

Breaking Cycles of Risk Accumulation in African Cities



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Foreword

King's College London



Professor Mark Pelling

The world is currently going through a significant demographic transformation whereby, between 1950 and 2050, the global population majority is shifting from 70 per cent rural to 70 per cent urban. This transition also means that ever more economic activity, urban assets and invested capital are concentrated in urban areas. Although there are significant benefits in concentrating people, activities and assets for reasons of economies of scale, these same concentrations also produce less beneficial outcomes.

Many of the problems associated with dense urban concentrations are well known, varying from intense local concentrations of poverty to soil, air and water pollution and it is now increasingly acknowledged that communities are becoming more susceptible to hazard risks. A major tropical storm, earthquake or flood hitting a large city can lead to a great loss of life, damage to infrastructure and homes, as well as severely disrupted economic activity.

But major catastrophes and disasters are not the only threat. On a day-to-day basis, lesser events such as fires, landslides or infectious diseases, and also small disasters like flooding or intense weather phenomena are having an impact. It is often the poor and other vulnerable groups of society that are most susceptible to everyday hazards and small disasters because they are typically less served by

protective infrastructures or because they live in the more hazardous areas of cities. They are also more vulnerable since there is simply insufficient information about how urban communities can improve their risk resilience.

In an effort to raise awareness of this, particularly of the plight of the more vulnerable segments of the urban population in sub-Saharan Africa, King's College London established Urban Africa: Risk Knowledge (Urban ARK), with funding from the UK Department for International Development and the Economic and Social Research Council. This three-year research and capacity-building programme was led by 12 policy and academic organisations from across sub-Saharan Africa, with partnerships in the United Kingdom. The work was concentrated in four core cities with different development and hazard contexts: Ibadan (Nigeria), Karonga (Malawi), Nairobi (Kenya) and Niamey (Niger). Further research has been undertaken in Freetown (Sierra Leone), Dar es Salaam (Tanzania), Mombasa (Kenya), Dakar (Senegal) and Addis Ababa (Ethiopia).

The activities of Urban ARK resulted in numerous policy briefs, academic papers, new datasets and policy advisories, which can be found on the programme website www.urbanark.org. This work has been synthesised into key thematic chapters which have been compiled in this publication. The book seeks to provide guidance and insight on how participation by urban communities in all aspects of risk response, mitigation and prevention can be achieved while improving cooperation with local authorities and other actors in urban risk management.

This publication covers a range of disaster risk management (DRM) themes, from community participation in DRM data collection to risk mapping and from urban waste management to hazard accumulation in urban risk traps. Yet it is only a start in the vast amount of research that is still required to prepare for, mitigate and ultimately prevent the multiple risks that affect so many inhabitants of sub-Saharan cities in general, and the most vulnerable among them in particular.

Professor Mark Pelling

Lead Scientist for Urban Africa: Risk Knowledge

UN-Habitat



Mathias Spaliviero

The United Nations Human Settlements Programme (UN-Habitat) was invited to be part of the Urban Africa: Risk Knowledge programme funded by the United Kingdom's Economic and Social Research Council and Department for International Development (DfID). The programme, which concluded in 2018 and which serves as the basis for this book, represents a commendable effort in gathering together cutting-edge knowledge on a range of cities and drivers of disaster risk in sub-Saharan Africa.

This work is aligned with the main goal of UN-Habitat's resilience work, which is to support local governments and relevant stakeholders to transform urban areas into safer and better places to live, and improve their capacity to absorb and rebound quickly from all potential shocks or stresses, leading them towards sustainability.

In sub-Saharan Africa the challenge of achieving resilient urban communities is compounded by an urban population, which is expected to triple in absolute number by 2050 as compared to 2015, from approximately 400 million to 1.2 billion people (UNDESA, 2018). In most cases, both central and local governments in the region are ill prepared for such extraordinary

growth. Much of this urban expansion is taking place against a background of poor planning and management capacity as well as weak financial mechanisms at the local level, resulting in growing informal settlements characterised by poor living conditions and a lack of access to basic services and infrastructure. Urban risks are exacerbated by the increasing severity and unpredictability of the effects of climate change.

UN-Habitat is driving resilience-building efforts through several initiatives across sub-Saharan Africa and has developed tools for this purpose. The City Resilience Profiling Programme (CRPP) set up in 2012 provides national and local governments with tools for measuring and increasing resilience to multi-hazard impacts, including those associated with climate change. These tools are being used in Maputo, Mozambique as well as several cities in other regions of the world. The City Resilience Action Planning (CityRAP) Tool enables municipal technicians in low-capacity cities to conduct a quick and effective assessment of the city's vulnerabilities to help prepare a Resilience Framework for Action (RFA). It targets small to medium limited-capacity cities which have little data available and focuses on improving local solutions. It has been implemented in 30 cities in the region.

UN-Habitat engages in normative work to increase resilience building, and it is hence a pleasure to present this book, which is both policy and practice oriented, and which seeks to serve as a contribution to creating more inclusive, safe, resilient and sustainable cities.

Mathias Spaliviero

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Nairobi County Government



Brian Chunguli Kisali

It is my pleasure to commend to you this important publication. The Nairobi County Government strongly supports the transition from reactive emergency response to more proactive disaster risk preparedness and management. This aligns with the County Government's desire to develop inclusive and pro-poor disaster risk management. Nairobi City is one of the fastest growing cities in the world but is also faced with multiple hazards and persistent poverty. Floods, fires, collapsing buildings, air pollution and waste management are some of the major hazards experienced in the city. These hazards are prevalent throughout the year affecting the social, economic and environmental wellbeing of the city and its environs, and preventing people from escaping poverty. Fire and floods remain constant hazards in the city, largely affecting the informal settlements where response systems such as infrastructure and service delivery are relatively poor. The social, environmental and economic cost of these hazards runs into millions of dollars. This impacts the city's capacity to deliver on the Sustainable Development Goals (SDGs), the Sendai Framework and the 100 Resilient Cities Initiative (Nairobi is a member city).

The Nairobi County Government has made commendable efforts towards addressing these hazards

and human vulnerability. The Kenyan Constitution mandates the county to develop and implement suitable disaster management policies. To this end, the county is currently preparing the Disaster and Emergency Management Act, which seeks to put in place institutional systems for disaster management and to

The Nairobi County Government has made commendable efforts towards addressing these hazards and human vulnerability. The Kenyan Constitution mandates the county to develop and implement suitable disaster management policies

enhance resource mobilisation. The city has also entered into various strategic partnerships to help address these disaster concerns. Most of these efforts have helped the city to respond to the overwhelming magnitude of disasters. However, the city still needs support in terms of developing and implementing effective policies in addition to technical training to enable it to address disasters in optimal ways. The County Government therefore desires to work with various partners including national, international and local agencies to develop a disaster management system that will enhance risk preparedness.

I wish therefore to take this opportunity to thank all the partners for contributing to this book and for the underlying research that was coordinated by the Urban ARK programme and for their engagement in this noble duty.

Brian Chunguli Kisali

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Nairobi City County Government

Chapter 1

Risk management in urban Africa: key context and concepts

By Donald Brown, Cassidy Johnson,
Hayley Leck and Mark Pelling

Policy pointers

- As sub-Saharan Africa's population is increasingly urbanising, so is its exposure to urban risk. Given that the bulk of this urbanisation is occurring in the smaller urban centres where urban governance capacities are typically weak, these towns will need to become the priority areas for risk-reduction interventions.
- To better understand the nature and scale of urban risk and how urbanisation is shaping the social and spatial distribution of risk, more detailed local data is required. As shown in this chapter there are new methodologies to better inform how policies tailored to local needs and priorities can promote urban risk reduction.
- It is critical to address the full spectrum of urban risk, encompassing 'extensive risk' (everyday hazards and small disasters) as well as 'intensive risk' (large-scale disasters). Reducing extensive and intensive risk requires coordinated policy approaches involving, among others, urban planning, public health, environmental and disaster management, and climate change adaptation.
- Urban risk reduction policy is required to: a) inform on risks and their reduction; b) provide for inclusive decision-making processes; and c) mediate between hazard outcomes, dynamic risk governance processes and planning procedures to assure, among others, access to safe water and sanitation, and solid waste collection, as well as safe and secure land for housing as key mechanisms for building resilience and reducing risk.

Major disaster databases tend to exclude smaller, everyday hazards such as road traffic injuries despite the significant impacts they can have on the lives of urban dwellers
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Sub-Saharan Africa's rapid urbanisation presents opportunities to plan and manage for more resilient and sustainable towns and cities. Although urban decision makers and risk managers are rising to the challenge, they need better information on urban risks and more action at the local level. Notably, public health and disaster risk preparedness and wider management need to come together to tackle the spectrum of risks. This book draws on the experience and analysis of risk planners, urban managers and community actors in cities across sub-Saharan Africa. All were partners in the Urban Africa Risk Knowledge (Urban ARK) programme, see www.urbanark.org for more detail and supporting documents on each chapter. The aim is to provide insight and experience in breaking cycles of urban risk accumulation by linking science and policy to produce knowledge and action in an approach we call 'co-production'. Risk reduction innovations are developed to contribute to the knowledge of how to make sub-Saharan African cities and towns more resilient and sustainable.

Harnessing urbanisation for risk reduction in sub-Saharan Africa

Sub-Saharan Africa is rapidly urbanising and the forecast is that, by 2040, more Africans will live in urban than in rural areas, amounting to 854 million urban dwellers (UNDESA, 2015). Yet, in many African towns and cities development actors have been slow to respond with increased capacity to plan and manage this rapid urban growth. Without appropriate interventions, growing urban populations imply more vulnerability to disasters of all types and scales. It leads to processes of risk accumulation that pose threats to poverty reduction and sustainable development (Adelekan *et al.*, 2015).

Urban data gaps

Stakeholders at all levels are rising to the challenge of urban risk reduction. But major data gaps limit their understanding of the nature and scale of urban risks and how urbanisation is influencing the social and spatial distribution of risk.

Most data on everyday health outcomes and disaster losses is aggregated at the national level. This obscures important differences in how the impacts of different hazards vary across urban areas and locations in different city sizes, between genders, ages and human abilities (Osuteye, Johnson and Brown, 2016).

Major disaster databases also tend to exclude smaller, everyday hazards – ranging from infectious diseases to road traffic injuries and localised floods – despite the significant cumulative impacts they can have on the lives and livelihoods of urban dwellers, particularly the urban poor (Pelling and Wisner, 2009). Analysis needs to be broadened to encompass the full range of hazards affecting the inhabitants of African towns and cities and to capture key social characteristics with particular attention to gender.

Understanding urban trajectories shaping risk

Available data allows us to make some tentative generalisations about urban trajectories shaping risk in African towns and cities. Firstly, smaller urban centres (<500,000 inhabitants) contain nearly half of sub-Saharan Africa's urban population and are

expected to accommodate a large share of all future urban growth (Satterthwaite, 2015). But many small and intermediate urban centres lack the capacity to plan urban growth, manage risk and adapt to emerging hazards (Wisner *et al.*, 2015). Many of the future challenges for risk reduction will thus need to be concentrated outside the largest cities which currently attract most attention.

Secondly, large cities of more than 1 million and mega-cities of more than 10 million inhabitants remain important priorities for risk reduction given their strategic economic importance and the large number of people and assets they concentrate. At present there are two mega-cities in sub-Saharan Africa: Lagos (Nigeria) and Kinshasa (Democratic Republic of Congo). While data shows these largest cities are not growing especially fast, absolute numbers are considerable with medium-sized millionaire cities continuing rapid growth (McGranahan and Satterthwaite, 2014).

Thirdly, the urban poor are typically more at risk since they tend to live in poorly serviced and hazard-prone areas. These are often, but not exclusively, informal settlements that combine exposed locations with lack of service provision, complicated by illegal status inhibiting government recognition and investment (Dodman *et al.*, 2013). Consequently, the urban poor tend to suffer disproportionately, not only from disasters but also from biological pathogens (Hardoy, Mitlin, and Satterthwaite, 2001). Much more needs to be understood about the practices of communities working to reduce risk as part of their ongoing efforts to access secure housing and basic services.

Conceptualising the risk spectrum

The full risk spectrum encompasses everyday, small and large events. This is important since evidence shows that the cumulative impacts of what is termed 'extensive risks' (including everyday hazards such as infectious and parasitic disease or road traffic injuries) and small disasters (such as localised landslides and floods) are greater than those of what is termed 'intensive risks' (i.e. larger, less frequent disaster events such as tropical storms, earthquakes and floods)

(UNISDR, 2009). Addressing the full risk spectrum opens up opportunities to better understand:

- The relative importance of different hazards (biological, environmental and human-made) in terms of losses and impacts;
- The specific forms that vulnerability takes among separate identities (such as women, infants, children and the elderly) in relation to different hazards;
- The interactions between multiple hazards, including cascading failures where the impacts of an event lead to knock-on effects. For example where damage to the electricity supply caused by local flooding in a sub-station, or drought and failure of hydro-electric power generation, can have knock-on effects on the pumping of drinking water or on drainage, public lighting and traffic flow, or personal safety; and
- The underlying drivers of risk that are linked to poverty, poorly planned and/or managed urban growth, and climate change.

Bringing together policy, practice, and science

This book aims to help those responsible in cities respond to three key challenges which hamper efforts to integrate risk reduction into urban development processes:

1. A lack of detailed disaggregated data on the social, spatial and temporal distribution of losses and disaster impacts, especially for low-income population strata and those living in informal settlements;
2. A lack of systematic analysis of the ways in which urbanisation, spatial planning, urban governance and climate change are influencing existing/future risk; and
3. Inadequate human capacity and coordination among communities, national and local governments, civil society, NGOs and the private sector.

This book is targeted particularly at the local government level, since this is where decisions about land management, services provision, risk-reducing infrastructures and planning are often taken.

Our work is guided by four interlinked programmes (see Box 2) that bring together development practitioners,

Box 1. Key terms and definitions (IPCC, 2012) used by Urban ARK

Risk: The likelihood of future loss and damage. This is composed of hazard, exposure and vulnerability.

Hazard: The potential for harm caused by a natural or human-induced event.

Exposure: The presence of people, livelihoods, environmental services and resources, infrastructures or economic, social or cultural assets in places that could be adversely affected.

Vulnerability: The propensity or predisposition to be adversely affected.

Disaster: A situation or event which overwhelms local capacity, necessitating a request to the national or international level for external assistance.

Resilience: The ability of a system and its component parts to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration or improvement of its essential basic structures and functions without preventing capacity for transformation.

epidemiologists, natural hazard scientists, climatologists, disaster risk managers, sociologists and urban planners. The programmes offer new opportunities for coordination across disciplinary boundaries.

Addressing dynamic processes and cross-cutting themes

The evidence and experience presented in this book argues for a focus on factors that mediate the relationship between hazard outcomes (everyday, small and large) and dynamic processes of risk governance. These factors form entry points for risk reduction policy and include:

- Safe water and sanitation;
- Solid waste management;
- Safe land and secure tenure for housing;
- Public health;
- Knowledge about risk and its reduction;

Box 2. Four interlinked programmes of work

1. **Vulnerability Assessment** which, through deploying vulnerability and loss assessment methodologies, focuses on assessing hazards and the underlying socio-economic and environmental conditions of vulnerability. Other methodologies involve epidemiology, community participation, and child- and gender-sensitive approaches.
2. **Hazards Assessment** appraises (a) multi-hazard relationships and their impact on infrastructure networks and land use, including the production of new digitised land use maps; and (b) climate downscaling to translate global climate change analysis for use at city scale for urban planning and decision making.
3. **Root Cause Analysis** investigates (a) the dynamic historical processes of urbanisation and governance in sub-Saharan Africa as they shaped contemporary hazard, vulnerability and risk management capacity in response to both everyday hazards and disasters; and (b) the factors shaping the emergence and contribution of mediating or intermediate actors around urban development and risk reduction, with a focus on filling the governance space between local communities and local government bodies.
4. **Urban Development Planning and Governance** investigates relationships between urban risk production and reduction through an examination of (a) current and recent investments in infrastructure, construction and planning; (b) urban planning policy and regulatory frameworks; and (c) the underlying power dynamics between stakeholders that guide urban development, including organised grassroots and local governance networks, governments, the private sector and others.

- Social conflict; and
- Decision-making processes and planning procedures.

Several crosscutting themes are embedded in the overall programme as well:

- Extensive risk arises from chronic hazards that can continuously erode people's health, assets and income, reducing their capacity to cope with larger-scale events, to recover, and to reduce future risk.

- Gender, among other social identities (e.g. age, income/class, ethnicity), is significant in determining who within an urban population is most at risk.
- Conflict and violence can intensify the vulnerability of particular groups but can also arise in the aftermath of a disaster when competition over resources can aggravate community tensions.
- Poverty with its many deprivations renders those living in ill-served and insecure localities (as is often the case in informal settlements) among the most vulnerable to biological and environmental hazards (everyday, small and large).
- The co-production approach ensures that the knowledge generated by risk assessments and research is legitimate and accessible to risk managers in its conception, generation, dissemination and application.

The role of urbanisation in risk reduction

Major international policy frameworks, including the New Urban Agenda, the Sustainable Development Goals, and the Sendai Framework for Action, are explicit about the need for urban resilience in sustainable development.

Risk managers can further these agendas through capacity building, evidence-based planning and policymaking, and strengthening the sub-Saharan African policy and academic landscape for resilience. Examples of impact include:

- Linking disaster risk reduction with urban poverty reduction and development planning;
- Protecting development gains from the impacts of climate change and poorly planned and managed urban growth;
- Addressing the immediate and root causes of risk linked to poverty, poorly planned and managed urbanisation, and limited governance capacity, especially at the local government level; and
- Harnessing the synergies between disaster risk reduction and urban health promotion through the creation of healthier and more resilient urban living environments, especially for the urban poor.

Chapter 2

African urbanism: implications for risk accumulation and reduction

By Hayley Leck, Sarah Colenbrander,
David Dodman and Maria Rusca

Policy pointers

- Although urban centres in Africa are very diverse, exchanges of staff and learning of lessons among cities can allow policymakers to more effectively address shared challenges that can increase the likelihood of loss of life, reduced economic output and damage to assets as a result of disasters.
- Making African cities safer for all citizens will require understanding of and engaging with the social, economic, spatial and governance factors that create and unevenly distribute risk.
- Risk management needs to be taken into account in all African urban planning, policymaking and investments, not just those narrowly addressing climate change or disaster risk reduction.





The extent to which African cities face climate change and natural hazard-related disaster risks is shaped by much more than just their exposure to hazards. Past and current patterns of urban growth and development have shaped the context of risk in multiple ways. The urban economies, spatial form, societies and governance of African cities all create specific conditions under which particular threats can turn into disasters. By taking the underlying circumstances more fully into account, policymakers and planners can intervene in ways that will reduce risk to cities and their inhabitants.

African cities are among the world's most vulnerable urban settlements when it comes to disasters because the risks they face are being compounded by climate change and rapid demographic shifts. Yet, effective urban risk reduction strategies are still limited in most African countries. There have also been few explicit analyses of how the specific characteristics of African urbanism drive risk exposure and how the consequential vulnerabilities can be incorporated in preparations for and responses to disaster.

This chapter presents the key messages resulting from a review of the distinguishing features of African urbanism and their implications for risk creation and risk reduction. Meeting these needs will also help in cities contributing to national commitments under the eleventh Sustainable Development Goal (inclusive, safe, resilient, and sustainable cities).

Going beyond the often-cited scale and pace of urban growth in sub-Saharan Africa, this chapter considers the broad features of African urbanism (demographic, spatial, connectivity), its social dimensions (including gender and age), the economic dimensions (particularly the incidence of poverty and informality) and the governance practices and processes that reflect and shape these. The analysis suggests that the distinctive traits of towns and cities in sub-Saharan Africa – including fragmentation, violence and fragility – play a significant role in creating risk. However, many also offer potential for addressing risk and breaking cycles of risk accumulation.

— Informality and urban risk

The extent of urban poverty in Africa is frequently underestimated because most assessments fail to take into account non-food costs in urban areas (Mitlin and Satterthwaite, 2013), including housing, transport and food. Poverty also increases the cost of meeting other needs, particularly food and water, which low-income households are often forced to purchase from informal vendors at higher costs and more variable quality, with negative consequences for health and resilience.

The cost of living in urban Africa is also higher in real terms than in cities in other low-and middle-income countries. A conservative estimate suggests that, controlling for per capita GDP and other factors, urban dwellers in sub-Saharan Africa pay 11 to 18 per cent more overall than those in

comparable cities worldwide (Gelb and Diofasi, 2015). This implies that African urban residents spend a larger share of their income on meeting basic needs, reducing their budget for such risk reduction strategies as upgrading their homes.

The large informal sector of most African urban economies has the potential to exacerbate risks, especially through environmental degradation. Informal providers operate outside formal state oversight and regulation such as water quality standards or minimum wages. Nevertheless, a vibrant informal sector also has positive aspects. It often allows urban residents to find alternative livelihoods in the absence of formal employment opportunities. Informal businesses and networks further frequently assume responsibility for risk mitigation and management through, for example, savings groups that act as informal insurance schemes. Successful risk reduction strategies must therefore acknowledge the significance of the informal sector and seek collaboration with informal operators in such sensitive sectors as food, water and housing (Ziervogel *et al.*, 2017).

— Urban form and risk

The majority of African urban dwellers live in cities and towns of fewer than 500,000 inhabitants. While there are exceptions, the bulk of small settlements have lower economic productivity, lower per capita incomes and, therefore, smaller revenue bases than larger cities. They typically also have less well-developed technical, institutional and financial capacities. They often struggle to provide risk-reducing public infrastructures and services.

Inadequate land use planning and rapid population growth in sub-Saharan African cities have led to large scale urban sprawl, which comes with significant costs. Lower population density implies more expensive per capita infrastructure and services provision such as roads, sewer networks and health care. Moreover, much urban sprawl is taking place in low-elevation coastal zones and deltas, which are prone to storm surges and flooding.

Urban infrastructures and services are highly unevenly distributed over sub-Saharan cities. Despite recent initiatives such as the International Drinking Water Decade and the Millennium Development Goals, African governments have largely proven unable or unwilling to meet the services needs of their growing urban populations. Rather, between

Box 1. Everyday risks

The combination of urban sprawl and informality renders urban dwellers more vulnerable to both everyday hazards and catastrophic events. Informal settlements are more likely to be in hazardous localities such as on steep hillslopes or floodplains (where development may be formally prohibited), and where they are also less likely to be served by risk-reducing infrastructure. Lack of access to safe drinking water and adequate sanitation is particularly significant leading to high rates of diarrhoeal diseases. The prominence of cumulative everyday risks in cities reinforces the need for cooperation between public health, infrastructure and services provision, emergency response and other sectors.

1990 and 2015, the share of urban dwellers with water piped into their premises and/or access to improved sanitation has decreased in Eritrea, Malawi, Namibia, Nigeria, Rwanda, Sierra Leone, Zambia and Zimbabwe (Satterthwaite, 2016). This creates significant everyday risks for urban populations (see Box 1).

African urban societies and risk

African urban residents experience risk in different ways, depending on location, income, gender, age and (dis)ability. Yet, a few common characteristics can be identified across urban Africa.

Although specific city data is difficult to obtain, most African cities have a large majority of young people. The urban age profile has important implications for risk and resilience because children and young people are physiologically and psychologically vulnerable to a larger range of shocks and stresses. Youngsters living or working on the streets, or in informal settlements, are particularly susceptible to harm.

