuliano *et al.* 2012, 59) and there has been little systematic analysis of the current scope and distribution of funding for urban humanitarian and disaster preparedness and relief programmes. In addition, donors have yet to develop strategies for designating funds for humanitarian operations in urban areas (Zetter and Deikun, 2010).

6.2.1 Needs and vulnerability assessment

Most of the literature points to the need to develop new and different methods to understand vulnerability in urban areas, which can contribute to a better understanding of the assessment of needs (Sanderson *et al.*, 2012; Levine *et al.*, 2012; Lucchi, 2012, Roger Zetter interview). It is rare for an analysis of the political economy to be undertaken, especially in regard to the slums and informal settlements, and this has led to poor performance (Levine *et al.* 2012). There is a need for a more holistic and sophisticated understanding of the urban environment, in relation to the response to the 2010 Haitian earthquake – the humanitarian system dissected problems into (sectoral) pieces that appeared manageable but at the cost of addressing the bigger picture (Zetter and Deikun, 2010).

Urban vulnerability assessment includes identifying priority areas within cities, and neighbourhood level assessments, as vulnerability will vary widely across the city, especially if there are neighbourhoods or districts lacking basic infrastructure. Also different conceptions of vulnerability need to be understood – the typical categories of vulnerable, i.e. women, children, elderly, disabled, are often not so straight-forward. For example, a family who receives overseas remittances may be less vulnerable, or a family with no secure land tenure may be more vulnerable; sometimes IDPs and the most marginalised do not want to be identified. Furthermore, in crisis situations, ‘levels and types of vulnerability cannot be neatly divided between host communities and displaced populations, since they are all facing similar challenges in the struggle to survive’ (Pantuliano *et al.* 2012, 58). Also in most urban areas there are existing data and secondary studies about the

¹New revisions to the Sphere Project Handbook in 2012 to address urban disasters, WFPs review of Food targeting in urban areas, IFRC ‘Sustainable Reconstruction in Urban Areas’, Interagency Standing Committee Reference Group (IASC) Meeting Humanitarian Challenges in Urban Areas Task Group led by UN-Habitat; ALNAP Lessons Responding to Urban Disasters, also documents from NRC, WHO, UNICEF, UNDP, OCHA, ISDR and Shelter Centre.

population, which humanitarian groups can draw on, which may be held in various source such as universities, enumerations from community-based organisations and municipalities (Kate Crawford interview) although they are not known about or easily accessible. There is also the need to better understand the local market and how to support urban livelihoods (Sanderson *et al*, 2012).

The last decade has also brought a greater appreciation of the importance of community organizations formed by residents of informal settlements in reducing risk to disasters and in post-disaster responses. This is both in what community organizations can do and in how the effectiveness of local government action is much enhanced when this works with these community organizations. External funding is only as effective as the local institutions through which it is channelled. There are case studies that show how support for community organizations including those formed by disaster-survivors can get more effective responses to disasters and in the longer term to disaster risk reduction and climate change adaptation (see several papers on this in *Environment and Urbanization* 23.2, 2011).

6.2.2 Applications of Technology

The potential of new technologies for supporting humanitarian responses is an area that is yet to be fully explored – although some humanitarian organisations have begun to do this. Examples are using communication technology such as mobile phones for undertaking assessments and cash transfers, mapping that combines global positioning systems with on-the-ground surveys to identify areas most at risk (see Livengood and Kunte 2012), crowd-sourcing, accessing vulnerable populations and so on (Zetter and Deikun, 2010). Despite this ‘there is still only limited evaluative information available as to the success of these approaches, and significant disagreement on the degree to which data obtained from the crowd is representative and reliable’ (Letouze, Gordon and Young, 2012, cited in Sanderson *et al* 2012, p7).