Urban violence comes in different intensities and is produced by diverse actors with multiple goals. Whether violence is political or personal, it affects political legitimacy, social cohesion and economic productivity. It undermines human development, security and resilience in African cities (Fox and Hoelscher, 2012). Whereas inter-state violence in sub-Saharan Africa has decreased over recent decades, urban violence has increased, including through communal violence and civil rioting (Raleigh, 2015). Often, this is a response

to poor urban governance and weak capacity to address inequalities. Xenophobia and anti-migrant sentiments have fuelled violence in some cities, notably in South Africa.

African urbanisation also has implications for gender dynamics. While women's experiences in urban areas are highly varied, gender norms and discrimination imply that urban women face different and additional challenges to men. While men are more likely to be killed in urban Africa, women are twice as likely to experience physical violence (UN-Habitat, 2006; in Chant, 2013). Women's health care is often deprioritised within family units and wider societal groups relative to that of males.

Physical violence due to stress from social division or societal fragmentation is important in shaping the dynamics from vulnerability to risk production in African cities. By recognising the above inequalities and tensions, African urbanisms can offer new and empowering opportunities. Appropriate economic and social policies and the full participation of marginalised groups in the urban economy and governance decisions can be major factors in determining empowerment. Although African urbanisation can help reduce risk for marginalised groups such as women, children and minorities, it depends on political will and policy interventions whether cities will realise the opportunities to ameliorate the social and political drivers of risk.

African urbanisation also has implications for gender dynamics.

While women's experiences in urban areas are highly varied, gender norms and discrimination imply that urban women face different and additional challenges to men

African urban governance and risk

Weak governance capacities and exclusionary planning have resulted in much urban development occurring outside the parameters of official spatial plans, land regulation, property markets or building codes (Watson, 2009). Inadequate municipal revenue bases mean that large investments tend to be shaped

by funds from other sources, including development finance and loans from international development banks. Additionally, the absence of effective and inclusive governance creates a vacuum in which other different actors initiate projects. Taken together, this means that investments in African cities are frequently governed by ‘projects’ rather than by ‘planning’. Disjointed and fragmented infrastructure investments are likely to exacerbate exposure to risk, not least because power relations dictate that the interests of businesses and high-income households will typically be protected and prioritised over the well-being of those with lower levels of political leverage and adaptive capacity. For example, it is not sufficient to engineer or maintain one stretch of an urban river if this just moves flooding to a less-maintained area where risk then accumulates.

The complexities of governance are exacerbated both by rapid population growth, which compounds existing deficits in urban infrastructure and institutional capacity, and by the scale of informality, which often concerns developments that do not comply with official plans and regulations. Therefore, managing the interplay between formal and informal land use and planning lies at the heart of urban risk reduction in Africa.

Conclusion

Breaking the cycles of risk production in African towns and cities is complex. Capacity building, and closing data gaps to improve understanding of the nature and scale of urban risks, are both challenging.

It is not sufficient to only look at hazards and vulnerability. Urban planners and policymakers must also consider the intervention processes that actually create hazards, such as urban expansion into exposed locations and insufficient infrastructure provision. It is also critical to understand the dynamics through which multiple hazards interact and compound and how vulnerability is shaped. This is particularly the case where socio-political norms determine unequal access to opportunities and resources. Yet, despite these challenges, considerable opportunity for risk reduction and capacity building lies in the urban growth and urban development anticipated in sub-Saharan Africa, if the right policy approaches are applied.

Informality, poverty, infrastructure deficits, weak governance and exclusionary planning all contribute to the range of everyday and catastrophic risks facing African urban residents

Engaging with this challenge in practice is difficult but indications of how this might be successfully approached can be found in innovative neighbourhood-level responses to hazards that have re-shaped citizen-state relationships. The co-production of housing and infrastructure not only directly addresses some risks but also demonstrates that cooperation between civil society and public authorities can enable both to more effectively prepare for and respond to shocks and stresses. Under similar arrangements, the construction of community sanitation blocks has reduced disease incidence in Kampala (Dobson *et al.*, 2015), while the enumeration of informal settlements in Nairobi has equipped communities with the evidence base to negotiate more effectively with local authorities (Weru, 2004).

Three specific findings can be drawn from this review:

- How the characteristics of African urban development create and shape risk is poorly understood and there are few explicit efforts at generating and analysing empirical data on the generation or reduction of risk at the city level.
- Informality, poverty, infrastructure deficits, weak governance and exclusionary planning all contribute to the range of everyday and catastrophic risks facing African urban residents. These impacts are in turn experienced differently depending on an individual’s location, income, gender, age and (dis)ability.
- Complex as it may be, risk management needs to be taken into account in all African urban planning, policymaking and investments, not just those specifically focusing on climate and disaster risk. Initiatives to promote urban economic growth, shape urban form and enhance human well-being must be designed to safeguard human and economic gains against a wide range of disasters.

Chapter 3

Understanding risk in Karonga Town, Malawi

By Mtafu Manda and Elijah Wanda

Policy pointers

- Much of the Malawian urban population lives in small urban centres (<500,000 inh.). Since these settlements lack the political and economic leverage of large cities, their governance structures and capacities are insufficiently developed.
- Local governments of small urban centres usually lack the data to help them understand and address the life-, health- and livelihood-threatening risks that the citizenry faces.
- These risks include floods, earthquakes and diseases associated with inadequate sanitation and poor quality drinking water, as well as injuries and illnesses from the use of unsafe cooking or lighting fuels. Risks are worsened by the limited risk reduction capacity within local government institutions.
- Risk exposure is typically higher for low-income than it is for wealthier households.
- Knowledge of the full spectrum of risks, and insights into who is most at risk, is critical to informing policymaking, capacity-building and urban planning.
- It is important to establish where risk reduction is needed and possible, for large and small disasters as well as for everyday hazards.





The inhabitants of Karonga Town in Malawi are at risk from major disasters, including flooding, earthquakes and droughts. They are also at risk from so-called 'everyday hazards,' whose impacts are too small to be classified as a disaster. These include diseases related to poor water quality and inadequate sanitation provisions, traffic accidents, drownings, malaria or animal attacks, as well as politically-linked violence. This research sought to identify the full spectrum of risks facing the inhabitants of Karonga. These risks are defined by the residents themselves as 'events affecting their livelihoods and assets and/or those resulting in injury or premature death.' The research attempted to improve knowledge on the nature, scale and physical location of vulnerability, and to provide insight into where risk reduction is both needed and possible.

The research findings

Karonga, a small city in northern Malawi, and located on the shores of Lake Malawi, had 41,000 inhabitants in 2008 and is projected to grow to nearly 63,000 by 2018. Data on the range and nature of risks in Karonga drew on a household survey, an assessment of water quality, responses from selected informants, official reports and a review of hospital records. However, the research cannot claim to record all risks and their impacts since there is no consolidated registration system recording causes of death. All the same, the range of risks in Karonga is clear.

Karonga experiences events that, according to international criteria, can be classified as ‘disasters’. For example, in December 2009, Karonga suffered four large disasters within the span of two weeks. Each of these was an earthquake with a magnitude of between 5.4 and 6.0 on the Richter scale. Four people were killed, over 1,800 homes were either damaged or destroyed, and damage was done to infrastructure and many public buildings by these earthquakes.

Other calamities in Karonga concern ‘small disasters,’ which do not meet the international disaster criteria. Examples of such events are the annual floods that Karonga experienced between 2009 and 2016. Lesser misfortunate events are classified as ‘everyday risks’ and include, among others, traffic accidents and health problems due to inadequate sanitation, unclean water and unsafe fuels for cooking and lighting.

Table 1 categorises the risks to Karonga and reveals two important findings: 1) events classified as everyday risks may be causing more premature deaths than large disasters and small disasters combined; and 2) the cumulative impact of small disasters is larger than that of the more sporadically-occurring large disasters.

In the case of health-related events, the 2014 records from Karonga District Hospital show 67 tuberculosis (TB) deaths and 32 deaths related to other respiratory diseases. These are different to disaster deaths, as they are neither caused by a specific physical event (as in a flood or earthquake), nor do they involve damage to property. However, it can be argued that the risk of premature death due to TB or acute respiratory infections is much higher than that attributable to flooding. Flooding, however, carries a



Food insecurity is a risk which provoked deaths in Karonga in 2012 and 2014

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Karonga experiences events that, according to international criteria, can be classified as ‘disasters’. For example, in December 2009, Karonga suffered four large disasters within the span of two weeks

greater risk of damage to property and loss of assets, and it can have secondary health impacts such as cholera outbreaks.

As Table 1 shows, other causes of premature death occur as infrequently as annually or as daily incidents. They include traffic accidents, drought, drowning, crocodile attacks and cholera. Injuries resulting from politically-linked or gender-based violence occur sporadically and daily, respectively.

Table 1
Nature, scale and frequency of risks in Karonga Town

Type of risk	Category	Nature of the risk event	
		Occurrence and frequency	Examples
Flooding	Small disaster	Occurring every rainy season from 2009 to 2016	Karonga District Council reports that 50 households, the whole central town and settlements along the Rukuru River were flooded in 2010. On 6 December 2016 the whole town centre was flooded and 14 houses collapsed
Earthquakes	Large disaster	These occur frequently; four in December 2009 alone	Entire town affected in 2009; 775 houses collapsed, 1,154 houses developed cracks, many public buildings, businesses and services damaged or destroyed
Droughts and food insecurity	Small disaster	Drought and food security problems in 2012 and 2014	Drying of crops, death of livestock and nine and 13 reported deaths in 2012 and 2014, respectively, due to malnutrition/hunger
Road traffic accidents	Everyday risk/hazard	Daily	Karonga District Hospital reported five car accidents in 2016, killing five people and leaving 10 injured
Politically-linked violence	Small disaster	Occurred periodically, usually during food distribution exercises and political campaigns	Household respondents reported 12 people injured in the run-up to the 2014 national elections and some houses were burnt
Gender/ sexual related violence	Everyday risk/hazard	Reported as 'daily events'	Respondents reported 10 injuries due to Gender-related/sexual violence
Drowning in river/lakes	Small disaster	Mainly occurring in the rainy season	Respondents said boats often capsized, several undocumented fatalities
Crocodile, snake or other animal attacks	Everyday risk/hazard	These attacks happen each year, especially in the rainy season	Community members indicated that several people were killed or injured along the lakeshore – no specific events reported
Strong winds	Small disaster	Occurring annually, especially in the rainy season	Community members indicated that scores of house roofs were blown off – no specific events reported
Polluted/ poor water quality	Everyday risk/hazard	Reported as daily, but more serious during rainy season	Hospital records indicated four deaths due to cholera in 2016
Fish deaths	Small disaster	A seasonal event, especially during temperature inversions and mixing of waters due to currents in Lake Malawi	Respondents reported widespread unexplained death of fish species in Lake Malawi in 2006, 2011 and 2014
Diseases/illness	Everyday risk/hazard	Daily	Karonga District Hospital reported 30 and 67 TB-related deaths in 2012 and 2014, respectively, and 13 and 32 deaths from respiratory infections in 2012 and 2014 respectively

Source: Field study, Karonga Hospital data, 2016. Karonga District Council verbatim reports and data obtained from household interviews

Surprisingly, interviews and discussions with selected informants revealed that Karonga residents do not see preventable diseases as a risk. Flooding is considered the most serious hazard in Karonga by 56 per cent of the households interviewed. That was not unexpected since the majority of the population lives along the river in areas that are flooded either annually or more often

Surprisingly, interviews and discussions with selected informants revealed that Karonga residents do not see preventable diseases as a risk. Flooding is considered the most serious hazard in Karonga by 56 per cent of the households interviewed. That was not unexpected since the majority of the population lives along the river in areas that are flooded either annually or more often. Although the physical risk of flooding is high, most housing at risk is owner-occupied. This suggests that access to conveniently located land takes precedence over the seasonal flood damage; the locational advantages outweigh the perceived risks.

Key determinants of health

It is difficult to get accurate city-level data on health outcomes. Information on key determinants of health, such as access to clean water and adequate sanitation or the quality of housing, is easier to obtain. The household survey included questions about the quality of housing (permanent, semi-permanent, temporary materials) and household income.

Water

Only 17 per cent of the households had water piped into their homes and 43 per cent onto their plot. Others relied on an off-site or shared source (see Figure 1). Most houses that were built with permanent materials or in the high-income household category had water piped, either into their house, or on to their plot. Only a minority of traditional housing or low-income families had these conveniences.

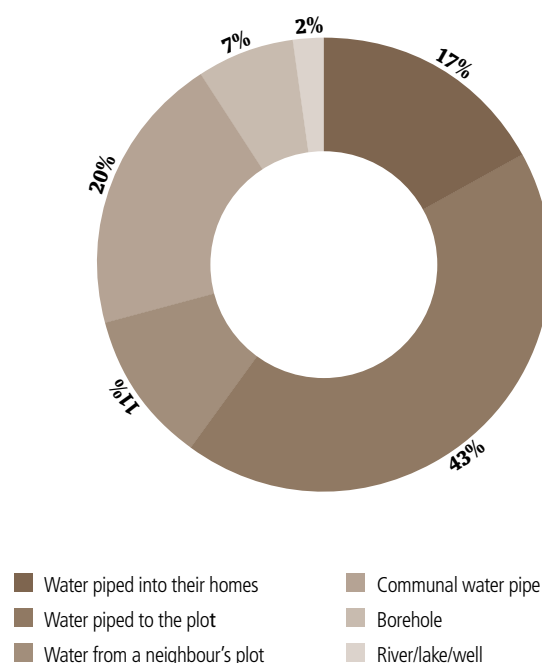
Having said that, water quality analyses found that in 56 per cent of the samples, faecal coliform levels exceeded the WHO drinking water quality specification and were not fit for domestic purposes. Diseases associated with unsafe water and inadequate sanitation were reported as among the most common

health problems. Six cholera-related deaths were recorded in 2016, most likely due to the consumption of unsafe water from the lake.

Sanitation

Most households use pit latrines. Only 13 per cent have flush toilets connected to septic tanks. Four per cent use neighbours' pit latrines and another four per cent do not have any toilet facility (see Figure 2). Higher-income households and those in permanent housing had the largest share of flush toilets with a septic tank. Generally, the quality of sanitation facilities is worse for people living in traditional housing areas (THAs) and dwellings built of semi-

Figure 1
Drinking water source for Karonga households



Karonga’s informal settlements are mainly located on customary land and accommodate a large proportion of the city’s population mostly in poor quality houses

permanent materials. Many of these individuals are low-income earners.

Sanitation factors impacting ground and surface water quality include pit latrines that are located less than 100 metres from shallow wells, boreholes or rivers.

Energy

Ninety-five per cent of the respondents rely on firewood or charcoal for cooking. Sixty-two per cent have no electricity. Therefore, 44 per cent of households use battery torches, solar lamps and cell phones for lighting. Only a few use electricity for cooking.

The social and spatial distribution of risk

The above overview of provision for water, sanitation and fuel highlights how, in general, a higher proportion of those with relatively high incomes and/or living in housing built in permanent materials enjoy better provision and quality of water and sanitation. This generates differences in the spatial distribution of exposure to risks. However, although all of Karonga is exposed to multiple risks, three specific areas are more imperilled: a) Karonga’s informal settlements; b) areas adjacent to the river; and c) the town centre.

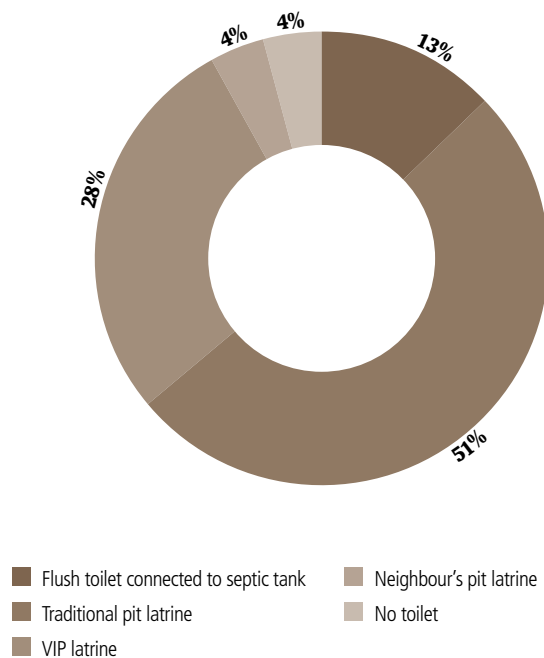
Karonga’s informal settlements are mainly located on customary land and accommodate a large proportion of the city’s population mostly in poor quality houses. Many informal settlements have expanded onto the flood plains along the river, the lakeshore or in flood-control drainage channels. The inhabitants of informal settlements have higher risk exposure because of a combination of factors: a) less secure tenure, b) absent or blocked flood-water drains, and c) due to their informal status, denial of state-provided infrastructure and services. Much of the risk exposure is linked to urban development policy and practices which condemn the poor to live in hazard-prone locations.

The town centre is at risk from annual flooding mainly because the two main roads act as dams.

Channels that are supposed to drain floodwater out of the town have been rendered ineffective by lack of maintenance. Moreover, due to a combination of weak or absent regulation and shortfalls in adequate urban planning, many Karonga residents expose themselves to significant risks by settling on hazardous pieces of land because these offer ease of access and fertile soil.

Karonga has become a significant city in Malawi despite a lack of adequate urban development guidance and support from the local authorities. In addition, the town council was dissolved in 2009, leaving rapidly growing Karonga under the supervision of a weak, rural council which was ill-equipped to cope with the complex

Figure 2
Karonga households’ sanitation facilities



urban challenges. Lack of financial transparency did not help either. The ensuing governance shortfalls also limited the risk management capacity, including the coordination of risk mitigation by different stakeholders.

Not surprisingly, the communities distrust the local government not only in their post-disaster relief distribution, but also in terms of their use of financial resources. For example, 52 per cent of the respondents felt that the Karonga local council was ineffective at

responding to risks because of inadequate funding, customary land tenure practices (whereby chiefs wield more authority than the local council) and lack of data for better informed decision-making.

— Conclusions

Urban areas need local governments that understand and address the risks facing their population. This case study of Karonga, in Malawi, shows a broad spectrum of life-, health- and livelihood-threatening risks that the town's population faces. Risks range from earthquakes and floods to unsafe sanitation

and drinking water and dirty fuels. Risk exposure is higher for low-income households and is compounded by the local government's inadequate capacities to fulfil its risk-reduction responsibilities.

Knowledge of the nature, scale and location of risks can create the basis for capacity building at both the community and local government levels.

Acquiring a more complete picture of the full spectrum of risks and knowing who is most at risk are key underpinnings for more effective interventions. Such knowledge would also highlight where risk reduction is needed and possible, whether for large or small disasters, or for everyday hazards.



Sixty-two per cent of the people in Karonga have no electricity and the vast majority rely on firewood or charcoal for cooking

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Chapter 4

Small disasters erode household resilience in Niamey, Niger

By Mark Pelling, Alejandro Barcena and Raphaëlla Montandon

Policy pointers

- The piloted methodology revealed that most households in poor areas of Niamey have low resilience and, consequently, all suffered recurrent losses due to seasonal flooding.
- Flooding can impact households in many different areas: health, shelter, food, economy, education and social ties (among others) and requires holistic responses.
- Most households do not have many adaptive strategies to deal with flooding and often do not report their problems to the authorities. This is an area that policymakers need to urgently address.
- Collecting data for compound resilience indicators in low-income contexts is challenging and proxies may need to be used.
- Disaggregating data collection to identify absorptive capacity by gender and age are important next steps.
- The research concluded that the Household Economy Approach can be successfully combined with indicators to measure household resilience in urban areas.





Urban resilience is a product of the capacity of households to absorb stress, adapt, and transform their scope for action in managing risk. This chapter outlines a new methodology to investigate aspects of resilience in very poor urban contexts. The methodology was developed in response to requests from Save the Children to explore scope for adapting a rural food security monitoring tool, the Household Economy Approach (HEA), to urban contexts. The new methodology was applied in Niamey, Niger to study the resilience of households located in areas of the city which are subject to floods every rainy season.

Challenges of measuring resilience in urban contexts: Piloting a new methodology

Disaster resilience is defined by the UK Department for International Development (DfID) as “the ability of countries, communities and households to manage change by maintaining or transforming living standards in the face of shocks or stresses - such as earthquakes, drought or violent conflict - without compromising their long-term prospects” (DFID, 2011).

Measuring household resilience in urban contexts is challenging since the tools developed by humanitarian agencies can only be used in rural communities. Transferring the use of these tools to urban contexts is difficult (Issoufou, Lecumberri and Boubacar, 2015), as explained below.

Analysing livelihoods is more complex in cities, because it is far more difficult to determine an urban household’s living standard, since their livelihoods are often very heterogeneous and tend to vary over time. The income sources available to poor households tend to be fragile, multiple and changing, creating diverse patterns of livelihood hazard exposure and vulnerability.

While access to food and economic security is fundamental, these factors are more difficult to differentiate in terms of resilience among urban households whose access to money and food is limited.

Box 1. Flooding in Niamey

In Niamey, inadequate land-use planning, limited infrastructure and increasing population pressure have led to increased occupation of flood-prone areas, notably in the flood plains of the Niger River. Risk exposure is compounded by Africa’s changing climate.

Over the past decade, there have been increases in the frequency and intensity of floods in Niamey. Floods are a recurrent event during the rainy seasons, but extreme flooding events occurred in 2010, 2012, and 2013. The flood of 2015 in Niamey, the focus of this study, is considered an ‘average’ flood year and affected 1,083 people and destroyed 60 homes in Niamey.

For the urban poor, differences in life opportunities (and therefore resilience) are often shaped by additional qualities, such as social capital; that is, the social ties and networks that dictate common support and cooperation between inhabitants of an area. Social capital plays a major role in influencing survival mechanisms in resource-deprived, poor urban areas. That is so because neighbours and wider social support networks can determine access to food, other resources and job opportunities, especially during periods of shock or stress (Putnam, 2001). Other factors such as health, education and personal security are also important determinants of vulnerability and vary from household to household (even within the same neighbourhood).

— Absorptive capacity as an expression of household resilience

In response to needs in urban contexts, this study has developed a household resilience measuring tool that incorporates elements of the rural Household Economy Approach (HEA). This new tool provides for capturing the nuances of urban resilience while still allowing for an HEA analysis to be extracted. In this chapter the discussion will be limited to the analysis of household resilience. The recommendation is that the HEA could and should be adapted to measure urban risk and resilience. The proposed tool calculates statistically-derived resilience categories to distinguish between households. The calculation is based on seven resilience components: nutrition, economic assets, security, social assets, health, education and shelter.

The research focused on absorptive and adaptive capacity. Absorptive capacity is the ability of a household to experience shock and stress, and be able to continue functioning. It is measured by calculating the change in status (the stability) of the seven resilience components before and after the flooding that occurred in 2015. Adaptive capacity is the ability of a household to adjust their practices to mitigate future risk and is recorded through interviews and discussions.

Calculating resilience classes

Between July and August 2016, 300 heads of households were interviewed in three zones of Niamey where flooding had occurred in 2015. 140 of these were interviewed in the peri-urban, highly flood-prone areas; 115 in the moderately flood-prone inner-city area; and 45 in the inner-city and only slightly flood-prone locations. These heads of households were asked to recall the state of the seven resilience components, before and after the 2015 flood.

For each component, households were arranged into quintiles and awarded scores from 1 (very limited resilience) to 5 (excellent resilience). Based on their resilience scores, households were grouped into four different resilience 'classes', with analyses examining the performance of each class over the flood event, to determine how resilience was expressed, built or

eroded for the respective classes. Each component was based on several indicators that were derived from the household questionnaire.

The findings

Nutrition

Food was the highest category of household expenditure across all resilience classes. Before the flood, all resilience classes had sufficient food to meet all their daily energy requirements. For the lower resilience classes, this was achieved in part through small-scale church donations. After the flood, access to food decreased for all households and for very low-resilience households it went below 100 per cent of the required daily intake. All groups suffered a significant decrease in food diversity, with the highest



People took shelter at schools during the 2012 floods and water had to be supplied to them for cooking

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Table 1
Common characteristics of the resilience classes

Resilience class	Descriptor	Resilience score range	People sleeping in the household (mode)	Mean daily household income (West African CFA francs)	Sources of income	Type of house (mode)	Education of head of household (proportion)
A (38.8%)	Very low resilience	1.21–1.84	5 (14%)	3,965	Agricultural (16%) Daily (67%) Waged (17%)	Thatched (25%) Banco (75%)	Illiterate (26%) Literate (48%) Primary (16%) Secondary (8%), Higher (2%)
B (18.4%)	Low resilience	1.85–2.44	7 (14%)	4,327	Agricultural (20%) Daily (63%) Waged (17%)	Banco (80%)	Illiterate (32%) Literate (15%) Primary (34%) Secondary (17%) Higher (2%)
C (4.0%)	Moderate resilience	2.45–3.2	9 (33%)	4,710	Agricultural (8%) Daily (75%) Waged (17%)	Mixed (Banco and cement) (80%)	Illiterate (8%) Literate (8%) Primary (26%) Secondary (8%) Higher (50%)
D (38.8%)	High resilience	3.3–3.83	10 (36%)	4,860	Agricultural (15%) Daily (59%) Waged (26%)	Permanent hard structure (75%)	Illiterate (2%) Literate (2%) Primary (2%) Secondary (19%) Higher (75%)

Levels of debt and savings showed the greatest differences before and after the flood. Amongst all groups debt levels were common but low before the flood. They elevated afterwards, with higher-resilience households taking on the most debt

resilience class experiencing the largest comparative loss. Expenditure increased after the flood, with slight differences in prioritisation for different resilience classes (shelter, health, basic foodstuffs and transport).

Economic assets

All resilience classes experienced a small income decrease after the flood, with the agricultural incomes of the low-resilience class being most affected. Levels of debt and savings showed the greatest differences before and after the flood. Amongst all groups debt levels were common but low before the flood. They elevated afterwards, with

higher-resilience households taking on the most debt. High-resilience households had the largest savings but also experienced the greatest reduction in savings in the post-flood period.

Security

Security was difficult to analyse, as respondents preferred not to discuss specific events. Instead, heads of households were asked to estimate risk using rating scales, and these perceptions of risk were used as a substitute. Reported fear of physical aggression increased after the flood, especially for the higher-resilience classes.

Although all classes perceived security loss to one extent or the other, the difference was highest amongst the high-resilience class. This may reflect the fear that the few (but relatively greater) assets held by higher resilience households are at greater risk of theft in the post-flood period of scarcities.

Social assets

Social support was measured through monthly attendances at neighbourhood associations or religious and non-religious groups, as well as monetary/food support offered by family members. For all resilience classes, attendance at associations and groups decreased in the post-flood period. This was especially marked in the lowest-resilience class's attendance of religious group meetings and was explained as a consequence of post-flood lack of money and time, along with reduced physical accessibility. However, support from family members increased after the flood, with low-resilience households receiving the most support.

Losses

Low-resilience households with houses made of banco clay were particularly badly affected, with around one-fifth of all compound walls (but not the dwelling walls) collapsing completely. No compound boundary walls collapsed completely for any households in the high-resilience class.

Box 2. Challenges of data collection

The study employed trained enumerators from the Université Abdou Moumouni in Niger, who asked selected heads of household to reflect on the status of different aspects of household life prior to and after the 2015 flooding. While heads of household can provide a wealth of information because they are responsible for many of the economic decisions in the household, they may, apart from recall bias, only have a partial view on the lives of each family member.

For three of the resilience components (health, shelter and education), a clear 'before and after' analysis was difficult to obtain. For health and shelter, heads of household were often unable to reflect on the status of these components before and after the flood. For education this was also difficult because the flooding took place during a long holiday period.

Although all classes perceived security loss to one extent or the other, the difference was highest amongst the high-resilience class. This may reflect the fear that the few assets held by higher resilience households are at higher risk of theft in the post-flood period of scarcities

Economic impact and loss of assets were highest in high-resilience households. However, the individuals who suffered the most through loss of income on flooding days were the informal sector and day labourers in the markets or in transport. Those with regular wages (monthly salaries) reported little if any impact on income.

Adaptation strategies

Adaptation strategies differed markedly among the resilience classes. More than one-third of households for all but the most resilient had no strategy to deal with flooding. Higher-resilience classes, perhaps due to their greater educational attainment, were more aware of the responsibility of public authorities to support flood risk management and were more likely to complain and ask for help. Lower-resilience classes, due to the destruction of their homes, were often forced to temporarily relocate. Few households participated in monitoring river levels during the rainy season.

— Conclusions

Measuring resilience amongst very poor 'at-risk' urban households in fragile contexts poses key challenges. The methodology described in this chapter recognises the diversity of components shaping urban household resilience. The newly proposed tool measures the capacity of households to absorb and continue functioning during and after shock or stress. Social capital, including both informal and formal ties, was confirmed as a key constituent indicator of resilience.

Adaptive strategies were mostly defensive and often undermined the long-term sustainability of households. For instance, as a result of coping with the flooding, many households had fewer savings

and more debt. For a high number of households, the only feasible coping mechanism was to temporarily relocate.

The analysis did not seek to capture the ability of households to transform their living environments and life chances through advocacy or organised collective action. Instead, a household-centric view was adopted. The former type of analysis would, however, be possible with the inclusion of interviews with agencies responsible for key service provision.

Efforts to measure and to improve resilience cannot just target economic aspects. While all households were located in poor areas of Niamey and shared low absorptive resilience, there were significant differences not only in terms of overall levels of resilience, but also in different resilience components. This reinforces the notion that poverty and resilience, while correlated, do neither always nor necessarily match. More

resilient households had stronger linkages to formal organisations; less resilient households relied more on neighbours for support.

Despite the 2015 flood being average and small, households assets were eroded through coping strategies. Oftentimes, higher resilience households, with their higher levels of well-being than lower resilience households, experienced greater comparative losses.

In sum: Both low- and high-resilience households: a) tended to have few adaptive coping strategies, b) rarely reported their situation to authorities, or c) received no advance information about flood risk and management. It is clear that local authorities and non-governmental organisations (NGOs) should work together to provide more transparent and better information and assistance to households living in flood-prone areas.



When the Niger river flooded at Niamey in 2015, the only feasible coping mechanism for a high number of households was to temporarily relocate

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Chapter 5

The impact of upgrading on the social contract and social cohesion in Kibera, Nairobi

By S. Mitra, J. Mulligan, J. Schilling, J. Harper, J. Vivekananda and L. Krause

Policy pointers

- Through horizontal and vertical trust-building, both within communities and between communities and governance providers, informal settlement upgrading can strengthen resilience to such risks as flooding, conflict and insecurity.
- Programmes that involve temporary or permanent relocation must provide sites that do not disrupt the livelihoods and social networks of those relocated.
- Development interventions with an integrated, multi-sectoral and consultative approach have a greater potential to increase resilience in multi-risk environments compared to single sector projects.
- There are lessons to be learnt about the value of holistic approaches that integrate employment and improve services provision.
- Enumerations of informal settlements can support slum upgrading if there is close engagement with the inhabitants and other local stakeholders.





In Kibera, a large informal settlement in Nairobi, Kenya, three major development efforts are under way to improve living conditions for the residents: a) the Kenya Slum Upgrading Programme (KENSUP) - the Kibera pilot; b) the Nairobi Railway Relocation Action Plan (The Railway Project); and c) the National Youth Service-led Kibera Slum Upgrading Initiative. This chapter describes these initiatives and assesses how they have affected the social contract and social cohesion. Upgrading interventions can reduce conflict, crime, insecurity and flood risks, as well as strengthen resilience in dense and complex urban environments. To that end, interventions need to assure meaningful consultation and social accountability mechanisms (the social contract) and build ‘bridging social capital’ between ethnic groups. They should also adopt multi-sectoral designs and integrate sectoral interventions to address multiple risks.

Kibera, in Nairobi, is one of Africa's largest informal settlements. Its residents face many challenges, including unemployment, poverty, inadequate water and sanitation infrastructure, poor quality housing, high rates of crime and insecurity, and floods. This chapter assesses how slum upgrading can contribute to resilience. It describes three major development initiatives in Kibera: a) the Kenya Slum Upgrading Programme (KENSUP); b) the Railway Project which, together with KENSUP, has introduced multi-storey housing to the largely single-storey settlement; and c) the National Youth Service (NYS), a multi-sectoral initiative involving youth in road widening and paving, water and sewerage infrastructure, solid waste management, and the initiation of micro-businesses.

The research

The research was carried out in the Kibera sub-locations of Gatwekera, Lindi (and its sub-area Andolo), Makina, Silanga, Soweto East and the decanting sites of Langata and Magade at the southwest and northeast fringes of Kibera, respectively. Decanting sites are temporary housing sites where residents of Kibera deemed entitled to new housing can stay until their new housing units are completed. The research areas were chosen to reflect different types and levels of risk (floods, security and conflict) and to overlap with the upgrading programmes.

Between November 2015 and February 2016, 339 respondents were interviewed, including representatives of the Kenyan government (chiefs, members of parliament, county commissioners), development organisations, UN-Habitat, community-based organisations (such as *Muungano wa Wanavijiji* - the Kenyan Slum Dwellers Federation), the district peace committee and the police. Focus group discussions (FGDs) were organised in each sub-location by a non-profit community development organisation in Kibera in close cooperation with community representatives. Respondents were asked to identify positive and negative changes they had experienced over the past years in Kibera and then rank the themes identified. This led to discussion of conflict and flood risks, the upgrading projects and implications for building resilience.

Although the three projects are not designed to enhance resilience or address flood or conflict risks, they can and do have an impact on resilience through

their poverty reduction and youth unemployment components, the lessening of environmental hazards, better quality housing delivery and improved water and sanitation services.

The KENSUP pilot, a joint project of the Government of Kenya and UN-Habitat, was initiated in Kibera's Soweto East neighbourhood because of: a) good road access, b) the area's 'cosmopolitan composition' with high ethnic diversity and economic stability; and c) existing development efforts in the area that KENSUP could connect to. The inhabitants were provided with temporary housing while their site was cleared and the new accommodation built. Residents were registered through household questionnaires, but did not play a significant role in project planning and implementation. There were difficulties getting all of the residents registered, and those who were registered were not consulted a second time prior to receiving notice to relocate to the temporary decanting site.

Box 1. Key definitions

The social contract is the process whereby everyone in a community consents to state authority, which limits some freedoms, in exchange for the state's protection of human rights, security, and adequate provision of public goods and services.

Social cohesion is 'the willingness of members of a society to cooperate with each other to survive and prosper'.

Social capital, a core component of social cohesion, refers to the networks and relationships among people that enable a community to function effectively. This contributes to community resilience by providing an informal buffer to those affected by disaster.

Bonding social capital refers to social capital within a group based on identity such as kinship, proximity, religion or ethnicity.

Bridging social capital pertains to building cohesion between groups. It is based on external ties across distinct groups and can link these groups to outside assets and socio-economic identities.

Table 1 highlights other challenges, such as delays due to structure owners opposing the project because they would lose their rental income; relocatees' difficulties in affording rent and saving for the down-payment on the new housing; disruption to social and business networks; and lack of access to income-generating opportunities. In addition, the number of people enumerated by far exceeded the number of new housing units. At the time of the research

(14 years after the launch of the project), no one had yet moved into the new housing. The latter only commenced in July 2016.

The Railway Project originated from Kenya Railways' need to recover its railway reserve and establish a safety corridor along the railway line through Kibera. Encroached upon by residents, businesses and schools, the railway track in Kibera doubles as an informal market and walking path for

The Railway Project originated from Kenya Railways' need to recover its railway reserve and establish a safety corridor along the railway line through Kibera. Encroached upon by residents, businesses and schools, the railway track in Kibera doubles as an informal market and walking path for pedestrians



The railway serves as a walking path for residents

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Table 1
Summary of impacts of slum upgrading on the social contract and social cohesion

		Social contract	Social cohesion
KENSUP	Positive (+)	<ul style="list-style-type: none"> • No conclusive findings. 	<ul style="list-style-type: none"> • No conclusive findings.
	Negative (-)	<ul style="list-style-type: none"> • Delays in project and lack of clarity on enumeration led to mistrust between residents and government. • Structure owners opposed the project via lawsuits that delayed project implementation. • Lack of affordability has been a significant cause for grievance. • Residents expressed lack of support from government initiatives, suggesting concerns over consultation process. 	<ul style="list-style-type: none"> • Residents relocated to Langata experienced disruption to their networks in Kibera, negatively affecting their livelihoods. • Low social cohesion in Langata among the Kibera residents and the middle-class residents.
The Railway Project	Positive (+)	<ul style="list-style-type: none"> • Concerted efforts to mediate the different interests (including those of tenants). These have been largely accepted. • Stringent criteria for eligibility, awareness campaigns, dialogue, consultation and community meetings helped reduce the risks of obstruction and conflict. 	<ul style="list-style-type: none"> • Residents relocated to Magade felt able to connect to social and business networks, as they continued to access different areas of Kibera.
	Negative (-)	<ul style="list-style-type: none"> • In 2004, prior to the interventions of AMT and the Kenya Slum Dwellers Federation, the Railway Corporation sent out eviction notices to railway land dwellers in Kibera without prior consent or consultation. 	<ul style="list-style-type: none"> • Future phases of housing will be further away from Magade, which may reduce ability to access and maintain social and business networks. • Local organisations expressed concerns about the long-term strategy for access between villages separated by the railway tracks, as well as for security within the reserve once the housing is complete.
NYS	Positive (+)	<ul style="list-style-type: none"> • Creating youth employment opportunities. The reduction of crime and insecurity built trust and encouraged take-up (especially in parts of Kibera initially resistant to the project). • Road widening facilitated improved services without large-scale displacement and largely with support from affected people. 	<ul style="list-style-type: none"> • Bonding capital was strengthened through youth participation in SACCOs that served as a support network. • NYS graduates/recruits from different communities trained and led community youth volunteer teams throughout Kibera, contributing towards strengthening bridging capital.
	Negative (-)	<ul style="list-style-type: none"> • Initial resistance in the political opposition stronghold of Gatwekera, partly due to the perception that upgrading promises were a government vote-procurement strategy. • Corruption allegations brought NYS work to an unexpected halt, causing insecurity in marginalised areas such as Andolo. 	<ul style="list-style-type: none"> • Crime and insecurity reduced significantly while youth were employed. • Increased crime when NYS and direct employment opportunities stopped abruptly.

The NYS Initiative focused on generating youth employment through road construction, household waste collection, cleaning of drains, construction of sewers and ablution blocks, and the provision of micro-enterprise development

pedestrians. The Railway Project consists of building housing, business units and social institutions for those who must move off the railway reserve.

The project identified eligibility through community enumerations in 2005 and 2010. The 2010 enumeration team included representatives from all affected villages, which helped ensure that those affected had confidence in the resettlement. The Kenyan Slum Dwellers' Federation and Akiba Mashinani Trust (AMT) ensured that the project made concerted efforts to mediate the different interests, whether between structure owners and tenants or between residential, business and institutional interests. Each affected person received one new house or shop per household. Structure owners received one unit plus compensation based on the number of structures they previously owned.

In June 2014, the first resettlement onto a decanting site took place. No rent was charged but fees for water and electricity were collected. No down-payments for the new housing units were required, since the new occupants were renters rather than owners. Since the decanting site was close to Soweto East, livelihoods and school attendance were not disrupted. The quality of housing and sanitation was generally perceived positively.

The NYS Initiative focused on generating youth employment through road construction, household waste collection, cleaning of drains, construction of sewers and ablution blocks, and the provision of micro-enterprise development. Youth employees received KSh 1,650 (USD 16) weekly for their work. Through savings and credit co-operatives (SACCOs) they were able to save around KSh 350 per week. The SACCOs provide loans to members to start businesses.

Most interviewees mentioned the many benefits of the NYS initiative, including reduced crime and insecurity. NYS also brokered agreements



The NYS Initiative sought to create youth employment to replace open sewers



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to widen a key road that transformed access to Kibera, encouraged many new enterprises in their development and improved security with street lighting and security posts.

Initially, some people were concerned that NYS was a mere government attempt to secure votes and, in 2015, corruption allegations stalled NYS work in Kibera. Indeed, both financial irregularities and technical challenges have plagued the initiative. The failure of commercial ablution services hampered some of the envisaged new employment for youth.

Impacts of slum upgrading on risk resilience

For upgrading efforts in complex political environments like Kibera to be effective in building risk resilience, this study proposes several pre-conditions:

- 1. Projects need to involve the communities in consultation and secure community buy-in.** This ensures understanding of the local context, including its risk dynamics, and enables transparency and accountability. Securing community buy-in through trust-building helps strengthen the social contract between the project implementers and the beneficiaries.
- 2. Where the social contract is weak, projects need to be particularly sensitive to the political context.** In the dense, heterogeneous and complex political environment of Kibera, technical interventions that lack consultation have less likelihood of take-up.
- 3. Projects that build social capital and social cohesion between groups have positive outcomes for resilience.** This is evident in the Railway Project and from the NYS support for SACCOs that secured avoidance of livelihood and social network disruption.
- 4. Multi-sectoral and integrated projects have a stronger potential to address multiple risks compared to single sector interventions.** Upgrading projects in particular, and development projects in general, can strengthen resilience to risks such as flooding, conflict and insecurity through horizontal and vertical trust building. Robust technical design and sustainable financing are further major factors in long-term project viability.

Chapter 6

Filling data gaps on everyday and disaster risks in cities: the case of Ibadan

By Ibidun O. Adelekan and David Satterthwaite

Policy pointers

- Basic data on health status and risks, especially those associated with environmental hazards, is a priority for urban planning. Many city governments in sub-Saharan Africa have little knowledge of the health problems impacting their population, especially in the case of informal settlement residents who often make up one-third of the city population or more.
- In the absence of such data, there is a need to complement and/or rehabilitate official data sources on health risks such as the registration of all deaths and their causes, as well as making census data on housing conditions available to local governments down to the street, ward and district level to facilitate improved governance in general and better management of disaster risks, in particular.
- National governments, preferably supported by international agencies, need to do far more to increase the funding and capacity that will allow city governments access to the very information and knowledge required to meet their responsibilities in reducing health risks. Ibadan is a dramatic example of a city with inadequate public finance and capacity for data generation and, consequently, its local governments struggle to govern this city of over three million inhabitants.





Many sub-Saharan African cities lack official records on deaths, serious illnesses and injuries from everyday hazards and disaster events at all scales. This signifies a major limitation to effective planning for risk reduction. The current chapter describes how a research team from the University of Ibadan drew on a range of data sources to fill in glaring data gaps for the period 2000-2015. They drew on newspaper reports, hospital records and government departments' databases. While excluding public health risks since data is scarce and incomplete, road traffic accidents, crime, violence and flooding were shown to be the most serious hazards in the city.

City governments should be drivers of risk reduction by meeting their responsibilities on infrastructure and the provision of risk-reducing services such as water and electricity supply, sanitation, drainage, solid waste collection, health care and emergency services. They need to invest in other aspects of disaster risk reduction too, like building climate change adaptation into city development and investment plans. But the effectiveness of their actions depends on the availability of good data for each locality to inform their interventions; especially data on the health influences and outcomes of various risks. Where city governments lack sufficient funding and capacities, the consequential governance shortfalls become drivers of risk and can lead to risk accumulation, especially as infrastructure and services deficits grow. This is particularly the case for informal settlements.

The case of Ibadan

Ibadan is one of the largest cities in Nigeria and the capital of its state. It is a city with a long history and is home to one of the best-known universities in Africa. Nevertheless, its governance capacities are deficient. It is, for instance, common for government employees not to be paid. Poor urban planning, poor development control and weak enforcement of building codes have increased the vulnerability to risks for large sections of the city's population. Risks include flooding, road traffic accidents, building collapse and fire hazards, besides crime and violence. The funding available to address such problems is far below what is needed while the allocation of funds to health care and social services has actually been declining despite population growth.

The city is divided into five autonomous local authorities within the municipality and an additional six local governments in the suburban areas. Due to this urban governance fragmentation, it is difficult to achieve city-wide planning and effective interventions.

Provision of infrastructure and services

A lack of or inadequate access to basic services (e.g. health care, public transport, emergency services) and infrastructure (e.g. roads, drainage and water supply) directly affects the incidence of everyday hazards and disaster risks. Inadequate sanitation and lack of access to safe water supplies increase health risks and they can become sources of diarrhoeal maladies, typhoid and cholera, among others. Lack of drainage

exacerbates flooding, while lack of adequate road infrastructure hinders evacuation when floods occur or it can prevent access by fire services in the case of conflagrations. The sprawl of Ibadan's city growth is not helpful either since that makes the provision of adequate urban infrastructure and basic social services more expensive.

The development of Ibadan as an urban settlement before the introduction of motorised vehicles determined the pattern and quality of the road network in the city's core area and, to some extent, in the newer informal settlements. Most roads are barely more than footpaths and many buildings are not accessible by motorised vehicles. Many of the newer urban expansion areas have emerged with a poor road network of few, if any, tarred roads and roads in a poor state of repair. Many residents face long walks to the nearest arterial road and bus services.

About 70 per cent of the solid waste generated within the metropolis is neither properly managed nor disposed of. Most solid waste ends up dumped in drainage channels, on unapproved dump sites or in wetlands

Poor water supply has been worsened by the sprawling urban expansions and population growth. Three-quarters of Ibadan's population lacks access to the municipal water supply. In the newer suburban areas municipal water supply is virtually non-existent. Many residents depend on wells and boreholes and other sources for drinking and household use. Many wells are highly polluted because of their proximity to pit latrines and solid waste dumps and because of other unsanitary practices and flood overflow. The absence of sewers means sanitation is not good.

About 70 per cent of the solid waste generated within the metropolis is neither properly managed nor disposed of. Most solid waste ends up dumped in drainage channels, on unapproved dump sites or in wetlands. Today, there are only an estimated functional 70 waste-collection trucks, whereas properly catering for the city would require at least 500.

Lack of data on risk

Ibadan, like many other sub-Saharan African cities, lacks systematic and comprehensive records of the impacts of everyday hazards and disaster events at all scales. City-wide systems for official recording of deaths and their causes are highly inadequate. To a large extent only the deaths that have occurred in hospitals and health facilities or which have involved the police are adequately recorded. Deaths due to other causes or occurring in the home are rarely registered.

Census results should provide valuable data on housing and living conditions and other health determinants for all households. But most census authorities do not provide city governments with the data they need, disaggregated to the level of the street and the ward that is needed to inform adequate planning. Instead, most government levels draw heavily on national sample surveys (including the Demographic and Health Surveys) with sample sizes too small to provide relevant data for cities, let alone for informal settlements.

There are further challenges when drawing on local data. Only in the last decade have government records been stored in electronic formats. The key problem of data shortfalls is associated with hard copy records. Many older records can only be obtained from manual registers and accessing these is very time consuming. There is also a lack of consistency in the form in which data is entered and stored over time and from one department to another. The quality of data is largely dependent on the skills of data-entry staff and the data management resources available. Variations in these are rife and affect the completeness, detail and reliability of data.