6.2.3 Housing, land and property rights in urban areas

Housing, land and property rights can be very complex in urban areas (IFRC 2012a), especially where disasters displace the residents of informal settlements so they have no legal claim to return to their former homes. Governments often do not want the residents of these informal settlements to move back – and there is also often pressure from developers to redevelop these sites. More work needs to be done to improve these practices and better understand the role that the humanitarian sector can provide in this to support the many forms of urban living. Organisations have already been experimenting with intermediate land titling and land pooling and re-allocation of land. For example an INGO network in the Philippines was configured to discuss cluster issues and better coordinate with local agencies. Some municipal governments have shown a willingness to work with the residents of informal settlements displaced by disasters to find both temporary and permanent solutions that work well – as in the case of Iloilo in the Philippines. It is well-understood that avoiding relocation to the edge of cities, and avoiding permanent relocation is best, but there needs to be improved understanding on how this can be done in practice in urban areas, and by engaging the affected groups. It will also require urban oriented minimum standards that are both adequately rigorous yet reasonably affordable (interview with Kate Crawford, Sanderson *et al* 2012). It is critical to get urban planning right for a city’s long-term recovery and risk reduction, yet more needs to be understood on when and how to intervene in this for humanitarian actors (Sanderson *et al*, 2012).

6.2.4 Transferring research and policy into operational change

In order to respond in urban areas, more needs to be understood about inertia for changing methods of operation within the humanitarian community. Arguments for change in the need for urban responses are clear and have been so for decades, yet the system has not galvanised itself in response (Pantuliano *et al*, 2012). Operational innovation exists but it is at an individual rather than an institutional level. Grünewald (2012 p121) suggests that success of humanitarian assistance may require ‘[a] rapid move to area-based coordination in line with urban administrative units and authorities, in order to counter the unhelpful division of labour created by the current cluster system and to have ‘city and neighbourhood coherence’ rather than ‘sector coherence’.

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7 EVIDENCE GAPS FOR FUTURE RESEARCH

Additional evidence is required to improve knowledge of urban risk in low- and middle-income countries. Some of this evidence is empirical in nature, and is related to specific aspects of the physical environment and its response to particular shocks and stresses. Other elements are related to the functioning of social, financial and governance systems. As urban risk is a function both of physical hazards and the social and economic systems upon which these impinge, both types of evidence are required to understand the specificities of risk in towns and cities. In addition, further research is required to strengthen understanding of the necessary elements for humanitarian response in urban areas. In this realm, the key linkages are between the organizational and institutional characteristics of humanitarian and aid agencies and the social and political organization of cities and the myriad stakeholders within them. Social, political and organizational research is key to understanding these dynamics and improving the ability of humanitarian and aid agencies to programme effective activities in urban areas.

The broad sets of questions below arise from the analysis of the literature in this report, and represent some of the key evidence gaps. Not all of these gaps are equal: in some cases, very little research has been undertaken; in others, there is a body of knowledge that is geographically limited; and for others the research has not yet been adequately linked to specific policy and implementation actions. In particular, a strong body of evidence has been developed in relation to climate change risks and responses in urban areas (as shown in the greatly expanded coverage of human settlements in the IPCC Fifth Assessment Report) and this is slowly beginning to influence policy (including the UN Framework Convention on Climate Change, and donor programming decisions such as the Urban Climate Change Resilience Partnership in Asia). However, the coverage of intensive risk in urban areas is lagging behind (with little reference to this in the Hyogo Framework for Action or in discussion about its replacement), while extensive risk is largely ignored. The challenge for research in this broad area of urban risk and humanitarian response is therefore to cover this broad terrain effectively while remaining sufficiently focused to support effective programming by a range of agencies that are seeking to expand activities into this area.