Government agencies seldom keep records and data on deaths and losses arising from everyday hazards and disaster events at scales lower than the state level. It is only major disaster events that have some record of the impacts at the city level. When available, the data is not usually disaggregated at scales lower than the city level. For example, the gross number of deaths resulting from major flood disasters in Ibadan in 1980 and 2011 was recorded without reference to the number of deaths from floods in different areas of the city. In most cases little attempt, if any, is made to record other risk-related data at a scale lower than the local government area. Yet, risk assessments are critical to understanding each ward's particular risks and who is most affected.



A damaged plantain field in Ibadan where localities experience serious impacts from rainstorms



Detailed socio-demographic data for the majority of victims or persons affected by everyday hazards and disasters in the city is rarely recorded. This makes identifying and acting to support vulnerable groups particularly difficult

As the section below describes, although risk information drawn from a systematic review of all newspaper reporting can provide valuable data, this is neither exhaustive in terms of coverage nor detail. The exception is hospital records, for which patients' information on age, gender, occupation and residential addresses is available. Detailed socio-demographic data for the majority of victims or persons affected by everyday hazards and disasters in the city is rarely recorded. This makes identifying and acting to support vulnerable groups particularly difficult.

Drawing on new data sources

The first new data source came from a review of all issues between 2000 to 2015 of the *Nigerian Tribune* newspaper. Drawing on this information, a database was built of reported deaths and losses from everyday hazards and disaster risks in the city. This systematic collection of data covered the whole spectrum of risks, including disasters and everyday hazards that resulted in illness, injury and/or premature death, or property and economic losses.

Other sources used in the research included hospital records, Ministry of Health records, and data from other government departments and agencies. For every hazard/disaster event or health risk documented the following information was collected, where available:

- Date of hazard or disaster event;
- Incidence location or residential address for patients in the case of hospital records; and
- Number of deaths (i.e. people who died due to direct causes immediately or sometime after the disaster).

Other hazard/disaster information gathered included the number of people injured or otherwise affected (including loss of property) and the number of damaged or destroyed houses.

Findings on everyday hazards and disaster risks in Ibadan

Analysis of daily newspaper reports showed that city residents are exposed to many different risks. Figure 1 shows that road traffic accidents, crime, violence and floods accounted for the largest number of premature deaths over the 15-year period reviewed. The analysis of *Nigerian Tribune* reports showed 548 recorded deaths due to road traffic accidents from 2000 to 2015. Road traffic accidents statistics sourced from the Federal Road Safety Corps also showed large numbers of fatalities or injuries from road accidents since 2009 and confirmed that road traffic accidents represent a leading cause of premature deaths and injury.

At different times since 1992, mass violent demonstrations and destruction of property have occurred in Ibadan in response to attempts by the government to increase the prices of petrol and allied products. Elections have also been a source of conflict and violence, sometimes resulting in injury, loss of lives and property

The newspaper reports further revealed 352 deaths from crime and 205 from violence. A range of factors are known to contribute to the risk of urban violence including governance failures, substandard and overcrowded housing conditions, inability to absorb surplus low-skill labour, under- and unemployment, inequalities in the provision of services, income inequality, local grievances and failure of cultural integration. All these factors are readily observable in Ibadan.

At different times since 1992, mass violent demonstrations and destruction of property have occurred in Ibadan in response to attempts by the

government to increase the prices of petrol and allied products. Elections have also been a source of conflict and violence, sometimes resulting in injury, and the loss of lives and property.

Deaths from fires are largely due to inadequate emergency services and the large share of urban low-income groups in housing without adequate access roads, as noted earlier.

Floods claimed 129 recorded deaths. Ibadan faces changes in the frequency and intensity of extreme weather events, climate change and local environmental change. These have particularly profound impacts on the urban poor and other vulnerable groups. While the number of injured and premature deaths from these hazards does not compare with that recorded for road traffic accidents, violence and crime, the impact in terms of buildings, physical infrastructure and property damaged or destroyed is significant. The inner-city localities experience serious impacts from the effects of rainstorm and windstorms, as do the newer eastern suburbs which have housing characteristics similar to the inner city.

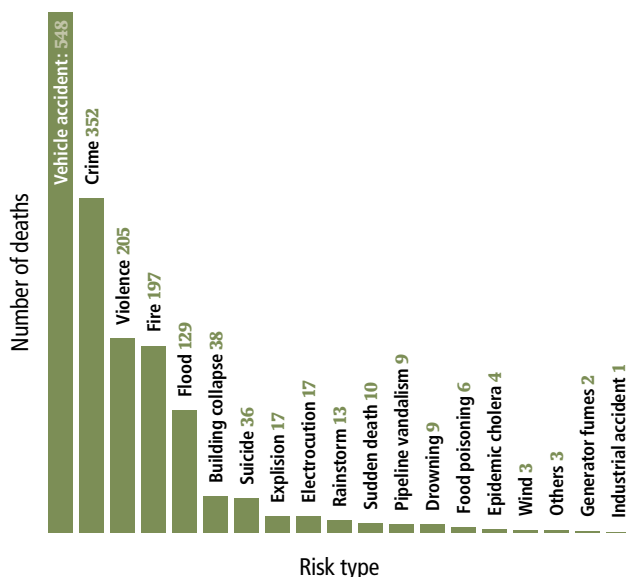
Weather-related impacts are under-reported. For instance, in February 2009, the Oyo State Emergency Management Agency recorded that a major rainstorm damaged or destroyed not less than 269 buildings in different localities in the inner-city and eastern suburbs. The risk was largely due to the old, poorly maintained or poorly constructed buildings in these locations. This event was not reported in the *Nigerian Tribune*.

In February 2013, about 1,000 residential, religious and commercial buildings and schools as well as urban infrastructures were damaged or destroyed by a strong 72-knot wind that accompanied the first rainfall of the year.

A key question is why infectious and parasitic diseases appear to contribute so little to reported deaths. Only cholera is listed in Figure 1 and with only four deaths in 15 years. What about diarrhoea, malaria, tuberculosis, typhoid, malnutrition or pneumonia? This reinforces the notion that many deaths (and most premature deaths) are simply not reported in newspapers.

Records from Ibadan's University College Hospital for the 2000-2013 period showed diarrhoea (124), meningitis (57) and typhoid fever (33) to be important mortality causes. During the same period, 133 deaths due to tuberculosis were recorded at the

Figure 1
Total number of reported deaths by risk type in Ibadan (2000–2015)



Data source: *Nigerian Tribune*

Government Chest Hospital, Ibadan. Deaths from tuberculosis have fallen over the 14-year research period due to improved health services provided by international agencies.

Given inadequacies in the provision for water and sanitation, a high prevalence of water-borne diseases is likely to remain, particularly typhoid, dysentery, cholera and diarrhoea, and among the urban poor in particular. Cholera outbreaks are common: there were 1,872 recorded cases in 2004 and 1,769 in 2006. In 2011, 537 recorded cases followed the August 2011 floods claiming four lives.

Conclusions

The risk landscape of African cities is influenced by many factors. Most are linked to the quality of housing, infrastructure and services across all neighbourhoods. This, in turn, is linked to the competence and capacity of local governments. But there are also many external factors including macro-economic conditions, politics and policy decisions at the national and state levels and, to some extent, the international development agenda.

Although the patterns of city growth and notably uncontrolled urban developments are important risk

drivers, the quality of urban management, operations and systems in terms of institutional capacities, governance at different scales and, by extension, public financing for urban infrastructure and social services are significant determinants of the nature and scale of risks in the city. While the sprawling nature of Ibadan city growth demands increased investment in physical infrastructure and basic social services, changing macro-economic conditions and poor financial management by successive state and local governments are seriously limiting robust city governance and environmental management. Poor urban planning and the failure of local authorities to adequately manage urban development and physical city expansion have resulted in an increased proportion of informal settlements in the newer areas of the city that lack adequate physical infrastructure and social services.

Governance limitations perhaps explain why there is no registration system recording all deaths and their causes or a more systematic use of hospital and health clinic records available for monitoring illnesses and injuries city wide and within each settlement. This chapter, however, has shown that by drawing on multiple sources, a fair start of a city-wide picture can be made on the most serious risks facing the urban population and who is most affected.

Public health risks aside (while recognising that these are under-reported), road traffic accidents, crime, violence and flooding are the most serious hazards in Ibadan. They result in social and economic losses, injuries and deaths. If there were complete data on premature deaths and their causes, however, it is quite likely that diarrhoeal diseases, tuberculosis and typhoid would be among the most common causes of death. This is especially the case in informal settlements where hazard and disaster-reducing infrastructure and service deficits are most acute.

Ibadan is one of many large cities in sub-Saharan Africa lacking city-wide data on the full spectrum of risks facing the population. This information is much needed to understand effective risk-sensitive development and disaster risk reduction. Deliberate and systematic action planning for risk reduction, including measures for reducing vulnerabilities to urban risks, needs to be integrated into short and long-term city development plans, with goals for investment and financing clearly defined and realised. This will contribute towards achieving the targets of the New Urban Agenda and achieving safer communities and more sustainable cities.

Chapter 7

Unlocking urban risk trajectories in Freetown's informal settlements

By Adriana Allen, Emmanuel Osuteye, Braima Koroma and Rita Lambert

Policy pointers

- Everyday risks and small disasters (e.g. fires and landslides) can have a cumulative impact on people's lives and assets. Risk accumulation cycles can be better understood through community-led risk mapping and monitoring to identify the who, how and why.
- Disasters and disease are strongly linked; notably in the case of flooding. Therefore, disaster risk reduction strategies should be designed in conjunction with public health initiatives.
- State regulation often inhibits local capacities to act. Designating an area as 'risk prone', for instance, is often used to justify evictions. Eviction threats undermine the collective and individual capacity to act by those most vulnerable.
- The urban poor have significant capacity to mitigate everyday risks, but this needs to be acknowledged and their rights recognised. This requires vigorous and concerted action between community organisations, public institutions and external support actors. Decentralising disaster risk management to the community level is crucial for inclusive and proactive approaches to breaking risk accumulation cycles, as the interface between statutory, customary and community-led governance structures.





In recent years, awareness has increased of the need to produce better and more grounded information on how urban risk manifests itself across African cities. This has triggered numerous assessment methods to capture how cities prepare, manage and recover from disasters and shock events. However, the African urban risk landscape requires a deeper understanding of the how, where and why shocks impact upon the physical and social fabric but, also of how ‘slow-burn events’ lead to risk accumulation or ‘risk traps’. This chapter is based on ongoing experience developed in Freetown, Sierra Leone. It reflects on how different participatory methods can be articulated to capture risk accumulation across temporal and spatial scales and is driven by the participation of informal settlement communities who face risk traps as part of their daily lives.

Urbanisation in sub-Saharan Africa is increasingly associated with the production and reproduction of risk accumulation cycles or ‘urban risk traps’. This encapsulates both the cumulative impacts of: a) extensive risks (including everyday hazards such as infectious disease and road traffic injuries; b) small disasters such as localised floods and fire outbreaks; and c) intensive risks (larger, less frequent disaster events such as tropical storms and earthquakes). Intensive risks are now receiving increasing attention in DRM and resilience debates but in most African cities the accumulation of preventable everyday hazards and recurrent disasters remains unattended. These events account for a high proportion of all disaster-related injuries, impoverishment and damage. Rather, risk accumulation is often ‘normalised’ as simply being ‘part of life’ and dealt with through coping strategies. Over time, the cumulative impacts erode the acting capacity of the poor locked in such risk traps.

The ‘slow-burn’ effects of risk traps have significant consequences. Not just for those caught in this vicious cycle but also for the development of a city as a whole, because multiple risk traps accumulate and can lock urban systems into problematic risk trajectories. Capturing risk accumulation across space and time is a first and necessary step towards breaking the cycles. This requires grassroots-led processes to assess not only how, where, why and with what consequences risk accumulates, but also what responses are adopted, by whom and with what impact.

This chapter reflects on an approach to co-produce actionable knowledge about how risk traps work and how these can be disrupted. Research was undertaken in collaboration with 15 low-income communities in Freetown, as part of the Urban ARK project. It was led by a team from the Bartlett Development Planning Unit (DPU), University College London and the Sierra Leone Urban Research Centre (SLURC), in collaboration with collectives of the urban poor, NGOs and local authorities.

The context

Freetown, Sierra Leone’s largest and most densely settled city, has seen significant population growth since 1985 and has more than one million inhabitants today. The city has developed in three geographic areas: a) coastal settlements along the

Atlantic Ocean; b) sprawling inland settlements along the Sierra Leone River estuary; and c) hillside settlements on steep slopes, which are encroaching onto vital forest land. Internal displacement during the civil war (1991-2002) and rural-urban migration have contributed to the city’s growth and have led to widespread unplanned settlement, due to growing demand for living close to business centres or markets, and unaffordable land and housing in the formally planned areas of the city. As such, this resulted in an ongoing process of ‘risk urbanisation’ with low-income groups settling on marginal lands.

Box 1. Urban risk traps

Risk traps are “defined as the sum of the articulation and reproduction of vulnerability and daily and episodic dangers or threats, coupled with eroded capacity to act.” However, such traps are frequently invisible or neglected in the management and planning of cities and “their reproduction is caused to a large extent by a flawed and misleading appraisal of what constitutes and causes risk in the first place.” (Allen *et al*, 2017: 479).

Freetown, Sierra Leone’s largest and most densely settled city, has seen significant population growth since 1985 and has more than one million inhabitants today

In Freetown’s informal settlements, flooding, rock falls, landslides and building collapse are all common (and often simultaneous) phenomena. They cause significant economic losses and destruction of infrastructure and property while triggering injuries and fatalities. The incidence of epidemics, especially of waterborne diseases, is also significant.

There is variation in the perception, experience and understanding of risk amongst informal settlement residents in the most hazardous parts of the city that are lacking risk-reducing services and infrastructure (e.g. piped drinking water and drains). Many of these residents also lack secure tenure,



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The research in Freetown showed that residents of informal settlements do have capacity to better respond to disasters and risks if awareness-raising and self-help/community schemes are applied

During the last decade, Sierra Leone has promoted a decentralised approach to disaster risk management (DRM), with a view to enhancing local authorities' and dwellers' capacity to mitigate recurrent hazard events

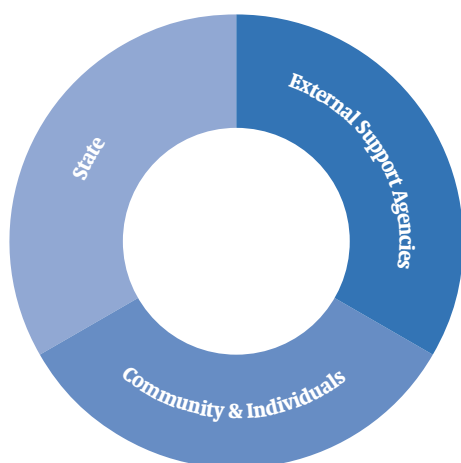
have low incomes and are recent migrants; factors that all reduce their capacity to upgrade their living environments. Due to differences in risk exposure across and within these settlements, risk burdens are unequally distributed, depending on gender, age, ethnicity and ability. This inequality reduces the capacity of local communities and the most vulnerable households to work collectively towards breaking risk accumulation cycles.

During the last decade, Sierra Leone has promoted a decentralised approach to disaster risk management (DRM), with a view to enhancing local authorities' and dwellers' capacity to mitigate recurrent hazard events. However, DRM remains largely top-down and does not

comprehensively address the combined and cumulative impacts of everyday risks and small-scale periodic disasters. The value of employing community-based approaches to capture urban risk accumulation is that it seeks to contextualise, identify and assess the hazard and risk accumulation people face, as well as their vulnerability, resilience and capacity to manage risks.

By taking a holistic view, community-led assessments consider the range of environmental, socio-economic and political factors that drive the production and reproduction of risk traps. The added value here is that the information generated can be used as a basis for action planning and interventions beyond localised capacities.

Figure 1
Floods: The DRM Risk Wheel on Flooding in Freetown



Infrastructure projects, Training, Advocacy, Funding, Relief for disaster victims, Sensitisation & mobilisation, Disaster risk plans

Networking with other actors, Community bylaws & enforcement, Volunteerism cleaning sensitization, Provide support to affected victims, Advocacy, Self-help self protection measures

Flood management plans, Sensitisation, Infrastructure projects, Vulnerability capacity assessments, Evacuation & resettlement, Clearing drains, Co-ordinate humanitarian support, Skills training, Disaster policy

A bold attempt at co-producing community-led knowledge on risk accumulation in Freetown's informal settlements started in 2016. It was initially carried out in two settlements (Dworzack and Cockle Bay) but was later extended to an additional 13 settlements across the city, with plans to further expand this approach to other settlements. Workshops led by the Urban ARK project team brought together community residents and other stakeholders involved in urban planning and risk governance. Field work was led by the communities and their collectives over six months. The findings were fed into collective discussions and exchange visits across settlements and into action plans co-designed with governmental and non-governmental organisations. To prioritise the community-voice

and experience, participatory methods were adopted to establish where and when risk accumulation occurs and what actions can be implemented locally and externally to prevent, mitigate or reduce the impacts of risks.

Addressing urban risk accumulation through community-led methods

Several methods exist to capture trajectories of urban change and to understand where change happens, why it happens, who is affected and how. Co-producing this information with those who experience negative change trajectories is essential to reversing undesirable impacts. Three key articulated methods were employed in Freetown, as follows:

- **Settlement timelines** were adopted to plot risk events over time, outlining demographic change and the actions adopted to improve housing and the provision of protective services and infrastructure to cope with and mitigate risks. Settlement timelines provide a snapshot of the historical process of risk accumulation and reveal moments of significant change or landmark events that shape settlements' risk experience and in relation to other parts of the city. Events captured in the timelines provide a good basis around which deeper backgrounds and histories of risk trajectories are constructed while building local histories into wider city trajectories through discussions with community elders. Timelines also provide the background to adopt a forensic approach to the turning points. That is, when the incidence or perception of risk changed and triggered different ways of acting. For example, eviction threat often acts as a unifying moment that solidifies new social contracts and action, taken towards risk prevention. The exercise also served as a hands-on means for collective learning as well as the refinement and validation of the information collected.
- **Disaster risk management wheels** can be used to better understand and assess the scope and impact of ongoing practices and interventions. This is done by engaging a wide range of participants in focused group discussions to identify and evaluate the responses adopted by ordinary citizens, the public sector and external support agencies

Box 2. Interview with an elderly community leader in Cockle Bay

“Over the years, Cockle Bay has been developed through land banking - reclaiming land from the sea, often through the use of debris, sand and waste. This is a small settlement and we are bounded by the sea. So, as more and more people settled here to be close to jobs and avoid the high rents elsewhere, their main and often only option is to first produce the land where they are to settle. A few years ago, staff from the Ministry of the Environment came and told us that the banking had to stop because we were gradually encroaching on a conservation area. The plan was to evict many households along the shore, so we came to a new agreement within the community to stop the land banking and then agreed with the Ministry on demarcating a boundary. You see those posts there? They show the boundary agreed. This meant that we had to look at ways of densifying the areas already consolidated and to ensure that rainwater can run through the channels into the sea and not be obstructed by new buildings. Banking still continues; it is difficult to stop, but we do it in a way that has reduced floods and the authorities know this.”

(ESAs) to deal with recurrent problems identified through the settlement timelines. In Freetown, the wheels focused on actions to address small-scale and periodic hazards (e.g. fires, road traffic accidents, flooding and water-related illnesses), who addresses them and what resources are used. The wheels are useful tools to: a) assess different actors' capacity to act; b) evaluate the impacts of actions, projects and programmes; and c) design more strategic and collaborative interventions.

The findings show that residents of Freetown's informal settlements are prone to multiple hazards and risks that recurrently stress their collective and individual capacity to act. Although this observation holds true for most informal settlements, a closer examination both reveals different challenges depending on the relative capacity within each settlement to act collectively, and in the relations with governmental and external support agencies.

Figure 1 shows the wheel resulting from the first multi-actor discussions on what is done to deal with flooding risk across the city's different informal settlements. It highlights the important role of external support agencies and the implicit dependency on intermittent projects and donor funding. Attributing weight to the resources devoted to each action or practice showed gaps between what is planned and done in reality. Different actors are undertaking similar awareness raising and disaster relief actions. As put by one community leader from Dwarzack: “It is always the same: NGOs work on sensitisation, and then we all chip in disaster relief, distributing food or whatever available among those most affected, but there is very little in between.”

Iterated discussions of the wheel facilitated an understanding of why certain actions are repeated despite implicit knowledge that little will change or that they will not be sustained beyond the life of a project. They also offer key entry points to discussing how to move towards more strategic and coordinated actions in a relational way. By discussing what could be done differently, how and with whom, the wheel works as a map of practices and allows visioning alternative options and what they would entail.

- **Community-led mapping** interacts and builds upon the previous methods to produce geo-referenced information and build a risk profile of each settlement through transect walks, observation and collective discussions. Participants were trained in manual and electronic documenting of risks, using survey manuals and open source mobile phone applications such as Rambler and Survey 123. In Freetown, mapping was done at the settlement level, but it is also possible at the household-level if a more detailed analysis, is required. The information was fed into ReMapRisk Freetown, a tool to document and monitor how risk accumulation cycles materialise over time, where and why. This is done by feeding spatial and temporal details into a database in which all information collected is georeferenced.

The database stores information about hazards, vulnerability and capacity to act and enables its visualisation through maps. Information considered confidential by the communities was excluded. The information gathered concerns: (a) specific disaster events of varying magnitude and their impact; (b) a

The public interface of ReMapRisk allows users to explore the relative intensity or frequency of hazards occurring in one or all surveyed settlements. Users can also explore why certain areas are more vulnerable to specific hazards than others

vulnerability assessment that allows for a disaggregated understanding of who is most vulnerable, where and why; and (c) an assessment of local capacity to act, not only through isolated individual and community responses but also in relation to others (e.g. municipal authorities, religious organisations and external support agencies). In short video clips local dwellers reflect on their experience of recurrent hazards and on the effectiveness of responses implemented over time.

The public interface of ReMapRisk allows users to explore the relative intensity or frequency of hazards occurring in one or all surveyed settlements.



In Freetown, mapping was done at the settlement level

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Users can also explore why certain areas are more vulnerable to specific hazards than others. ReMapRisk further enables interactive assessment of the capacity to act of local residents, authorities and support organisations in terms of particular hazards and vulnerabilities. The data reveals the type of interventions implemented to reduce risk threats and the spatial distribution, density and types of interventions that exist in either a particular settlement or across the whole city.

Settlements have different risk response capacities. A major capacity determinant is the presence of community governance structures. When such structures are in place and functioning, residents are more likely to support collective action. However, residents are wary of openly discussing risk with external agencies because that may increase eviction threats. The politics of using risk to justify eviction contributes to uncertainty and undermines individual, collective and collaborative actions to address cumulative risks. This conspires to further increase residents' vulnerability.

Building upon ReMapRisk, all surveyed settlements have developed specific action plans to tackle risk accumulation. The platform offers a means to visualise and track changes over time, as well as promote further collaboration with external audiences. Four settlements are now engaged in a pilot planning process to redefine and update the city's structure plan.

Concluding remarks

The above findings and policy pointers are based on a co-learning process that has been developed through the articulated application of different participatory methods. The emphasis has been on generating a process-driven understanding of the slow-burn stresses that lead to intractable risk traps. Not only are the impacts of these traps disproportionately felt in specific localities, but responses are often highly localised, burdening those most affected. Yet, risk accumulation cycles refer us to historical wider processes of uneven and maladaptive development at the city level. We advocate for a generative and grounded way of understanding risk urbanisation by the communities who most experience risk accumulation. The ultimate aim is to understand urban risk-landscapes from within, supporting anticipatory and structural action in a relational way.

Chapter 8

Applying multiple methods to understand and address urban risk

By David Dodman, Hayley Leck and Faith Taylor

Policy pointers

- The range of hazards that inhabitants of African towns and cities face can be described as a 'spectrum of risk'. Such hazards require a 'spectrum of methods' to understand them.
- Multidisciplinary research and multifaceted interventions are central to reducing urban risk.





The inhabitants of African towns and cities are at risk from events that can cause impoverishment, illness, injury or death. The range of hazards they face can be described as a spectrum of risk. Yet despite the rapidly growing number of African urban dwellers, the extent and relative severity of these risks, and how they are often interrelated, are poorly understood. A multi-country research programme has shown that using a spectrum of methods is an effective way to better understand urban risk and is an essential tool in breaking cycles of risk accumulation.

Most sub-Saharan African towns and cities are risky places. Dense concentrations of people and economic activity, high levels of water and air pollution, inadequate provision of basic services and insufficient risk-reducing infrastructure have resulted in high incidences of physical injury, serious illness, reduced productivity and loss of life. The risks, whether from disasters or from disease, tend to disproportionately affect low-income groups.

Urban Africa Risk Knowledge (Urban ARK) - a wide-ranging multi-country programme of research - has applied a 'spectrum of methods' to understand this 'spectrum of risks' across urban sub-Saharan Africa. Applying this approach helps in understanding and addressing the events and processes that affect health, disrupt lives and livelihoods, prevent some people from escaping from poverty and cause other vulnerable individuals to slip back into poverty.

The spectrum of urban risk

Residents of urban centres, and of low-income neighbourhoods in particular, face a range of risks. This spectrum of risk can be understood as 'all the potential and likely causes of events resulting in premature death, illness, injury or impoverishment' (Satterthwaite and Bartlett, 2017). While for many years, studies of disaster risk focused primarily on large, single-hazard disasters that caused substantial damage to property or loss of life, there has been growing recognition of what is termed 'extensive risk.' This is associated with the 'dispersed and recurrent occurrence of small- and medium-scale impact misfortunes' (Lavell and Maskrey, 2014). Cumulatively, these can severely erode coping capacities and livelihood strategies.

Direct engagement with residents of low-income urban communities frequently reveals the many factors that cause losses, damage to property, injury, ill health or even death. It can also shed light on the underlying drivers of susceptibility to harm in the multi-hazard environments of everyday life.

At one end of the spectrum of risk are the everyday health risks faced by residents of low-income and informal settlements. Most informal settlements are unhealthy places with especially high risks of infections and injury, notably so for children. At the other end of the risk range are large urban disasters, such as Hurricane Katrina in New Orleans (2005) and the earthquake in Port au Prince (2010). Falling somewhere in between are intermittent calamities

Box 1. Why is it important to understand risk in urban centres in sub-Saharan Africa?

Understanding and reducing risk in urban centres in sub-Saharan Africa (SSA) is relevant for several reasons:

- Most towns and cities in SSA are growing rapidly. Between 1950 and 2000, the overall urban population of SSA grew from 20 to 197 million; in 2015 it reached 360 million and it is projected to amount to 1.1 billion by 2050. Although the smaller urban centres (<1 million inhabitants) are among the fastest growing, risk research has overwhelmingly focused on the largest cities. The need for reducing urban risk is acknowledged and embedded in the goals of the Sendai Framework for Disaster Risk Reduction, UN Habitat's New Urban Agenda and the Sustainable Development Goals.
- The growth in urban populations is neither matched by an equivalent increase in urban governments' resources and capacities, nor by an equally expanded supply of well-located, adequately serviced and affordable land and housing for low-income groups. Rather, in this governance and supply void, many low-income urban dwellers revert to informal settlements. Of course, not all such settlements are equally risky – and the inhabitants of some formal settlement areas can also be exposed to unacceptably high levels of risk – but such deprivations both create risks and reduce the ability of people to cope with them.
- Urban growth is taking place alongside climate change and other pressing challenges such as the threat of newly-emerging diseases. There is significant opportunity and potential for resilience building and addressing disaster risk before it arises, especially in urban centres and in urban informal settlements where much innovation and creativity is centred.

such as floods, fires and temperature extremes that, yet again, disproportionately affect low-income and informal settlement inhabitants. Yet most of these are ignored beyond (or even by) local media outlets.

Addressing the information deficit

Generating comprehensive, itemised, and socially and spatially disaggregated information on the full spectrum of risk requires complete and detailed

reports of all events that result in premature death, serious illness or injury, loss of or damage to assets (including housing), and loss of livelihoods. Yet many of the records that could provide such information are absent or incomplete for many SSA cities.

The approach taken to research throughout the Urban ARK project was deliberately open and iterative rather than narrowly defined and restrictive. This ensured that the most appropriate approaches – using available data, presence of local expertise and identified need from policy actors – were used in each location. A major focus has been on engagement with city stakeholders and supporting demand-driven approaches to evidence for generating and identifying policy priorities.

Documentary and institutional analysis

Despite widespread data deficiencies, documentary analysis can be a useful source of information on the spectrum of risk in African cities. While this is seldom as straightforward as analysing readily available datasets, there are certain readily-available sources and others that can be accessed and analysed. The Demographic and Health Survey (DHS), for instance, is a large-sample survey undertaken on a regular basis (typically every five years) to provide data on population, health, and nutrition.

One of the most comprehensive datasets for understanding extensive risk is generated by DesInventar (www.desinventar.net), an online database on disasters, based on pre-existing official data, academic records, newspaper sources and institutional reports. An analysis of DesInventar data on Dakar, Freetown, Kampala, Nairobi and Niamey (Osuteye, Johnson and Brown, 2016) suggests that the major losses in urban disasters in these cities came from flooding, epidemics, fires and traffic accidents and, to a smaller extent, building collapse, industrial disasters, drowning and storms. In terms of houses destroyed or damaged, flooding is by far the leading cause, although fires and storms also instigate considerable losses.

Other sources of data can be accessed to complement the picture of the drivers of risk. These include records from hospitals, reports on traffic accidents and fires. The research in Karonga Town included one year of archived inpatient records of Karonga District Hospital to assess the relative importance of different environmental health problems - from poor water and sanitation to

seasonal floods and drought, and large-scale disaster events (Manda and Wanda, 2017).

Community data: surveys and participatory approaches

Various data collections can be used to build an understanding of risk in low-income urban neighbourhoods (see Box 2).

Household surveys to assess risk can draw on existing methodological approaches or develop new ones. Boubacar et al. (2017) modified the Household Economy Approach (HEA) – a tool routinely used to monitor household-level vulnerability to food security shocks in rural sub-Saharan Africa – to

One of the most comprehensive datasets for understanding extensive risk is generated by DesInventar, an online database on disasters, based on pre-existing official data, academic records, newspaper sources and institutional reports

assess the absorptive capacity of residents in flood-prone neighbourhoods in Niamey, Niger (Boubacar, Pelling and Barcena, 2017). More participatory and ethnographic approaches, such as participatory mapping and transect walks, can also be used. If applied appropriately, these methodologies can go beyond recording perceptions of risk to help bring local risk to policymakers' attention.

While some of these approaches may provide detailed insight into very specific and complex risk situations, they can also, by their sheer detailed focus, render themselves less useful for further and comparative analysis.

Observational tools and remotely sourced data

Technological advances have made it easy to record different types of data, at low cost, on portable equipment. This includes logging the locations of particular hazards and recording accurate data on

Box 2. Open source mapping for risk reduction

In addition to local knowledge, academia worldwide can also contribute to the generation of data useful for understanding exposure to natural hazards. An Urban ARK 'mapathon', (mapping marathon) organised by KCL Humanitarian Mappers in London in March 2016, aimed to enrich the globally crowdsourced OpenStreetMap spatial dataset for the town of Karonga. Before the mapathon, 75 buildings and 243 km of roads were mapped. After the mapathon (and during the following weeks when the task was available online for the global community to contribute to) 29,030 buildings and 1,347 km of road were mapped, with the data being freely available for download. Since the mapping is done using recent aerial imagery, the resulting map presents an objective view of the spatial distribution of formal and informal housing and roads across the area from which exposure to hazards, such as floods and earthquakes, can be better understood through the overlaying of hazard maps and infrastructure maps.

air and water pollution. The use of this type of data in research in Dakar (Senegal), Mombasa and Nairobi (Kenya) has helped identify linkages between self-reported health conditions and exposure to poor solid waste management. At the same time, biomedical sampling around the municipal waste dump site in Dandora, Nairobi, showed infections, injuries, accidents and chronic and mental illnesses associated with exposure to solid waste among landfill workers (APHRC, 2017).

Remote sensing techniques can be useful when there is data paucity, since it allows for first approximations to develop 'good enough' models. For several cities, remote sensing provided a coarse overview of urban infrastructure (e.g. roads, water, communications, electricity) and the zoning of the city into different parcels ('urban textures'). Overlaying these urban texture maps with coarse hazard event maps provides insights into how different parts of the city are likely to be affected by the same event, and how people, goods, and hazardous processes might flow between these zones during a hazard event.

Providing climate information for cities requires using different types of data from multiple sources.

Climate data, for instance, has been used to develop climate profiles and narratives for various Urban ARK case study cities and to facilitate effective communication of complex climate information to improve data use and stakeholder engagement. But this information needs to be complemented by qualitative studies that look at such matters as the impact of heat stress in informal settlements.

Conclusion

Addressing the spectrum of urban risk requires innovation in methodological approaches; notably the use of a diverse set of methods (quantitative and qualitative, deductive and inductive) to capture and support better information towards risk-reduction interventions in integrated ways. Adopting a mixed method approach helps to bridge technical, historical, social, health, and other perspectives and data.

Several key conclusions can be drawn:

- Data collection methods are particularly useful where they are locally informed. The approaches described above recognise the specific challenges posed by urbanisation in Africa, and how urbanisation contributes to risk. They help identify data collection methods that can be applied in low-income neighbourhoods and/or high-risk settlements.
- Effective research on the spectrum of urban risk requires close partnerships among researchers, community organisations, municipal authorities and other research users – not just to provide the type of information that is assumed to be useful, but also to cooperate closely in identifying data that will be useful for policy and strategy formulation.
- There is a need for greater inter-urban and intra-urban perspectives that identify and address risk differentials between and within urban centres of different sizes and in different geographic situations that can inform urban and regional approaches to planning and risk reduction. Individually, the methods address an important, yet partial, range of the spectrum of risk. But in joined-up approaches they have the potential to address many of the major risks in urban centres.

Chapter 9

Community-based disaster risk reduction and climate change adaptation: findings across the city studies

By David Satterthwaite

Policy pointers

- Community-based organisations set up by informal settlement dwellers can contribute much to disaster risk reduction, but their efforts can only scale if they work with the local government.
- Where local government lacks the capacity and resources to address its responsibility of providing risk-reducing infrastructure and services, it still has a key role to play in authorising and encouraging community action, particularly in informal settlements.
- National federations of slum/shack dwellers can contribute to filling in data gaps on the full spectrum of risk in informal settlements, from everyday, to small and large disaster risks.
- Attention to documenting and acting on everyday, small and large disaster risks provides a foundation for climate change adaptation, taking into consideration how climate change impacts are changing, or will change the risk spectrum.

Research after the floods in Niamey showed stark differences in the times residents were away from their homes dependent on their degree of resilience
© Gustave Deghilage





Community-based organisation and action can contribute greatly to disaster risk reduction and, by extension, build resilience to the impacts of climate change. However, as city case studies from the Urban Africa Risk Knowledge (Urban ARK) programme show, community action needs to be oriented more towards working with local governments, rather than attempt to fill the gap of local government inaction. This is the case even when a local government lacks the capacity to act, since it can still encourage and legitimise (or refrain from constraining and repressing) community-based action. The city studies also show how attention to the full spectrum of risks can highlight interactions between risk reduction from everyday, small and large disasters. In addition, community-led data collection on conditions in informal settlements can inform and strengthen community-local government partnerships for risk reduction.

Fundamental change in responding to disasters, which includes a strong focus on disaster risk reduction, has largely been driven by risk assessments in urban centres in Latin America. It has also greatly been influenced by the development and application of the DesInventar methodology (see <http://www.desinventar.net/methodology.html>), which made the recording of disasters more comprehensive. Many city governments have reoriented their approaches, plans and investments accordingly.

This change in methodology has also been influential in other regions, as shown by the application of DesInventar in Ibadan (Adelekan, 2017). However, the Ibadan local government, as in the other Urban ARK case study cities in Africa, has little capacity and funding for disaster risk reduction and less capacity to act than Latin American cities. There are huge gaps in the provision of infrastructure and services that underpin disaster risk reduction and climate change adaptation, and which are the responsibility of local government. Even though Ibadan is an important and rapidly growing city, its various local governments are seriously constrained by inadequate funding from the state and federal government – as seen in the dramatic fall in funding for social services, the rapid increase in debt or the non-payment of civil servants' salaries. Here, the greatest driver of risk, whether of disasters or the outcomes of everyday risk, is the inability of many local African governments to meet their responsibilities, as shown by the case of Karonga and other Urban ARK city case studies (Manda and Wanda, 2017).

When a local government lacks the capacity to act on risk, individuals, households and communities are forced to fill the governance gap, notably for services such as water provision and home treatment and disposing of household and toilet waste. Households are also often left with the responsibility of ensuring that their residences are resilient to extreme weather events and accidental fires, or of organising their own security schemes to protect their homes and other assets. However, praising community organisations for their 'resilience' can also be used to deflect criticisms of local government inaction (Kaika, 2017).

— Reducing risk in low-income communities

Research after the 2015 floods in Niamey assessed the resilience of 300 low-income households living in a range of flood-prone neighbourhoods. Hazard

exposure was similar across the different locations, with six to eight days of flooding. However, there were stark differences in the number of days household members lived outside their dwelling because flooding had rendered their homes uninhabitable. For the moderate and high resilience categories, no relocation was reported. For the very low and low-resilience groups, the average time spent away from home was 15 and 19 days, respectively.

Household interviews indicated that strong relationships had been built between at-risk households and local organisations (neighbourhood associations and mosques). This included giving and receiving support during shock events such as floods. However, there were lower rates of this social resilience component in the post-flooding period. Many households reported being resigned to flooding and have no strategies to address these shocks. A need was therefore identified for local authorities to take measures to engage with, and support, low-income households at risk (Boubacar *et al.*, 2017).

There is generally a lack of data and other evidence to inform government action in sub-Saharan cities on disasters and other risks. In cities where 'small disasters' have been documented, the scale and range of local government inaction has become apparent, as is illustrated by the case studies of Ibadan and Karonga (Adelekan, 2017). Local governments have the responsibility, among others, of maintaining city-wide drainage that guides away small and large amounts of flood-water. They should also ensure that affordable and safe housing plots are available to avoid settlement on slopes at risk of landslides or plots that are located in watersheds.

Other responsibilities include implementing building codes that take account of disaster risks (i.e. setting construction standards that, if applied, would prevent damage or destruction by earthquakes or extreme weather events), disaster resilient systems for water, sanitation and solid waste services, and also health care and adequate emergency responses in the case of fires and floods. They are further expected to provide traffic management to reduce accidents, introduce advance warning systems to inform all inhabitants of approaching disaster events (e.g. extreme winds, heatwaves) and respond appropriately to such events. But local government action must go beyond just legislation and policies. In Nairobi, for example, there is no shortage of policies on solid waste

Community profiling and mapping is not only important for identifying and acting on disaster risk, but is also useful for filling a large data gap at the local government level. There are now over 12 national federations of slum/shack dwellers in sub-Saharan Africa

management, but there is a marked deterioration in waste collection (Haregu *et al.*, 2017).

Community-led action

Community organisations can play an important role in risk reduction in informal settlements, especially where local government action falls short in infrastructure, services and land use management. However, to what extent can community organisation and action replace local government action on disaster risk reduction? In taking on these tasks, do community organisations risk absolving local governments of their responsibilities?

The Urban ARK case studies include examples of community-based organisation and action in Nairobi, such as the Kenyan slum dwellers' federation, *Muungano Wa Wanavijiji*, which maps and profiles informal settlements and manages a successful resettlement programme for people living close to railway tracks (Mitra *et al.*, 2017). A case study in Freetown describes the work of various community organisations and structures. It shows why the existence of community governance structures is a major component of disaster risk reduction capacity. When these structures are functioning well, residents are more likely to be organised into committees and trained. Moreover, the research has indicated that very effective responses occur under joint initiatives by residents and the city council or other public agencies, as is evident from the Cockle Bay case study (Allen *et al.*, 2017).

There are many examples of effective autonomous action by community organisations in informal settlements where the local government lacked capacity, including successful cases of household- and community-level coping and adaptation (Stephens, Patnaik and Lewin, 1996). However, community organisations work locally and cannot put in place city-wide systems of risk reduction. They can neither build the trunk infrastructure (e.g. piped

water, sewers, drains, and all-weather roads), nor reduce the risks of flood on watersheds. Policies that promote interventions at an individual level are equally unable to respond to the underlying structural causes of risk cycles (Mitra *et al.*, 2017). In addition, autonomous adaptation tends to divert risks to people in other locations, such as improved drains to decrease flood risks but which discharge into neighbourhoods downstream.

Therefore, most of the reduction of everyday and disaster risk in urban areas is not possible if local governments fail to meet their responsibilities. Inaction by urban governments, especially failure to address the underlying causes, is the single-most important factor in determining most life- and health-threatening risks. This is often further underpinned by lack of support from higher levels of government and international agencies. The assessment of solid waste management practices in Nairobi and Mombasa, for instance, points to complex and difficult governance issues, including the need for a stronger institutional capacity to enforce regulatory frameworks, besides action to address patronage, corruption and criminal cartels (Haregu *et al.*, 2017).

Drawing on risk data collected by grassroots organisations

Research in each of the case study cities included space for low-income households, community organisations and other civil society groups to contribute to risk documentation. This comprised setting priorities for action through focus group discussions, participatory mapping and interviews with community leaders.

Community profiling and mapping is not only important for identifying and acting on disaster risk, but is also useful for filling a large data gap at the local government level. There are now over 12 national federations of slum/shack dwellers in sub-Saharan Africa – including Kenya, Malawi, Nigeria, Sierra Leone and Tanzania – where Urban ARK

teams are at work. These are federations of savings groups set up and managed by the inhabitants of informal settlements, with most savers and savings group managers being women. Among the methods used by such federations to engage the state is the preparation of detailed profiles and maps of urban informal settlements. Prior to this, local governments had little, if any data, or maps of these settlements (see <http://knowyourcity.info>).

The profiles include reports from informal settlement residents on their everyday and disaster risks, as well as detailed maps with boundaries and GPS coordinates. If local governments agree to support upgrading, then more detailed enumeration (in effect a census) is undertaken in each informal settlement to collect data for each household and plot. Since all data are collected by community members, the information can be fed back to the residents to stimulate and support their formulation of plans and priorities. This type of community-driven data collection has been a key factor underpinning the resettlement programme in Nairobi.

The informal settlement profiles and community-driven censuses contain a lot of detail on the risks reported by the residents, including risks due to inadequate water, sanitation, solid waste collection, health care and emergency services. Data has also been collected on disasters and on inhabitants' perception of the most serious risks they face. Since the same set of questions is used for each survey, the information can further be used for city comparisons

— Avoiding forced eviction

From the perspective of many low-income communities, the greatest disaster risk is forced eviction without consultation, without provision of alternative accommodation and without warning. Recent reports from Lagos give a powerful example of forced evictions, both in their scale and in the community responses (see www.justempower.org). Here too, the nature of the relationship between residents of informal settlements and the local government is key. Many slum/shack dweller federations in sub-Saharan Africa and elsewhere were established partly to resist evictions, and partly to develop better relations with local governments to help avoid evictions. If the eviction cannot not

be avoided, public authorities should engage with residents on how to make resettlement plans serve their needs (Haregu *et al.*, 2017)

It must be understood, however, that not all forced evictions, calamitous as they may be to those affected, are illegal actions by the public authorities. There may be pressing reasons for local authorities to demand clearance of an area 'for the public good' or 'in the public interest.' In such cases, those affected should receive adequate warning, be offered compensation and/or a resettlement option. This is in contrast to 'evictions contrary to the law,' where evictions do not follow proper procedure.

Governments may also justify and implement forced eviction as part of their disaster risk reduction or climate change adaptation policies. The justification for this can be a formal designation of the area as risk prone (mainly due to floods and disease outbreaks) or earmarked for important new urban functions. In Freetown, the residents of informal settlements have long been faced with persistent (annual) threats of eviction, since they had settled on areas of land subject to annual flooding and designated by the local authorities as ecological conservation areas. The case study on Freetown shows how such threats and uncertainty undermine both collective community action to address the known risks, and residents' individual investment in housing, which further increases the risks. The eviction threat made residents wary of discussing risk openly with external agencies, as that could increase the threat of eviction (Mitra *et al.*, 2017).

Community-driven informal settlement profiles are an important means in preventing eviction. Besides providing information on land tenure, eviction threats and disaster risks, such profiles can provide detailed data on livelihoods and business activity to demonstrate the economic importance of informal settlements to the city and the consequential costs to the city if they were to be bulldozed

— Conclusion

In most urban contexts, one key role of community organisation and action on risk reduction is to gain local government engagement and support. This calls for more collective and participatory efforts that take on board local knowledge and the resources of both ordinary citizens and public actors.

Chapter 10

Inserting rights and justice into urban resilience in the South

By Gina Ziervogel, Mark Pelling, Anton Cartwright, Erik Chu, Tanvi Deshpande, Leila Harris, Keith Hyams, Jean Kaunda, Benjamin Klaus, Kavya Michael, Lorena Pasquini, Robyn Pharoah, Lucy Rodina, Dianne Scott and Patricia Zweig

Policy pointers

- Urban resilience can play a central role in progressive development if approached from a perspective of the rights of citizens.
- Opportunities must be created for 'negotiated resilience' that focuses on resilience processes rather than resilience outcomes.
- Resilience responses are more likely to be successful if they integrate local processes, knowledge and norms.
- More African contributions are needed to help reimagine the role that African cities can play in global financial, political and scientific processes.





The concept of resilience is receiving wide attention and is gaining policy traction globally. Since much of the resilience agenda has been shaped by policies and discourses from the global North, its actual applicability in cities of the global South, particularly in Africa, has not been sufficiently assessed or taken into consideration. Urban residents in many African cities daily face significant risks. Making the rights of urban citizens resilient, rather than a focus on the resilience of physical and ecological infrastructures, could help address many of the root causes of the risks. Negotiated and endogenous forms of resilience are key to bringing the emphasis back to people and processes, and in order to focus on rights and lived realities.

The concept of resilience is increasingly informing the policy agenda of urban risk management in the global South. In the past, the focus has mostly been on ensuring the resilience of infrastructures. Hard infrastructure, technical engineering and ecosystem services continue to play a critical role in building pathways to resilience today. This chapter aims at reconceptualising the aims of resilience building, seeking more emphasis on urban citizens' rights and justice than on resilience infrastructure. This approach draws on theories that consider justice to include: a) the fair distribution of social and material advantages; b) meaningful participation by all those affected in decision-making processes; c) acknowledgement of social, cultural and political differences; and d) the right to provision of minimum levels of capabilities and opportunities to achieve livelihood and wellbeing goals (Young, 1990; Sen, 1990; Rawls, 1971).