Research Theme I: Deepening understanding of the nature and scale of urban risk

- What methodologies and approaches can and should be used to gather city-wide information about urban risk, in a systematic way? How can these approaches incorporate the experiences, perspectives and priorities of various actors that show how risks and vulnerabilities vary within the city and its surrounds?
- What forms of empirical data about natural hazards are available in different cities? What additional information of this type is required to make effective programming and planning decisions by different actors?
- What indicators and proxies can be used to make assessments of the levels of risk for premature death in different cities? How reliable are these, and how effective are they as a basis for planning risk reducing and humanitarian responses?
- How can local knowledge be used alongside scientific data to help shape city decisions in planning for risk reduction and disaster preparedness?
- How does climate change add to the urgency of all the above questions with consideration needed for how to build city-wide resilience to its direct and indirect impacts – and to do so cumulatively as these direct and indirect impacts also change?
- What are the impacts of urban risk reduction and disaster response on the residents of informal settlements – for instance in regard to tenure security, eviction and resettlement?

- What methods could be used to better communicate urban risk to various stakeholders (including citizens, community organizations, and private sector and government agencies)?

Research Theme II: Understanding the role of multiple actors in urban risk reduction

- How can humanitarian actors engage with multiple stakeholders and local groups – and thus support local governance processes in which those most at risk and those most affected by disasters have central roles?
- What are the existing financial frameworks that support action for risk reduction in urban areas? What potential exists for strengthening these – recognizing the limited capacity of local governments (and other actors) in low- and middle-income countries to absorb funds effectively?
- How can humanitarian agencies understand what shapes the decisions of low-income and vulnerable communities to live where they do, and integrate this in risk reduction planning? What are the potential and limits for community-based responses to risk reduction in urban areas?
- What is the role of different types of insurance in addressing urban risk? What is the potential for insurance in low-income cities, and in low-income and informal communities?
- What measures or indicators can be used to assess whether communities and cities are becoming more “resilient”?
- What opportunities exist for cross-country exchanges and learning about risk reduction and other needed responses to risk in cities?

Research Theme III: assessing the potential for incorporating risk reduction in urban planning

- Should aid and humanitarian agencies move from “early warning, preparedness and immediate response” to addressing the underlying causes of vulnerability and risk in urban areas? What technical and organizational changes would be required to facilitate this?
- What good examples exist of efficient governance systems for reducing disaster risk and responding to extreme events? What key principles from these are broadly transferrable across contexts?
- What is the role and potential of national planning frameworks for integrating risk reduction in urban and regional land-use and development plans? How can humanitarian actors help ensure that risk reduction strategies are not waylaid by leadership changes at the level of city and national governments, and are ingrained in institutional memory?
- How effective are regional and global initiatives in contributing to risk reduction in cities?
- How can urban risk management and resilience-building strategies be integrated into city development plans and into land use and building norms and codes in ways that are both sufficiently robust yet affordable for urban residents?
- What are the key features that have enabled cities to build up “accumulated resilience” over a period of decades? How are these related to the process of “urban development”, and how can this process be supported by humanitarian actors?

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APPENDIX 1: INTERVIEWEES

1. Melanie Duncan	UCL	melanie.duncan@ucl.ac.uk
2. Kate Crawford	CARE, Independent Consultant	katecrawford@fmail.co.uk
3. Roger Zetter	University of Oxford	roger.zetter@geh.ox.ac.uk
4. Jim Jarvie	Mercy Corps	jkjarvie@thismiafocus.com
5. David Sanderson	Oxford Brookes University	dsanderson@brookes.ac.uk
6. Pablo Suarez	Red Cross/ Red Crescent Climate Centre	suarez@climatecentre.org
7. Robert Muir-Wood	RMS	Robert.Muir-Wood@rms.com

APPENDIX 2: INITIATIVES TO ADDRESS URBAN DISASTER-RELATED ISSUES

Across Africa, Asia and Latin America there are a number of different initiatives which have been launched to reduce urban risk and build resilience, coming from the UN, World Bank, INGOs, NGOs, CBOs, academic institutions and city networks at different geographical scales. A few worth noting, although by no means a definitive list, are:

DRR initiatives at an international level

- World Bank's Cities Alliance and Cities in Transition
- UNESCO's initiative on urban biospheres
- Millennium Ecosystem Assessment
- International Human Dimensions Programme (IHDP) urbanisation science project
- Diversitas science plan on urbanisation
- International Union for the Scientific Study of Population (IUSSP) Urbanisations and Health Working Group
- **The International Strategy for Disaster Reduction (UNISDR)** is the United Nations office for DRR. Its purpose is to ensure the implementation of the International Strategy for Disaster Reduction, and is starting to address the urban agenda
- The **Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP)** promotes sector-wide learning between humanitarian organisations and from previous experiences to improve the performance of humanitarian action. It has produced a number of reports recently regarding responding to urban disasters. ALNAP and UN Habitat agreed to create a shared portal for urban initiatives to be captured online, but unsure as to whether this has happened or not.
- **The Inter-Agency Standing Committee (IASC)** is the primary mechanism for inter-agency coordination of humanitarian assistance, and has a project on urban humanitarianism
- The **Global Facility for Disaster Reduction and Recovery (GFDRR)** is a partnership of 41 countries and 8 international organizations committed to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change. The partnership's mission is to mainstream disaster risk reduction (DRR) and climate change adaptation (CCA) in country development strategies by supporting a country-led and managed implementation of the Hyogo Framework for Action (HFA)
- UN-Habitat has established its own global network, **SUD-NET**, to promote sustainable urban development through Habitat Agenda partners at global and local levels. Its flagship programme is The Cities in Climate Change Initiative (CCCI) which aims to strengthen the climate change responses of cities and local governments and has focused on Mombasa, Bobo Dioulasso in Burkina Faso, Saint Louis, Walvis Bay, Kigali, Maputo and Kampala as partner cities (in addition to Esmeraldas in Ecuador, Sorsogon in the Philippines. Cities in 9 other Asian Countries are also preparing to join).
- **Shack/Slum Dwellers International (SDI)** is a confederation of country-level organizations of the urban poor from 34 countries throughout Africa, Asia and Latin America. Countries where there is a strong presence of **SDI** in Africa are Ghana, India, Kenya, Malawi, Namibia, Nepal, Philippines, South Africa, Sri Lanka, Tanzania, Uganda, Zambia and Zimbabwe. They are also building partnerships in Angola, Cambodia, DRC, East Timor, Indonesia, Liberia, Mozambique,

Nepal, Nigeria, Pakistan, Sierra Leone, Swaziland and Vietnam. Within Asia SDI has partnerships in Cambodia, India, Nepal, Pakistan, the Philippines, Sri Lanka and Vietnam, and in LAC Argentina, Bolivia, Brazil, Colombia, Haiti and Honduras. <http://www.sdinet.org/affiliates/>

- A number of **INGOs** and research bodies (such as the ODI and IIED) are starting to address risk and resilience building in urban areas, notably Mercy Corps, Wold Vision, Oxfam GB, ACF, and IFRC. The majority of these however are again in the larger coastal urban centres and focus on risk for IDPs, refugees etc.
- A variety of websites provide case studies on risk in Asian, Latin American and African countries. For example **Relief Web** publishes daily updates on disasters in countries (from both intensive and extensive risk) from NGOs, governments, research institutions and the media, some of which may be in urban areas. Within these countries it identifies the most vulnerable groups and types of risks they face. **Prevention Web** is designed to identify the nature and extent of risk in countries. It provides case studies by country/ region and lists a risk profile and disaster statistics, although is again not city specific, and provides a wealth of information on disaster risk including urban risk and planning. The **DesInventar database** includes several countries and offers some information on risk at the urban district level, including small scale events and everyday hazards.