This chapter deliberately focuses on the global South, because the failings of everyday development are most real there and because of the high degree of urban inequality and threats to social and ecological resilience. As a result, impoverished urban population strata are increasingly vulnerable to everyday stresses and even less able to deal with the (more rare) extreme events.

In this chapter key consideration is given to resilience, rights, entitlements and risk management in urban areas (Lawhorn *et al.*, 2014). The entry points for considering the logic and utility of a justice orientation to resilience include: a) finance; b) decision-making; c) scale; and d) global systems because that would encourage a critical consideration of hazardous events. This chapter is informed by the lived realities and conceptual innovations of urban contexts.

The urban resilience agenda

Policy narratives on urban resilience tend to focus on expert-driven inputs, such as engineering-based understandings, and on externally defined pathways to development (MacKinnon and Derickson, 2012). The global urban policy narrative also assumes that planning processes are both relevant and inclusive, regardless of the actual decision-making norms or capacities that exist or are lacking at the city level. Despite this criticism, the resilience agenda has been endorsed by global frameworks like the

Sustainable Development Goals (SDGs) and Northern development agencies' programmes such as, for example, the Rockefeller Foundation's 100 Resilient Cities project.

While recognising that multiple actors play a part, local authorities have the primary responsibility for delivering urban resilience. However, contemporary resilience planning often shifts the responsibility to individuals and 'at risk' households. This forces urban citizens to cope with, rather than resolve the social structures, legal arrangements and administrative practices that inequitably distribute vulnerability and risk. The voices of urban residents and their capacity to contribute are often missing from resilience building, with clear implications for procedural justice. The mention of resilience alongside 'wellbeing' and 'poverty alleviation' in the SDGs puts emphasis on the need to deliver urban resilience through governance. But there is little guidance on how financial systems, decision-making or information systems can support this policy agenda.

Questioning resilience

While the resilience agenda now receives considerable global attention, it is not without its critics. Criticism notably focuses on the ambiguity of the term 'resilience.' Indeed, its uncertain nature leaves the concept vulnerable to vested interests' interpretations, while it does not account for the political structures of decision-making in the local context. Nonetheless, increasing references to resilience in visioning documents, and in the urban planning discourse, make the concept important to engage with.

Resilience holds value because its strategies are often both multi-scalar and system-oriented. That methodology is more useful for addressing complex, everyday stressors in socio-ecological contexts than the more restrictive approaches that tend to dominate today's urban adaptation and planning (De Sherbinin *et al.*, 2007; Carter *et al.*, 2015).

Rights and justice in the context of resilience

'Rights' and 'justice' are contested terms too. They have intrinsic value, meaning that they are valuable in themselves, as well as instrumental value, in that they hold significance as a way to achieve further goals. Their instrumental value is central to resilience

because it implies that having a right- or justice-based entitlement increases the formal or informal social protection afforded to the rights bearer.

This chapter assumes that people have a basic right to core entitlements, such as personal safety, good health, access to safe water and sanitation, shelter, energy, transport and communications, food and education (Sultana and Loftus, 2012). Entitlements are understood as the bundles of commodities or services that people can access in society, including all of their rights and

The resilience agenda endeavours to help cities prepare themselves, both for catastrophic events that can overwhelm existing systems and for everyday risk

opportunities (Sen, 1984). In terms of justice, some theories emphasise the importance of recognising (and treating) everyone as equal within a society, while others focus on the importance of fair distribution of benefits.

The resilience agenda endeavours to help cities prepare themselves, both for catastrophic events that can overwhelm existing systems and for everyday risk. There are persistent shortfalls in administrative, organisational, budgetary and human resource agendas in many cities in the South, that undermine peoples' rights and entitlements and that cause increased vulnerability to shocks (Neumayer and Plumper, 2007). The challenges, but also the opportunities, of resilience framing are to bring together systemic protection and processes that deliver on basic needs, while managing and planning for extreme events.

Making the investments and procedures through which progressive rights claims can be honoured can ensure that resilience becomes a central component of pro-poor and progressive development. This is important, because the degree to which communities are resilient to both everyday accidents and extreme events is related to the distribution of employment opportunities, infrastructure, adequate housing and other needs. In African cities, the number of people living in informal settlements

and lacking risk-reducing infrastructure is growing, generating further inequality (Ezeh *et al.*, 2016).

For resilience to play a central role in progressive development, it is necessary to:

- Develop a rights- and justice-based approach to vulnerability, based on plausible (even if contested) views;
- Identify the underlying causes of poor alignment of rights and justice, on the one hand, and peoples' actual lived entitlements on the other; and
- Understand how a resilience approach to governance, combined with focused rights- and justice-based empowerment of vulnerable communities, can encourage the safeguarding of entitlements in the face of such everyday challenges as violence and disease.

To this end, four entry points for inserting rights and justice into urban resilience are proposed:

1. Move away from a mere financial perspective of risk.

To really understand risk and its place in urban governance, analyses should engage a broad set of stakeholders. However, the risk discourse tends to mostly focus on financial analyses and asset insurance considerations that merely consider economic losses resulting from everyday mishaps or disasters of all scales. The broader impacts on humans, and the often critical losses suffered by poorer households, whether through everyday mishaps or larger events, are often overlooked (Vatn and Bromley, 1994; Hallegatte *et al.*, 2017). A justice focus would reorient urban governance towards identifying which types of risk are to be prioritised and mitigated, and what outcomes ought to be avoided.

The emerging resilience discourse provides an opportunity to improve on the current financial risk analyses by furthering the understanding of the underlying, structural causes and the trade-offs associated with addressing risk from a financial perspective. Resilience approaches would benefit from:

- Understanding the drivers of global capital investments, to find ways to reallocate these towards poverty-alleviating public goods;

- Engaging the social justice perspective and identifying what currently influences urban governance;
- Reorienting investments to ensure that justice-based concerns are incorporated in risks-related decisions;
- Understanding which political and economic relationships shaping urban governance have not been fully considered; and
- Establishing a broader set of decision-making criteria to ensure that negative externalities are addressed and that actions generating positive externalities are prioritised.

2. Create opportunities for negotiated resilience

The concept of negotiated resilience does not predefine what resilience should look like. Instead, it implies a process and an arena in which diverse interests can be discussed and their interests, values and experiences negotiated to define the concept (Harris *et al.*, 2017). Importantly, the process of negotiating resilience involves contestation, deliberation of trade-offs, prioritisation of interests and critical evaluation and redistribution of gains and losses. It is an iterative process that requires ongoing support for meaningful and equitable participation. Negotiated resilience has the potential to harness the rights and justice aspects of resilience - for whom, to what, where, when and why (Meerow and Newell, 2016). It further has a potential to insert equity, accountability and justice into resilience planning and interventions that would otherwise be technocentric and capital-driven (Anguelovski *et al.*, 2016).

3. Strengthen endogenous forms of resilience

It is important to ground resilience in the urban realities. African cities often have low governance capacity, high levels of informality and combinations of planned and unplanned urbanisation in low economic development environments. Although achieving resilience in African cities has many challenges, there are countless locally embedded sources of resilience. A mix of formal and informal networks often exists alongside diverse knowledge practices, presenting an opportunity to build resilience from the bottom up (Myers, 2011; Pieterse, 2008; Taylor and Peter, 2014). Resilience building should be careful to avoid

imposing externally defined pathways and approaches. Rather, it should first explore communities' own, embedded resilience and capacity to adapt to risk.

4. Place urban resilience within global systems

While endogenous resilience is important, African cities are nested within global, regional and local political and financial systems. Nonetheless, they have common characteristics that set them apart. Notably, they share a history of late decolonisation and they hold a peripheral place in world systems. This has created an urban political economy unique to Africa (Ernstson *et al.*, 2014). Many African cities, compared to cities elsewhere, have a lesser ability to influence the global system. Recent solutions to building resilience have relied on green consumption, the growth of capital markets and other financial solutions that often represent symptomatic approaches to vulnerability and that do not attempt to understand the structural causes of vulnerability. Local priorities, complexities and contestations must be recognised if the African cycle of economic dependency, ineffective political regimes and embedded unsustainable development is to be broken. Inserting rights and justice into

Many African cities, compared to cities elsewhere, have a lesser ability to influence the global system

resilience offers a foundation for better addressing these challenges, by seeking to change administrative structures, visions and on-the-ground investments, while reimagining Africa's role in the global system.

— Conclusion

Given that the concept of resilience is now more widely used and gaining policy traction, this chapter underlines the need to continue critical engagement with it. A resilience framing can support pro-poor development if rights and justice are inserted into the thinking and urban governance policy. The experience of Southern cities, particularly African cities, must be central to the debate about the concept of resilience. With a focus on rights and justice, the everyday risks experienced by growing numbers of urban residents will not be forgotten.

Chapter 11

Assessing health risks in informal settlements in sub-Saharan African cities

By David Satterthwaite

Policy pointers

- The scale of premature death, serious illness and injury in sub-Saharan African cities goes largely unnoticed due to a lack of health and disaster-related injury data.
- Data shortfalls are particularly acute for those living in informal settlements, but detailed data systems such as censuses, vital registration systems and disaster records are critical to inform future interventions.
- Additional research is needed to address the limited available data on health and other risks, including community-led data collection in informal settlements.
- Multi-sectoral interventions by local governments and communities are needed to address the overlapping health risks in informal settlements.

Those living in informal settlements lack the infrastructure on which good health depends: here shacks in a South African township use solar panels to overcome the lack of mains electricity
© Mrnovel





Around half of the urban population in sub-Saharan Africa lives in informal settlements and lacks the basic infrastructure and services on which good health depends. These include safe water regularly piped into homes, good quality sanitation, drains and solid waste collection, electricity, healthcare and emergency services. However, there is very little data available on health problems at the neighbourhood and city scales, which is required to guide action in African cities. Improving official data collection (such as censuses, vital registration systems and healthcare records) will be necessary to address the health risks in informal settlements. In addition, city-based studies of risks and their implications for health can generate data on the most serious health risks facing residents of informal settlements.

The combination of rapid expansion of African cities and unresponsive local governance is generating complex urban risk profiles and the impacts upon health in informal settlements remain particularly poorly understood. Africa has the world's highest share of urban population living in informal settlements. 'Informal settlement' refers to areas outside of official land registration, building codes, and/or planning legislation. In 2014, nearly 56 per cent of Africa's urban dwellers lived in informal settlements, compared to just 30 per cent for the global South overall (UN-Habitat, 2016). In 2015, only 11 per cent of Africa's urban population had toilets with sewer connections and less than half had good quality water provision (WHO and UNICEF, 2017). Many African informal settlements are also highly vulnerable to the impacts of climate change, which may exacerbate ill health and poverty in these areas (Manda and Wanda, 2017).

— A need for neighbourhood-level data on informal settlements

Local governments need detailed data on the health risks, health determinants and causes of death within their jurisdictions. Existing data rarely captures the health risks in informal settlements and often has the following limitations:

- Censuses collect data on housing conditions and service provision for all households (typically every decade). But most census authorities do not provide local governments with data for each ward or neighbourhood.
- Household surveys (e.g. demographic and health surveys) include detailed data on health determinants and outcomes but they cannot provide data for informal settlements (as their sampling frame is too small).
- Vital registration systems record deaths and can provide detailed data on the causes of premature deaths and where deceased residents lived. However, these systems do not function in most African cities.
- Hospital and health care records can provide data on health outcomes for each locality or informal settlement. However, these records are not usually analysed and they may not serve residents of informal settlements.

- Traffic accidents are a major cause of death and injury, but records are not available for individual districts or cities.
- Records of disaster impacts should be available to show deaths, serious injuries and loss of property, but most small-scale disasters are not included in international or national disaster records.

Urban Africa Risk Knowledge (Urban-ARK) is a three-year comparative research programme seeking to identify the range of risks in African cities and to inform the formulation of holistic responses. City case studies include research and policy engagement in Addis Ababa (Ethiopia), Dakar (Senegal), Dar es Salaam (Tanzania), Freetown (Sierra Leone), Ibadan (Nigeria), Karonga (Malawi), Mombasa and Nairobi (Kenya) and Niamey (Niger). In all these cities, researchers gathered data on health determinants, mostly at the informal settlement level and, in the case of Karonga, for the whole city. The research uncovered extremely poor provision of water, sanitation, health care and emergency services and other key health determinants in these cities' informal settlements. Some researchers compiled highly detailed disaster records too, while interviews and focus group discussions in informal settlements analysed residents' most serious health problems.

The findings consistently showed high risk across a wide spectrum of hazards, ranging from everyday risks to small and large disasters. Urban-ARK's case studies confirmed past studies' findings that the impacts of many disasters often came from events that were too small to be classified as such in disaster databases (Bull-Kamanga *et al.*, 2003). The case studies also showed how interventions must address 'everyday risks' that are distinct from disaster risk, as they are present in homes, neighbourhoods and the wider city. Everyday risks pose a constant threat. As described below, the full spectrum of risk in urban areas must encompass the full spectrum of risks from large- and small-disaster risks to everyday risks (Satterthwaite and Bartlett, 2017).

— Urban-ARK's findings on health in African cities

Taken together, the case studies underscore both the prevalence and erosive impacts upon household wellbeing of everyday risks and small disasters. Analysing the full spectrum of urban risk required

the development of innovative methodologies. Urban-ARK researchers used a diverse set of methods (quantitative and qualitative, deductive and inductive) and methodological pluralism capable of supporting holistic actions on urban risks.

In Karonga, a survey focusing on households' perception of risk showed that the most commonly identified risks were related to flooding, droughts/food insecurity and earthquakes (Manda and Wanda, 2017). However, many of the most life-threatening risks in Karonga, such as cholera, malaria, TB and acute respiratory infections, were not perceived as risks. Yet, these are leading causes of premature death.

In Karonga, a survey focusing on households' perception of risk showed that the most commonly identified risks were related to flooding, droughts/food insecurity and earthquakes

Research in Niamey's informal settlements highlighted the erosive impacts of floods on housing and health outcomes. It also explored the range of coping capacities (Boubacar *et al.*, 2017). Although all respondents experienced six to eight days of household flooding, no relocation was reported in the most resilient group. By contrast, the very low and low-resilience households averaged 15 and 19 days in another lodging, respectively. High-resilience households often coped with floods by expending their savings and taking on debt. However, these strategies can have erosive impacts because assets may be unavailable for the next shock, underscoring the long-term consequences of disasters, even for better-off households.

In Ibadan, researchers analysed newspaper reports of 'small disasters' from 2000 to 2015 (using the DesInventar methodology, see www.desinventar.net). Leading causes of mortality were vehicle accidents (34 per cent), crime (22 per cent), violence (13 per cent), fire (12 per cent) and flood (8 per cent). The study also revealed the large health impacts from a range of risks and the interlinkages between different risks, such as floods, inadequate or poorly-maintained

infrastructure, settlement in areas at high risk of flooding, and inadequate emergency responses (Adelekan, 2016).

Research in Freetown highlighted the health impacts of major floods and the 2014 Ebola epidemic, but also showed how residents of informal settlements face everyday risks (e.g. from inadequate water and sanitation) and small disaster risks, including accidental fires, landslides, and flash floods (Allen *et al.*, 2017). Many informal settlements are located on lands at risk from flooding, rock falls, landslides and building collapse. Data on Freetown's everyday risks from infectious and parasitic diseases or malnutrition is rarely available. Freetown's large disasters did receive media coverage for example, the UK's *Guardian* newspaper covered the devastating mudslide in August 2017 that underscored the interrelated risks stemming from intense rainfall, land degradation and urbanisation in hilly areas. Informal settlements in Freetown (and other African cities) often also experience elevated threats of eviction that may undermine households' investments or community collective action, increasing risks still further.

The above and other Urban-ARK research help demonstrate the large spectrum of health risks in informal settlements, ranging from everyday risks to small- and large-scale disasters. Such findings help to fill existing data gaps on health and health determinants, while also creating new methods that can create a stronger evidence base in African cities.

Future research agenda

There is an urgent need for detailed and disaggregated data on African cities' health and disaster risks, particularly for their informal settlements. Meanwhile, detailed case studies can provide the aggregated data needed to inform city-level or national interventions to improve urban health outcomes.

The data shortfalls likely hide the scale of premature death, serious illness and injury in informal settlements. Limited data can also curtail the identification of particularly vulnerable city dwellers. Data gaps on illnesses, injuries and premature deaths make it difficult to assess the scale and nature of many vulnerabilities, such as groups with high mortality rates (e.g. infants, children and mothers) or larger disease burdens (e.g. from malaria or respiratory infections).



A schoolboy with a mosquito net donated by UNICEF. The health burdens from 'invisible' risks such as malaria are harder to document than the risks from floods and physical dangers

Social science research methods (e.g. household surveys, focus group discussions, spatial analyses) can help document key health determinants and the full spectrum of risks (Dodman *et al.*, 2017). However, there may be definitional or methodological challenges in gathering such data. Local rankings of risks can be strongly influenced by understandings of what constitutes risk (e.g. whether to include infectious or parasitic diseases (Manda and Wanda, 2017)). It can also be difficult to capture 'invisible' urban risks— floods are much more visible and readily documented than the health burdens from malaria or diarrhoea. This is especially the case if data is unavailable from vital registration systems or hospital records. Finally, residents' recall of their health risks or health outcomes may not always yield reliable or detailed results (Boubacar *et al.*, 2017).

More positively, during data collection by slum/shack dweller federations, residents have gathered detailed findings on multiple risks to health and well-being in informal settlements. Affiliates of Slum/Shack Dwellers International (SDI) are active in 33 nations

throughout Africa and Asia, where they have profiled over 7,712 settlements (see <https://knowyourcity.info>). These profiles contain standardised questions on health, disaster, service provision, and other health determinants, thereby generating policy-relevant data. For instance, profiles of Kisumu's 28 informal settlements (home to nearly 221,000 people) found that 75 per cent of residents lived on dangerous sites, including flood-prone areas or near garbage dumps (Muungano Support Trust, 2014). Most residents were tenants and 83 per cent lived in temporary structures. Almost 70 per cent of the residents lacked regular water supplies. In 20 settlements, there were over 100 residents per working toilet. Regular garbage collection was almost non-existent, and only four settlements had access to fire stations.

What can be done?

Urban policymakers should engage with both the proximate and the ultimate drivers of risk. Yet Urban-ARK studies consistently highlight that local governments do not. Whether due to limited resources, lack of political will or capacity constraints, failures in local governance are often the most important determinant of ill health and premature death in informal settlements, particularly due to deficits in risk-reducing infrastructure and services.

This failure is often an outcome of national governments not supporting local governments to meet their responsibilities and failing to maintain adequate health information systems (Osuteye, Johnson and Brown, 2017). A further underlying cause lies with development assistance agencies who have usually shown little interest in supporting urban governments to provide essential infrastructure or services.

With new and additional data on urban risks and health outcomes, health officials and city planners can create multi-sectoral interventions that may reduce several risks and improve health. Moving forward, health officials and researchers should work more closely with residents, local governments and disaster response officials to address the overlapping risks in African informal settlements. Multi-pronged strategies may generate several co-benefits for health, disaster risk reduction and climate resilience in informal settlements, while fostering more responsive governance and social inclusion (Bartlett and Satterthwaite, 2016).

Chapter 12

Assessing solid waste management policies in Kenya

By Carol Gatura and Blessing Mberu

Policy pointers

- Coordination mechanisms are required for solid waste management (SWM) policymaking, implementation and evaluation.
- Enhanced capacity building among key actors in the public sector (infrastructural, financial and human resources) is crucial for successful implementation of the policies.
- Health, rather than environmental outcomes, should be at the heart of SWM policy frameworks.
- Policy interventions need to broaden from just collection, transportation and disposal to also include recycling and reuse, since these can be a source of jobs and industry.

Over half of the 1,500 tonnes of waste generated each day in Nairobi, the capital of Kenya, remains uncollected
© Nahashon Diaz | Pixabay





Kenya has developed various policy frameworks to guide its solid waste management. Previously the policy tended to focus on the environment rather than on health outcomes, while major gaps existed in both policy strategies and the implementation mechanisms. This chapter reveals that solid waste management policies in Kenya have now evolved to more specificity in terms of focus, functions and scope. The focus has shifted from criminalising offences to promoting good practices; from generic acts of parliament to specific ones; and from centralised mandates to more decentralised responsibility allocation. Explicit articulation of policy strategies and implementation mechanisms, however, still remains inadequate.

Kenya's population is growing rapidly as is its solid waste generation. The current amount of waste produced in Kenya (about four million tonnes annually) is expected to double by 2030. In the capital Nairobi, most of the 1,500 tonnes of solid waste generated daily is not well managed. It is estimated that about half of it remains uncollected.

Improper collection, transfer, treatment, recycling, resource recovery and/or disposal of solid waste have been linked to a wide range of risks, including stalled economic development, negative health outcomes, environmental degradation and adverse impacts on livelihoods.

Solid waste management in Kenya

Over recent decades, the Government of Kenya has enacted a number of policies and established legal frameworks to improve its solid waste management (SWM). It has also set up institutions and systems at different levels of governance. Nevertheless, effective and coordinated implementation of the SWM policies remains a challenge due to: a) a dominant policy focus on the environment over health outcomes; b) a lack of explicit articulation of policy strategies; and c) inadequate implementation mechanisms.

To explore the evolution of these policies, the levels of integration within and among SWM policy frameworks in Kenya were examined, particularly where they addressed health challenges among vulnerable populations in urban areas. The gaps and overlaps among key SWM policies were also reviewed. This study identified strategies that could improve synergies and maximise efficiency in the implementation of SWM policies in Kenya.

Six sources of SWM policies in Kenya were reviewed:

1. External (global and regional) policies endorsed by the country (e.g. The Declaration of the United Nations Conference on the Human Environment);
2. National laws that provide the broad provisions (e.g. The Constitution of Kenya 2014);
3. Integrated policies that address many environmental issues (e.g. The Environmental Management and Coordination Act 1999, National Environmental Policy 2013);

The evolution of SWM policy frameworks in Kenya commenced in the 1960s and, today, Kenya has approximately 77 statutes that relate to environmental concerns

4. Sector-specific acts (e.g. Public Health Act 1986, Factories Act 1987);
5. Issue-specific regulations (e.g. Water Quality Regulations 2006, Waste Management Regulation 2006); and
6. SWM (stand-alone) policies (e.g. National SWM Strategy 2014).

The main data sources for this study were national and sub-national SWM policy documents and policy reviews.

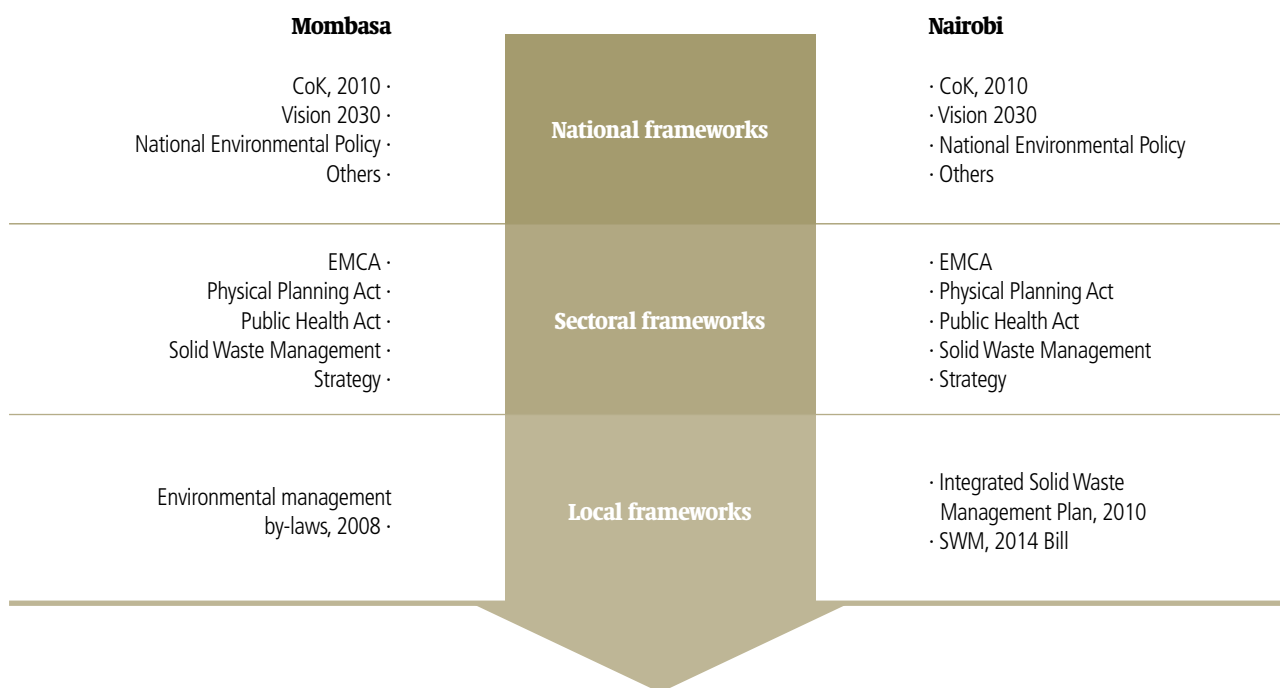
Key findings

Over the past two decades, there has been an expansion in the breadth and depth of Kenya's SWM policy frameworks. The first policy text relevant to solid waste management in Kenya was in the penal code of 1948, which made it an offence for anyone:

"... to voluntarily vitiate the atmosphere in any place, to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way; and to corrupt or foul the water of any public spring or reservoir, to render it less fit for the purpose for which it is ordinarily used."

The evolution of SWM policy frameworks in Kenya commenced in the 1960s and, today, Kenya has approximately 77 statutes that relate to environmental concerns. The Environmental Management and Coordination Act 1999 (EMCA) was enacted to provide a structured approach to environmental management in Kenya. It laid the foundation for the development of other policies and strategies relevant to the environment and health of the population. Once the EMCA was enforced, the environmental provisions within the sectoral laws were reinforced to better manage Kenya's deteriorating environment.

Figure 1
Hierarchy of SWM policy frameworks in Kenya



While national-level policy frameworks could be helpful to provide broad SWM guidance, devolution to county-level policy frameworks would demonstrate internalisation and streamlining of national policies into county-level governance and administrative systems

However, the emphasis has been on environmental issues to the detriment of health concerns. Several thematic regulations have been developed and enacted following the endorsement of EMCA, e.g. Water Quality Regulations and the Environmental Impact Assessment Regulation. Although each of these has a component relevant to SWM, protection of the environment was their primary focus. Consequently, the promotion of health and the prevention of disease did not receive direct attention in these regulations.

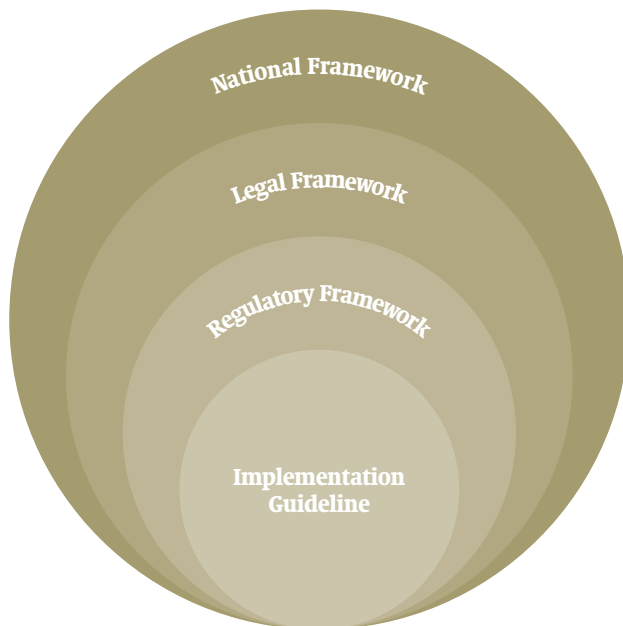
The devolution of national level SWM policy frameworks to the counties has been feeble. In Nairobi County, for example, where SWM by-laws, plans and bills are in place, their enforcement and implementation remains weak. In Mombasa County, SWM interventions rely heavily on national-level policy frameworks, albeit that a few SWM by-laws were developed several years ago. While national-level policy frameworks could be

helpful to provide broad SWM guidance, devolution to county-level policy frameworks would demonstrate internalisation and streamlining of national policies into county-level governance and administrative systems. County authorities should focus on effective implementation of local-level SWM policies.

Policy segmentation

The first form of SWM policy segmentation aimed at streamlining SWM in specific sectors through acts. For example, the Factories Act 1987 addresses the generation and disposal of waste from factories. The second form of segmentation concentrated on specific thematic issues, such as the Hazardous Substances Regulation 2007, which prescribes the safe disposal of hazardous waste. However, segmentation of SWM policies into sector-specific and issue-specific functions

Figure 2
Categories of SWM policy frameworks in Kenya



has resulted in weak linkages among policies which, in turn, compounds implementation deficiencies. Although issue-specific policies are applicable across sectors and while sector-specific policies focus on the sector-wide processes, segmentation does not provide guidance on how the two realms work together.

National-level policies aspire to zero waste, but studies have revealed that the problem of SWM is a significant one in many urban areas of Kenya. In coastal towns, even though legislation is in place, enforcement and compliance remain limited at best.

The roles of various stakeholders and actors in SWM are clearly defined in the policy frameworks but are poorly operationalised. Coordination mechanisms are not well stated in the policy guidelines. The public-private partnership model is also not clear from the reviewed policy frameworks. Policy-making processes driven by the government are top-down, with limited participation from private sector stakeholders, communities and those whose livelihoods depend on poor SWM (e.g. waste pickers).

Another missing link between policy and practice is that SWM policies and their implementation mechanisms do not take into account the ever-

The overall evolution of the SWM policy architecture in Kenya may seem well-informed by the global policy dynamics in environment and waste management but, apart from linkages through closeness and the timing of development and endorsement of the policies, there is no concrete and direct evidence about this influence

changing dynamics of SWM. Policies are not substantiated, reiterated and/or reviewed with feedback on what works and what does not. There are also both insufficient institutional capacity and resources to streamline and enforce implementation of recommended SWM procedures and practices.

The overall evolution of the SWM policy architecture in Kenya may seem well-informed by the global policy dynamics in environment and waste management but, apart from linkages through closeness and the timing of development and endorsement of the policies, there is no concrete and direct evidence about this influence. Citations of global and regional policies, as well as their reaffirmations in the national policy frameworks, would have provided better evidence for the impact of global policy dynamics on national SWM policies.

— Conclusions

The findings of this review have important implications for policy, practice and research. The implementation of current SWM policies, and the development of future ones, needs to pay more attention to policy integration at all levels. This is as critical to effective and efficient responses to Kenya's SWM problems, as it is to other African countries.

The devolution and segmentation of the SWM policy frameworks in Kenya are not well aligned and the institutional mechanisms converge in a top-down approach. SWM practices need to adopt a more integrated approach among the different stages and the various stakeholders. Further research is needed to identify why the current level of policy integration has emerged and how it can be improved in a sustainable manner.

Chapter 13

How better waste management practices can reduce health risks in Nairobi and Mombasa

By Blessing Mberu, Kanyiva Muindi and Cheikh Faye

Policy pointers

Measures that city authorities can take to reduce the health and environmental risks from poor solid waste management (SWM) include:

- Adopting environmentally-friendly waste disposal practices;
- Encouraging mainstreaming of waste reduction, reuse and recycling;
- Strengthening regulation and coordination among community and private sector players; and
- Implementing an integrated approach to solid waste management.

Long-term exposure to toxic waste may cause cancer or trigger irreversible damage to health
© Fabian Plock





Globally, urbanisation is associated with an increased generation of solid waste. City authorities are struggling to provide adequate waste management services, especially in developing countries. In Nairobi, Kenya, approximately 50 per cent of the solid wastes generated daily is disposed of unsafely. Poor solid waste management (SWM) has negative health impacts, including the proliferation of communicable and non-communicable diseases. It also contributes to environmental degradation and greenhouse gas emissions. Research carried out in Nairobi and Mombasa revealed a high variability in SWM practices, whether related to storage, collection, transport or disposal. Residents of both cities who participated in the study reported high levels of awareness about the health risks associated with poor SWM, but a limited awareness of waste reduction, reuse and recycling. The findings in this chapter set out policy implications for integrated SWM.

For the first time in history, the UN declared that in 2009 a greater number of people worldwide were living in urban centres compared to rural areas. This growth in the global urban population has been accompanied by a rise in the quantity of solid waste produced in cities and towns. The estimated global total of municipal solid waste generated ranges from 1.7 to 1.9 billion metric tons annually (UNEP, 2010). In many cases, municipal authorities cannot cope with the accelerated growth in waste generation. This is especially challenging and visible in developing countries where a mere 30 per cent of urban solid waste is collected and disposed of appropriately (Chalmin and Gaillochet, 2009).

Kenya is no exception to the global urbanisation and waste generation trends. In 2009, approximately one in three Kenyans lived in an urban centre. By 2030, it will be one in two and, by then, the quantities of solid waste generated are expected to have doubled from the current four million tons annually. Unfortunately, improvements in SWM have neither kept pace with the growth of the urban population, nor the quantities of solid waste produced. Approximately 1,500 tons (50 per cent) of the solid waste generated daily in Nairobi is not collected (UNEP and City Council of Nairobi, 2010), which implies widespread unsafe disposal.

Informal settlements have become a characteristic feature of urban areas in many developing countries. In 2010, six in ten residents of African urban areas lived in informal settlements (UN-Habitat, 2013). Such areas typically receive very limited basic services such as the provision of clean water, adequate sanitation or waste management. Informal settlements are also often located on marginal land, such as in flood-prone areas or adjacent to dumpsites and landfills and these factors combine to expose the residents of informal settlements to higher health risks.

— Risks arising from poor solid waste management

SWM has five key components. The actors in these components of the waste chain vary, which calls for an integrated approach if SWM is to be effective and efficient. An integrated approach means that solid waste is managed in ways that effectively protect human health and the environment. Poor SWM is linked to a wide range of risks, including higher incidence of diseases, environmental degradation, the slowing down of economic growth and deterioration in the quality of life.

The health impacts of improper waste management can be categorised as follows:

1. Infection transmission: bacterial, viral or through other disease-causing organisms;
2. Physical bodily injury: cuts, blunt trauma, chemical injury or burns;
3. Non-communicable diseases: long-term exposure to toxic waste may cause cancers or trigger other irreversible damage; and
4. Emotional and psychological effects from living close to a degraded environment (Ziraba, Haregu and Mberu, 2016).

In addition to the negative effects on human health, the release of emissions from decomposition or the burning of solid waste contributes to the accumulation of greenhouse gases and climate change.

— Assessing SWM practices in Nairobi and Mombasa

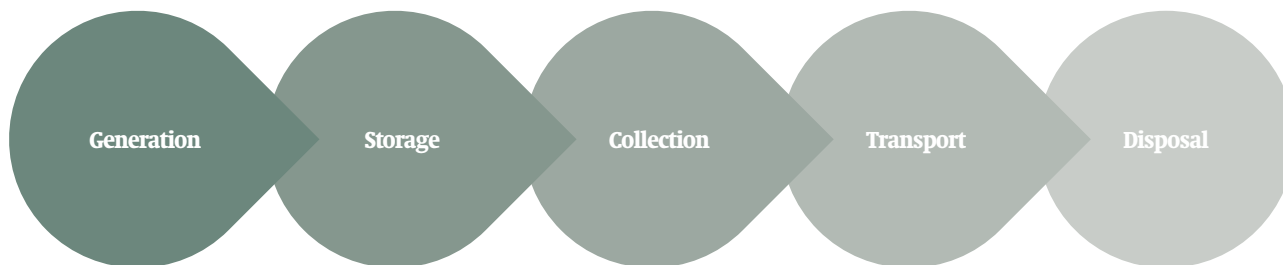
To better understand the health and environmental impacts of poor SWM in Kenya, the African Population and Health Research Center (APHRC) undertook a research project in Nairobi and Mombasa as part of the Urban Africa Risk Knowledge (Urban ARK) programme. The study focused on SWM practices in these two cities and the associated health and environmental outcomes.

APHRC conducted a survey of 1,165 households in Nairobi and 1,225 in Mombasa, across a range of communities in formal and informal settlements. The study examined SWM practices on storage, collection, recycling and disposal.

The research showed that 85 per cent of the households in Nairobi and 52 per cent of those in Mombasa stored their waste in plastic bags. In Nairobi, waste is collected four to six times per month for 92 per cent of the respondents and for 49 per cent in Mombasa. In Nairobi and Mombasa, community-based organisations provided the collection services in 62 and 51 per cent of the cases, respectively. Waste disposal by burning, in Nairobi and Mombasa, accounted for 19 and 47 per cent respectively, while 5 per cent of the waste is recycled in both locations.

From the above figures it is clear that waste collection in Mombasa is about half as frequent as

Figure 1
Core components of solid waste management



in Nairobi. This may explain Mombasa’s higher level of reported waste burning. In both cities, municipal authorities have largely withdrawn from collection and the service is now dominated by the private sector and community-based organisations (CBOs). Residents of informal settlements in Nairobi and Mombasa reported lower rates of waste collection, likely due to an inability to pay for the service. Although a considerable proportion of respondents were aware of recycling and composting, very few reported using these methods of waste disposal.

A quarter of the waste produced in Nairobi is disposed of at the municipal dumpsite in Dandora, an open landfill adjacent to residential areas that receives all types of waste including household, agricultural, industrial and medical. Over 250,000 people live adjacent to the dumpsite and are exposed to a range of health risks. In addition, the Nairobi River runs close to the landfill and its water is used to irrigate food crops for consumption in Nairobi. This further increases the potential for human exposure to harmful toxins stemming from poor SWM.

Perceptions of health and environmental risks

The study also examined community members’ perception of exposure to solid waste and the associated health risks. This revealed that those who recognised the risks to their health were likely to change their behaviour and reduce their exposure to harmful solid waste handling practices. The study revealed that a majority of the community members in both cities understood the risks associated with

Table 1
Commonly cited risks of poor SWM

Type of risk	Nairobi (%) of respondents	Mombasa (%) of respondents
Health risks	87	99
Dirty environment	52	69
Air pollution	55	53

poor SWM. Table 1 shows the most commonly cited risks mentioned by the survey respondents.

Some 28 per cent of the respondents in Nairobi and 14 per cent of those in Mombasa reported that they or a household member had experienced a health issue related to poor SWM. The most commonly reported illnesses for which respondents had sought medical attention were diarrheal diseases, respiratory conditions and allergies. Despite high awareness of the health risks, over 60 per cent of the respondents in both Nairobi and Mombasa reported that they and other community members were not doing anything to address, mitigate or reduce these risks. Reasons for their inaction included inadequate resources, lack of government support, poor coordination and insufficient knowledge.

Policy implications

Poor SWM is widely understood to pose health and environmental risks. Policymakers understand this too and city residents, especially those living in informal settlements, face this reality daily.

Inadequate SWM is a visible problem and municipal authorities are often judged on their ability to deliver effective SWM services. As urbanisation trends continue, the increases in waste generation call for even greater resources provision by often already over-stretched municipal authorities. Given the growing challenges, four policy implications for integrated SWM can be drawn from the research conducted in Nairobi and Mombasa.

1. Adopt healthy and environmentally-friendly solid waste disposal practices

The location and accessibility of municipal dumpsites is a core component of a city's SWM system. Nairobi's Dandora landfill is overflowing and is no longer a viable disposal locality. Its continued use increases the accumulation of hazardous toxins and heightens the health risks for people who work there and live nearby.

Local authority action should include changing solid waste disposal from open dumpsites to safely managed landfills that incorporate appropriate technology to maximise the (re)use of waste materials. For instance, energy can either be generated from waste incineration or from on-site biogas harvesting. People interviewed in Nairobi indicated that county staff have already received training in safe waste disposal. Regrettably, the city government has not yet allocated sufficient resources for its full implementation.

2. Encourage reduction, reuse and recycling

The research revealed that, while there was some degree of awareness among community members about waste reduction, reuse and recycling, this did not translate into action. This highlights a need for awareness building on integrated waste management, waste reduction, recycling and composting to maximise efficiencies and societal benefits. For this to work, households should be encouraged to separate waste at source to reduce the costs of segregating waste materials later.

To achieve this, awareness campaigns should be carried out in partnership with community and non-governmental organisations to reach households and individuals effectively. These campaigns should communicate the economic benefits that can be realised through reduction, reuse and recycling. For instance, community organisations can generate income from selling compost to farmers or reselling plastics to manufacturers. Such activities can boost the incomes for residents of informal settlements and other low-income neighbourhoods.

3. Strengthen coordination and regulation of community and private sector players

CBOs and the private sector can play vital roles in providing SWM services. As public sector participation has declined over time, alternative service providers have stepped in to fill the gap. This study revealed that, today, city authorities provide collection services to less than one per cent of households in Mombasa and Nairobi. This has implications, especially in low-income neighbourhoods where households cannot afford private collection services. City authorities need to consider how they can effectively work and support co-ordination with CBOs and private firms to ensure that all neighbourhoods, including informal settlements, receive collection services.

However, private sector players and CBOs must be monitored by the government to ensure that they operate within the regulatory framework and meet health and environmental requirements across the SWM chain. For instance, they should use appropriate trucks; workers should wear protective gear when transporting or handling waste; they should dispose of waste in the sites allocated by city authorities rather than dumping it at roadsides or in rivers. While private sector actors and CBOs have a role to play in introducing SWM innovations, they must be held fully accountable to ensure they promote health and environmental protection.

4. Implement a truly integrated approach to SWM

Municipal authorities in Kenya have tended to spend disproportionately large amounts on solid waste collection compared to waste transport and disposal. This can be attributed to the high visibility of uncollected waste. Uncollected garbage is a visual nuisance that city residents can easily point at as a municipal governance failure. However, disproportionate emphasis on collection comes at the expense of the other steps in the SWM chain. A truly integrated approach to SWM would allocate resources equitably across the entire process, from collection through to disposal. This would also imply increased resources for awareness raising on reducing waste generation; provision and use of appropriate storage to ease recycling; collection at regular intervals, including in low-income neighbourhoods; transport and handling in line with regulations; and disposal and treatment at designated, safely managed landfills.

Chapter 14

Improving solid waste management and associated health risks in Dakar

By Kanyiva Muindi, Cheikh Faye and Blessing Mberu

Policy pointers

- Improvements in the working conditions of solid waste management (SWM) personnel should, at a minimum, include enforcement of safety regulations, regular medical check-ups and decent wages.
- Waste storage by households must be improved and waste sorting at source should be encouraged to support recycling as a waste reduction strategy. Public education is needed to stimulate behavioural change among residents and to avoid illegal dumping of waste.
- Neighbourhood streets should be widened to allow access for sanitation trucks and to increase efficiency in waste collection and transportation in all areas of the city.
- The municipal authorities should foster dialogue and communication with and among all stakeholders from the national government, other municipal authorities, communities and informal service providers, to mitigate the ineffectiveness of SWM in the city.





Dakar, the capital of Senegal, could efficiently handle current and future volumes of solid waste if the following steps are taken: synchronise formal and informal waste collection; enforce environmental laws and regulations; promote public awareness of proper solid waste management (SWM) practices; and assure sustainable financing of the sector. These steps are especially critical to Dakar's informal settlements since these accommodate a majority of the city's population and are underserved by the municipal authorities. This chapter assesses current solid waste management practices in Dakar and provides stakeholder opinions on the ways to improve SWM, both in the short and long term. The findings indicate that Dakar's inefficient SWM practices and reliance on open waste dumpsites put residents at risk, both through direct impacts and through indirect outcomes, such as flooding.

Africa is the fastest urbanising major region in the world with 56 per cent of its population projected to be living in urban areas by 2050, up from 40 per cent in 2015 (UNDESA, 2014). This rapid urbanisation comes with many challenges, including much higher generation of solid wastes. In most cities, waste generation has already outpaced current collection and disposal capacities, leading to indiscriminate dumping. This is compounded by a low allocation of resources to the sector, causing collection and disposal inefficiencies. As a result, some residents now live among waste dumped in their communities. Reliance on open dumpsites as the final destination for waste further adds to public and environmental health implications.

Throughout sub-Saharan Africa, access to services is especially dire for informal settlement dwellers who are mostly underserved by public and private providers. Yet these people constitute a sizable share of the continent's urban population. In the interest of public health, it is important to assess SWM practices, including community views on solutions to the waste management challenges in African cities.

As the economic and industrial hub of Senegal, the capital Dakar generates about 2,000 tons of solid wastes per day (Diawara, 2009). However, waste management practices are yet to be aligned with these large volumes. A 2017 study by the African Population and Health Research Center (APHRC, 2017) reviewed the perceived health risks associated with poor SWM and sought community opinions on ways to improve SWM. The study was carried out in three locations in Dakar: (1) the Keur Massar and Malika informal settlements located near the city's main dumpsite (Mbeubeuss); (2) the Thiaroye Djiddah Kao informal settlement, an area affected by frequent flooding; and (3) Medina/Patte d'Oie, a formal settlement chosen as a comparison site.

Findings

Waste storage

Only 27 per cent of the households in the three locations were using safe storage (closed containers) for their waste. The largest share of safe storage, 34 per cent, was in Medina/Patte d'Oie. The lowest share was in Keur Massar/Malika, at 12 per cent. This may be explained by the nature of these locations. Medina is a formal urban area while Keur Massar/Malika is an informal settlement. Lower incomes

and also differences in educational attainment among informal settlement dwellers may explain these findings. Medina/Patte d'Oie is wealthier and has a higher share of residents with secondary or university/college education compared to residents in the other settlements.

Waste collection

Municipal waste collection services are unequally available across the three sites studied. In Medina/Patte d'Oie, almost all households (99.7 per cent) are served, while in Keur Massar/Malika only 77 per cent are served. The share of households relying on informal waste collection (typically by handcart handlers) was highest in Keur Massar/Malika (21 per cent), followed by Djiddah Thiaroye Kao (4.7 per cent) and Medina (0.3 per cent).

Lower willingness to pay for waste collection services was associated with an absence of effective public services. This was especially evident in communities located nearer to the dumpsite

Willingness to pay for waste collection services

Lower willingness to pay for waste collection services was associated with an absence of effective public services. This was especially evident in communities located nearer to the dumpsite. The share of households willing to pay for waste collection services was two times higher in Keur Massar/Malika (62 per cent) than in Medina/Patte d'Oie (30 per cent) or Djiddah Thiaroye Kao (32 per cent).

Waste disposal

Across the three localities studied, no sorting of household waste was carried out before disposal. Overall, a third of households were willing to sort their waste, but this varied by locality. The share was 40 per cent in Medina/Patte d'Oie; compared to less than 10 per cent in the other sites. Unauthorised dumping of solid waste was more common in Keur Massar/Malika (31 per cent) than in the other two localities (≤ 11 per cent). In all three, toxic household waste (e.g. batteries and electronics) was unsafely disposed of and commonly mixed with non-hazardous household waste.