DRR initiatives at a regional level

Africa

- The African Urban Risk Analysis Network (**AURAN**) was formed in 2003 and ran until 2009, by six African research institutions and with support from the UN Development Programme (UNDP) and ProVention. Research was undertaken in Accra, Algiers, Cape Town, Dar Es Salaam, Nairobi and Saint Louis in order to understand the main disaster risks and vulnerabilities in specific urban areas, the processes that led to the accumulation of risk and what actions can be taken at the local level to reduce risk in partnership with local governments, CBOs, NGOs etc. The overall goal was to ensure that DRR was better understood in urban areas by a number of stakeholders and encouraged to be integrated into conventional urban development planning and urban governance. AURAN hoped to encourage many other city teams to join in this work through a major information dissemination programme, including local workshops and city-to-city exchanges, however this network seems to have disbanded (??) and again only focused on large coastal cities.
- Aligned with AURAN, but also in their own rights, the **University** of Cape Town, University of Science and Technology, Algiers, The University of Accra, Ghana; ENDA-Tiers Monde (Environment and Development-third Third World Senegal); University College of Lands and Architectural studies, Dar es Salaam and Disaster Management Research Unit at Kenyatta University have all undertaken extensive research regarding DRR urban in their localities. The University of Cape Town is also host to the African Centre for Cities (ACC) which runs the State of Cities in Africa project (looking at urban centres on a city by city basis) and the State of Ethiopian Cities project in conjunction with the Ethiopia Civil Service University.
- The Disaster Mitigation for Sustainable Livelihoods project (**DiMIP**) was developed by the Department of Environmental and Geographical Science at the University of Cape Town (now based at Stellenbosh University), along with partner organizations in southern Africa and is widely regarded as Africa's most experienced DRR capacity development and research centre. Through this the 'Periperi' network (partners enhancing resilience for people exposed to risks) was established to encourage governments and international agencies to address disaster risks through the integration of disaster risk principles into development planning and address urban vulnerabilities. So far it has helped coordinate over 60 NGOs in ten African countries (Ethiopia, Uganda, Kenya, Tanzania, Mozambique, Madagascar, South Africa, Ghana, Senegal and Algeria), and strengthened the capacity of their main universities to provide higher education, training, and research in DRR .

- The **African Development Bank (AfDB)** has an urban development strategy which focuses on infrastructure delivery, governance and private sector development and a partnership for climate action in cities. In addition there is an African Regional Strategy for Disaster Risk Reduction (ARSDRR), in partnership with The African Union (AU), its New Partnership for Africa's Development (NEPAD), UNISDR and AfDB. However there is very little specific city analysis and no urban specific focus.
- The **International Human Dimensions Programme on GEC's (IHDP's)** 10-year 'core project' on Urbanisation and GEC (**UGEC**) has set up a network of researchers, local authority officials, elected city representatives and agencies in West Africa (Simon 2010)
- The **Climate Change and Urban Vulnerability in Africa (CLUVA)** project, in partnership with a number of universities, aims to understand the impacts of climate change in African cities and develop methods which can be applied to these contexts to manage climate risks, reduce vulnerabilities and improve coping capacity and resilience towards climate changes. The project focuses on Saint Louis, Ouagadougou, Doula, Dar Es Salaam and Addis Ababa. Again these cities are all very large urban centres, although Ouagadougou is an anomaly in that not much literature has come out of there.
- The **South African Cities Network (SACN)** is a source of information for city managers and officials and a catalyst for debate in South Africa. Only very recently has it really begun to engage seriously on climate change. It particularly focuses on large cities and good governance, although has recently created a report on secondary urban centre.
- The **Monitoring, Mapping and Analysis of Disaster Incidents in South Africa (MANDISA)** database provides another vision of urban risk; providing an extremely detailed assessment of small-scale disasters in Cape Town, such as fire.

Asia

- The **Asia Regional Task Force on Urban Risk Reduction (RTF-URR)** is a thematic group of the ISDR system in Asia to facilitate and accelerate efforts and actions for urban risk reduction.
- The **Asian Cities Climate Change Resilience Network (ACCRN)** is a network of ten secondary cities in South and Southeast Asia that have engaged in a process to analyse vulnerabilities, and plan and implement measures to address them. With the support of the Rockefeller Foundation and numerous partners, these cities have identified more than 59 specific resilience building measures, of which 23 are being implemented ACCRN (Tyler *et al* 2010).
- The **Asian University Network of Environment and Disaster Risk Management (AUEDM)** is a network of universities undertaking education and research in the field of environment and disaster management. It was established in 2008 with 14 members, and as of January 2011, 22 universities from 17 countries and areas. It is hosted in the Kyoto University Graduate School of Global Environmental Studies.
- The **Asian Disaster Preparedness Centre (ADPC)** is a not for profit organization supporting the advancement of safer communities and sustainable development, through implementing programs and projects that reduce the impact of disasters upon countries and communities in Asia and the Pacific. One of the programs it runs is the Asian Urban Disaster Mitigation Program (AUDMP- funded by USAID) and specifically looks at urban disaster management.
- The **Philippines Homeless People's Federation** is a national network of urban poor community associations and savings groups that are engaged in many initiatives to secure land tenure, build or improve homes and increase economic opportunity, working wherever possible in partnership with local governments' (IFRC, 2011 World Disasters Report p56)
- The **Community Organizations Development Institute (CODI)** 'channels government funds in the form of infrastructure subsidies and housing loans direct to savings groups formed by low-income inhabitants in informal settlements. It is these savings groups that plan and carry out

improvements to their housing or develop new housing, and work with local governments or utilities to improve infrastructure and services' (IFRC, 2011 World Disasters Report, p67).

- The **Orangi Pilot Project (OPP)** is a Pakistani NGO which formed in 1980 and supported new models of infrastructure and services in informal settlements. It has supported one of the world's largest programmes to improve provision for sanitation in low-income areas in Karachi and other urban areas. OPP's aim is to change the way that local governments plan and manage investment in infrastructure, so this reaches low-income households with infrastructure that is good quality, affordable (both to users and to those who install and manage it) and sustainable.

Latin America and the Caribbean

- **La Red (La Red de Estudios Sociales en Prevención de Desastres en América Latina)**– the Network of Social Studies for the Prevention of Disasters in Latin America- is a network of individuals and institutions in Latin America that have worked collectively to document the scale and range of disasters in the region, their impacts and their underlying causes. From this has developed a particular interest in disaster prevention and in reducing the vulnerability of populations. This network has also pioneered a range of tools and methods for work in this area, including participatory methods for working with low-income groups and community organizations in identifying and acting on disaster risks. It now has members in 15 nations, drawn from many different disciplines and including a mix of researchers and practitioners. During the first few years, it focused mainly on documenting the scale and nature of disasters (including highlighting the number of "small" disasters) and their impacts; more recently, much of its work has been on developing instruments for intervention. La Red developed computer software (the Desinventar database) to allow documentation and analysis of disasters, and this is now widely used in the region and elsewhere. Local training courses and manuals and training modules to support them have been developed.
- The **Regional Strengthening and Disaster Risk Reduction in Major Cities in the Andean Communities** run by UNDP has focused on risk reduction efforts for the capital cities of five Andean countries (Bolivia, Ecuador, Venezuela, Peru and Colombia)
- **Resilient Cities Action Lab**: Creating partnerships for climate risk preparedness in Latin America
- **Latin American and Caribbean Center (LACC)** of Florida International University awarded a 5 year program on Disaster Risk Reduction (DRR) by USAID/OFDA
- **Caribbean Disaster Emergency Response Agency**
- **Central American Coordination Centre for Disaster Prevention**
- **Andean Community for Disaster Prevention and Attention**
- **CAPRA (Central American Probabilistic Risk Assessment)** is an on-going initiative to develop a set of tools to understand, communicate and support decisions related to disaster risk.
- **Caribbean Risk Atlas** is a University of West Indies led effort to build capacity, develop linkages and improve regional risk models

Countries with active national urban DRR programmes

1. Turkey
2. Jordan
3. Indonesia
4. The Philippines
5. India
6. Uzbekistan
7. Ecuador
8. Colombia (national DRR law)