Recycling and composting

Just over one-third of the households (34 per cent) had heard of recycling but only eight per cent had heard about waste composting. Most households reported a willingness to compost their waste if appropriate equipment was made available. The share was lower in Keur Massar/Malika (45 per cent) than in Djiddah Thiaroye Kao (74 per cent) and higher in Medina/Patte d'Oie (87 per cent). The Keur Massar/Malika households would be more willing to compost waste if there were opportunities for its resale (46 per cent). In contrast, a much lower proportion of households in Djiddah Thiaroye Kao (7 per cent) and Medina/Patte d'Oie (9 per cent) were interested in composting if there were opportunities for resale.

Environmental and health risks

Only 3.3 per cent of the households perceived themselves to be either 'at high risk' or 'at very high risk' of health- and environment-related hazards due to poor SWM. The most commonly cited hazards were unpleasant smell (27 per cent), children playing with garbage (16 per cent) and smoke from the dumpsite (15 per cent). Five per cent of the residents from Keur Maasa/Malika said that they had experienced health problems during the previous 12 months, compared to fewer than one per cent in both Djiddah Thiaroye Kao and Medina/Patte d'Oie.

The most commonly reported health problems across the three sites were asthma (30 per cent), skin problems (25 per cent), chest problems (23 per cent) and allergies (11 per cent). However, the health problems reported varied across the locations. In Keur Massar/Malika, asthma (42 per cent), chest problems (29 per cent), allergies (15 per cent) and skin problems (8 per cent) were reported, whereas in Djiddah Thiaroye Kao, it was skin problems (87 per cent) and cholera/diarrhoea (14 per cent).

Challenges

To understand the challenges in the SWM sector, focus group discussions and key informant interviews were carried out among members of the communities, policymakers and those working directly in the sector, such as transporters, waste collectors and waste pickers. For the communities, the most important SWM challenge was inefficient collection, identified by 63 per cent of households. Over half of the respondents (52 per cent) felt that

Box 1. Stakeholders' views on steps to improve SWM in Dakar

- Improve and/or widen access roads in and to neighbourhoods.
- Incorporate informal waste collectors into mainstream SWM by synchronising their waste gathering with collection by municipal trucks.
- Enforce existing environmental laws.
- Provide adequate financing to the SWM sector through increased taxation and enforcement of the 'polluter pays' principle.

education/communication should be undertaken to ensure effective SWM in the city. Little or no control of illegal dumpsites, and the absence of initiatives to sort waste at source, were other challenges identified by 30 per cent and 27 per cent of households, respectively. However, the magnitude of these challenges varied across the study sites.

The three main waste-related problems in Keur Massar/Malika and Djiddah Thiaroye Kao were ineffective and inefficient collection, illegal dumping and lack of public education/communication about SWM. In contrast, the three most important waste-related problems in Medina/Patte d'Oie were ineffective collection, lack of public education/communication and lack of solid waste sorting. To add to these challenges, SWM sector workers reported discrimination from the communities they serve and threats to their physical and financial wellbeing.

Improving SWM practices

Stakeholders, including officials from the national government (e.g. the Waste Management and Coordination Unit-UCG), municipal authorities, solid waste transporters, waste pickers and community members residing close to the Mbeubeuss dumpsite, shared their views on how to improve SWM. It was concluded that the challenges faced by collectors and transporters in accessing neighbourhoods were a major barrier to effective SWM operations. Informal



One suggested solution to avoid illegal dumping is to incorporate Dakar's cart handlers into the mainstream waste management system

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collectors, such as cart handlers who can negotiate the narrow streets, fill an important gap in SWM collection. However, they were also seen as the cause of illegal waste dumping within neighbourhoods. The suggested solution to avoid dumping was to incorporate cart handlers into mainstream SWM. If they synchronise their collection with that of the municipality, informally collected waste can be loaded on the municipal trucks and be disposed of properly. Enforcement of existing environmental laws was also perceived as effective to improving SWM practices. Adequate financing of the sector was seen as critical for improving SWM.

Box 2. Suggested municipal policy actions for better SWM in Dakar

- Commit more government resources for:
 - improving the working conditions of SWM personnel;
 - promoting public education on storage, separation, recycling and disposal of waste; and
 - ensuring access to all neighbourhoods by collection trucks.
- Foster dialogue and communication among SWM stakeholders to address ineffective SWM practices.
- Better enforce environmental laws.

Suggestions towards sustainable financing included increased taxation and enforcement of the 'polluter pays' principle.

Recommendations

The Dakar solid waste management study revealed that households commonly store their waste in unsafe containers. Illegal waste dumping occurs in residential neighbourhoods because the narrow streets restrict access to collector trucks. The service gap is filled by cart handlers but these are not fully incorporated into formal waste collection services. Informal collectors can contribute to proper SWM if their activities are streamlined with those of the municipal authorities. Another finding indicates that although little, if any, recycling and composting takes place, there is interest in these actions, together with waste separation at source being pegged to economic returns.

Communities are aware of the health impacts of their exposure to solid waste. Together with other stakeholders, the communities identified solutions to improve SWM, such as the inclusion of informal waste collectors in the formal SWM sector; the enforcement of environmental laws; sustainable financing of the sector; and ensuring the physical and financial wellbeing of SWM workers.

It has become clear that municipal authorities need to take greater responsibility for improving SWM in Dakar by committing additional resources to tackle the solid waste challenge.

Chapter 15

Emerging climate change-related public health challenges: the potential impacts of temperature rise on health in Dar es Salaam

By Lorena Pasquini, Lisa van Aardenne, Jessica Lee, Christie Nicole Godsmark and Christopher Jack

Policy pointers

Urban governments in Africa should develop comprehensive heat and health adaptation/response plans that embrace the following elements:

- Heat forecasting and monitoring to warn local officials, planning agencies, health agencies and citizens of high temperatures or heat waves and to help prepare responses.
- Improved disease surveillance, health data-collection and monitoring, strengthened by including private healthcare providers in reporting systems.
- Health-sector vulnerability and adaptation assessments, needed to identify current and future vulnerabilities and to develop interventions for avoiding, preparing for and responding to risks.
- Early/heat warning, education and awareness, including measures to notify the public of high temperatures or heat waves, as well as conducting public health outreach.
- High heat/heat wave responses to increase the resilience of cities and citizens in general, and to respond to heat waves, that need to be applied to different sectors (health, labour, local government etc.).

Outdoor workers in Dar es Salaam are at risk of heat stress and other health impacts with the projected rise in temperatures
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In Dar es Salaam, Tanzania, climate model analyses strongly suggest that both day- and night-time temperatures will rise, as will the number of heat waves. Heat will likely aggravate many existing health and well-being risks in the city. A rise in temperature can lead, among other impacts, to increases in infectious, vector-borne and heat-related illnesses; rising levels of morbidity and mortality related to non-communicable diseases; and deteriorating mental and occupational health. This chapter outlines interventions at multiple scales that could increase the resilience of Dar es Salaam's communities.

Cities, particularly those in the developing world, are very vulnerable to high temperatures and to the negative impacts of heat. High temperatures are common in Dar es Salaam, which can lead to the perception that people are ‘used to’ heat. Research on the human bioclimate in Dar shows that heat stress typically occurs between October and March, peaking in the months of December to February (Ndetto and Matzarakis 2013, 2017).

Climate model analyses strongly suggest that both day- and night-time temperatures will increase in the not too distant future. No single climate change model can project the future accurately, so a number of models (15 in this case) are used to give an idea of the worst- and best-case projections. Climate model analyses were performed at the University of Cape Town and are available at <https://www.urbanark.org/dar-es-salaam-climate-profile-summary-version> and <https://www.urbanark.org/dar-es-salaam-climate-profile-full-technical-version> and will appear in a forthcoming paper by Pasquini, L., van Aardenne, L., Lee, J., Godsmark, C. and Jack, C. Compared to the historical average, Dar will, by 2040, have more very hot days in a year and more very hot nights, in particular (see Table 1). The number of warm spells (events during which the highest daytime temperature is more than 34.6 °C for three or more consecutive days) is projected to increase in the future. The number of night-time warm spells (events during which the lowest temperature is above 24.5 °C for three or more consecutive nights) is also projected to increase by 2040.

Projections for the annual average relative humidity are only available for six climate models. These models suggest no change from the historical average until the 2040s. After that, some models suggest that there will be no change while others indicate a slight increase in the average relative humidity up to the end of the century.

The health impacts of heat in Dar es Salaam

Temperatures do not have to be extreme for heat to have an effect on health. Even moderate increases in temperature can negatively impact health outcomes. Several health risks linked to heat and rising temperatures are relevant to Dar es Salaam’s context. Some of the more significant ones are briefly discussed below. There are other impacts of temperature rise/heat that are not covered in this chapter (for space reasons). For example, an

Table 1
Average 2040 and 2100 heat projections

	At present	By 2040	By 2100
Average annual number of very hot days (when the highest temperature is above 34.6 °C)	36	50 – 180	80 – 365
Average annual number of very hot nights (when the lowest temperature is above 24.5 °C)	36	100 – 200	220 – 365
Average annual number of warm spells (events during which the highest daytime temperature is above 34.6 °C for three or more consecutive days)	(just below) 5	6 – 12	6.5 – 16*
Average annual number of night-time warm spells (events during which the lowest temperature is above 24.5 °C for three or more consecutive nights)	(just below) 5	6 – 13	4 – 8**

*A number of models project a decrease in the frequency of warm spells towards the end of the century because the average length of these warm spells increases so much that separate events join up into longer warm spells.

**By the end of the century, there will be a drop in the frequency of night-time warm spells because nights where the lowest temperature is above 24.5 °C become so common that the night-time warm spells join and become fewer in number but longer.

important possible impact from heat in Dar es Salaam concerns road safety as lowered concentration and fatigue under heat conditions can lead to increased traffic accidents.

Heat strain or stress (including heat exhaustion and heat stroke)

‘Heat strain’ (or stress) refers to a range of heat-related illnesses that can occur when the body cannot cool down enough to maintain its core temperature. Dehydration also places people at greater risk. Symptoms of heat stress include: difficulty concentrating, confusion, dizziness, headache, muscle cramps, heat rash, fatigue, fainting and nausea. In the most serious cases, heat stroke can occur and may lead to unconsciousness and death.

Infectious diseases

Rising temperatures could increase a variety of infectious diseases in different (and often complex) ways. There is a strong relationship between increased temperatures and diarrhoeal diseases like cholera, because the bacteria that cause cholera do well in warmer temperatures and in warmer water. Cholera is already an important health threat in Dar es Salaam (e.g. McCrickard *et al.*, 2017). Furthermore, heat can lead to behavioural changes (for example, the drinking of or washing in contaminated water to keep cool) that could increase infection rates.

Vector-borne diseases

Temperature, along with rainfall and humidity, is a key driver of the rate of malaria transmission. It is difficult to predict what impact an increase in temperature would have on malaria in Dar es Salaam. A small increase in temperature could mean an increase in transmission, but at relatively high temperatures, malaria could decrease. However, when it is hot, people's behaviour may change, including outside sleeping that can expose them more to mosquitoes and increase their chances of contracting malaria. Other vector-borne diseases linked to heat include dengue and yellow fever, tick-borne encephalitis, African trypanosomiasis, West Nile virus, schistosomiasis and the plague.

Non-communicable diseases (NCDs)

NCDs are diseases that are not passed from person to person. Some NCDs are related to heat/temperature rise, including cardiovascular disease, stroke, renal disease, diabetes and respiratory diseases. All these are increasingly contributing to Tanzania's national disease burden (Mayige *et al.*, 2012). People suffering from one or more of the NCDs mentioned above are particularly vulnerable to heat, albeit for different reasons. For example, diabetics are probably at a greater risk of developing heat-related illnesses because the disease is known to compromise heat dissipation. As another example, people with cardiovascular or cerebrovascular disease are admitted more to hospital during extreme heat events than when it is less hot. People who catch infectious diseases are often already suffering from one or more NCDs, which also puts them at higher risk of heat-related health problems.

Mental and occupational health

Heat/temperature rises can lead to mental and physical fatigue, affecting peoples' concentration

and ability to carry out work tasks. This can result in lowered productivity and can negatively affect peoples' income. Furthermore, people working outside, or with a high physical load, are more susceptible to developing heat stress and related heat illnesses. Associations have even been found for an increased risk of suicide with high temperatures.

The heat/health vulnerability of Dar es Salaam residents

Heat impacts on health vary noticeably, both across individuals and populations. Typically vulnerable population groups include women and children, the elderly, pregnant women, individuals with pre-existing illnesses (e.g. diabetes, cardiovascular disease) and people working outdoors. The poor and/or those living in Dar es Salaam's informal settlements are particularly vulnerable. Discussions with (and direct

NCDs are diseases that are not passed from person to person. Some NCDs are related to heat/temperature rise, including cardiovascular disease, stroke, renal disease, diabetes and respiratory diseases

observation of) residents in the informal settlement of Vingunguti, as well as discussions with health sector practitioners and policymakers in Dar es Salaam, showed that many factors combine to result in informal settlement residents having higher exposure, greater sensitivity and fewer adaptation options to heat (see Box 1). These factors are similar to those experienced by informal settlement residents in India (Mavalankar *et al.*, 2013).

Discussions with residents of the informal settlement of Vingunguti did not focus specifically on different vulnerabilities. However, the following findings did arise: a) residents are more uncomfortable from heat at night than during the daytime; b) sleeping outside can help cool people down during the night, but security concerns render this option less desirable, particularly for women and children; and c) children were generally reported to be the most affected by heat.

Box 1. Some factors that affect the vulnerability of informal settlement residents in Dar es Salaam to the health impacts of heat

Residents of informal settlements and other low-income groups are more likely to be exposed to heat due to:

- 1) living in low-quality housing structures (e.g. houses made of heat-trapping materials or with tin roofs);
- 2) lack of access to green spaces, trees and shade; and
- 3) working outside or in unventilated conditions.

Other factors can increase sensitivity to the negative impacts of heat on health, including insufficient access to adequate water or sanitation, living in crowded conditions and suffering from malnutrition and/or chronic medical conditions.

Informal settlement and low-income residents often have little capacity to adapt to high temperatures since:

- 1) they have little control over their home or work environments;
- 2) they cannot access reliable electricity, air conditioning, appropriate cooling facilities or adequate healthcare; and
- 3) they receive little heat-related health information.

The Urban Heat Island (UHI) effect is worsening the effects of temperature increases in Dar es Salaam. The UHI effect refers to the fact that temperatures are often higher in cities than in surrounding rural areas for many reasons. Urban construction materials, for example, absorb more heat than natural land cover, and vegetation is important for keeping an area cool, but greenery is often scarce and/or removed in urban areas (especially in dense informal settlements). Dar es Salaam has an UHI of between 1° and 4° C higher compared to more rural areas (Kibassa, 2014). The full analysis of interview results will appear in a forthcoming paper by Pasquini, L., van Aardenne, L., Lee, J., Godsmark, C. and Jack, C.

Recommendations

Many interventions, at different scales and sectors could increase the resilience of Dar es Salaam's communities to the health impacts of heat. Comprehensive heat and health adaptation and response plans (Heat-Health Action Plans) can reduce the negative health impacts of high/rising

Improved disease surveillance, health data collection and monitoring, including updated hospital admissions and emergency case records, can help to track heat-related morbidity and mortality

temperatures: see http://www.euro.who.int/__data/assets/pdf_file/0006/95919/E91347.pdf. The elements of such a plan might include:

- Heat forecasting and monitoring that allows meteorological services to send out heat warnings so that city officials, citizens and others can prepare. It requires the development of heat thresholds and defining what constitutes a heat wave in Tanzania/Dar (there is no standard definition for heat waves).
- Improved disease surveillance, health data collection and monitoring, including updated hospital admissions and emergency case records, can help to track heat-related morbidity and mortality. This reporting system would be strengthened if private healthcare providers were to be included. Health data can be disaggregated socially (e.g. by age, gender, occupation) and spatially (e.g. by neighbourhood) to understand who is most affected and where.
- Vulnerability and adaptation assessments for the health sector can identify current and future vulnerabilities to changing temperatures and, subsequently, inform policies, programmes and projects to avoid, prepare for and respond to risks. Disease-specific national action plans could, for instance, consider how a temperature rise would affect future patterns of risks for specific locations, such as Dar es Salaam.
- Early/heat warning, education and awareness, such as formal and informal systems for notifying the public of approaching high temperatures or heat waves. Social media, SMSs, billboards, radio, newspapers and television announcements can all be used. In informal settlements, community leaders can help disseminate such information. Public health

outreach can help ensure the health and safety of city dwellers, especially the most vulnerable groups. Local officials can communicate information about:

- which factors put people at greater risk (e.g. age, no access to cool spaces, working outside);
 - symptoms of excessive heat exposure (e.g. dizziness, nausea, muscle cramps); and
 - recommended response and treatment options (e.g. finding cool locations, staying hydrated, checking on family and friends).
- Mapping of high-risk areas vulnerable to heat impacts that takes into account what influences vulnerability to heat (e.g. access to water, building materials, density, shade etc.).
 - High heat/heat wave responses, that can be divided into: (a) those taken to increase the resilience of citizens to heat and high temperatures in general; and (b) those taken in response to a heat wave. Examples of both kinds of responses are provided below.

The following are examples of possible responses to heat and high temperatures to increase the resilience of citizens in general, divided into different sectors:

- The health sector: Build capacity among health care professionals to better recognize and respond to heat-related illnesses. Keep health facilities cool and comfortable or, at least, provide designated cooling areas.
- Local government and urban planning sector: City officials can apply strategies into their planning to reduce the UHI effect. This includes using cool or green roofs as well as planting trees and vegetation to keep buildings and their surroundings cooler. These measures also reduce electricity consumption through lower demand for air conditioning. The importance of providing shade trees is emphasised by a recent study of Dar es Salaam (Yahia *et al.*, 2018). Heat is often thought to be a greater problem in parts of a city dominated by high-rise buildings (because of the UHI effect), but the study shows that areas with low-rise buildings can be more stressful because



Emergency plans should be drawn up to distribute fresh drinking water through water tankers during heat alerts



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Employers should be encouraged to shift outdoor workers' schedules to cooler hours of the day during heat waves, and to provide ventilation, water, shade and rest periods

of the absence of shade. Planning permissions and building codes can be revised to consider adaptation to heat. Other strategies can include increasing the availability of parks, shaded open space and swimming pools, or creating 'cooling centres' in public places such as schools, libraries, places of worship etc. Where cooling spaces and centres already exist, access may need to be improved. Public access to water should also be improved, for instance by offering safe public drinking water fountains.

- The labour sector: Training can be organised for employers, workers and outdoor labourers on the health impacts of heat and how to protect oneself during high temperatures. Local businesses could be encouraged or required to provide fans, cool water, shade and rest periods for workers at risk. They could consider changing work hours to cooler times of the day. It will be more challenging to develop heat response strategies for the informal labour sector, given that this sector is unregulated.

Examples of responses to heat wave events include:

- Providing emergency community cooling centres, particularly in areas with highly vulnerable populations.
- Health centres, particularly those near informal settlements, could put in place staffing plans and protocols that increase capacity during heat waves.
- Emergency plans could be drawn up to distribute fresh drinking water through water tankers during heat alerts.
- Employers should be encouraged to shift outdoor workers' schedules to cooler hours of the day during heat waves, and to provide ventilation, water, shade and rest periods.

Chapter 16

A low-cost spatial methodology to assess multi-hazard risk to urban infrastructure in Africa

By Faith Taylor, Bruce Malamud
and Dr James Millington

Policy pointers

- A low-cost spatial data methodology, called Urban Textures, can be used to assess the potential impact of single and multi-hazards on urban infrastructure at a coarse scale across a town or city.
- The Urban Textures methodology does not require detailed infrastructure maps and gives a view of how potential impacts from natural hazards on infrastructure may vary across different parts of a city or town, by using real-world case histories or scenarios.
- Working through possible multi-hazard impact scenarios can assist multi-disciplinary teams (such as urban planners, infrastructure managers and emergency responders) to better understand the potential impacts of multi-hazards and allow for suitable preparation as to potential responses.





This chapter outlines how a low-cost spatial data methodology, Urban Textures, can support the assessment of hazard event impacts on different types of urban physical infrastructure, using as case examples Nairobi, Kenya, and Karonga, Malawi. Examples of natural hazards include earthquakes, landslides, and temperature extremes. Natural hazards can have inter-relationships, for example one natural hazard triggering another, or two natural hazards impacting the same region and time period. These natural hazard inter-relationships (multi-hazards) can have a significantly greater impact than the individual hazard events.

Box 1 lists the 21 natural hazards considered throughout this chapter and which are based on global-scale assessments (Gill and Malamud, 2014). Risks research and policy-formulation are typically based on assessment of single hazard events (e.g. maps of potential flood risk) and, consequently, there is limited information on multi-hazard events, when two or more natural hazards impact the same region at the same time. That could be a single natural hazard triggering another natural hazard (for example, an earthquake triggering landslides) or two or more natural hazard events impacting simultaneously (for example, a heat wave and an earthquake both striking a city). Multi-hazard events can affect people, infrastructure and/or the environment. Multi-hazards are relevant for urban risk assessments, as the overall impact of a multi-hazard event (including any inter-relationship between the hazards) might be greater than the impacts of each hazard considered individually. They can result in unanticipated outcomes and/or overwhelm the local response capacity and mechanisms. It is advisable that multi-hazard case studies be recorded in databases, to better understand their occurrence across urban and rural areas worldwide.

As part of the Urban ARK research programme, we use here two contrasting case studies to examine the potential of multi-hazard events: (i) Nairobi, Kenya a large, densely populated, 700 km² urban agglomeration with 3.9 million inhabitants in 2015 and with many different land-use types resulting in different infrastructure configurations; and (ii) Karonga, Malawi, a small town with 42,000 inhabitants in 2008 and with few different land-use types and infrastructure configurations. These two cities represent different types of urban setting common to Africa and are used as exemplars of our Urban Texture methodology. Since the methodology is not location specific, it can be used for assessing and making scenarios for multi-hazards in other African towns and cities, over a broad range of hazards.

Box 2 provides an observed multi-hazard event in Nairobi in April 2012 and a hypothetical event in Karonga. Both the observed and hypothetical multi-hazard events are important for planning purposes - observed to have a better idea of what has occurred in the past; and hypothetical to provide discussion on planning for what 'might' occur in the future.

Box 1. The 21 natural hazards considered in this chapter



Tsunamis



Ground collapse



Droughts



Lightning



Landslides



Hailstorms



Snow avalanches



Snowstorms



Local subsidence



Ground heave



Wildfires



Floods



Extreme heat



Volcanic eruptions



Earthquakes



Storms



Extreme cold



Regional subsidence



Tornados



Impact events



Geomagnetic storms

Box 2. Examples of real and hypothetical multi-hazard events and their impact on infrastructure

Observed event in Nairobi, Kenya

(heavy rain, flooding, strong winds, landslide)

Media reports indicated that heavy rains in April 2012 resulted in 48 recorded floodings across Nairobi. The outcomes included the destruction of more than 250 buildings, traffic delays and hundreds of families becoming stranded. The heavy rains were accompanied by strong winds and also triggered a landslide. Strong winds knocked over trees that damaged the electricity supply system and caused power outages. With the landslide, a large boulder crushed ten houses in the Mathare informal settlement, killing at least eight people. The combination of four natural hazards (heavy rain, flooding, strong winds, landslide), coupled with at least four impacts on infrastructure and people (traffic delays, power outages, property destruction and human fatalities), made this a complex situation for the local and national authorities to plan for and adequately respond to. This is an example of a high frequency, relatively low magnitude multi-hazard event.

A hypothetical event in Karonga, Malawi (earthquake, landslides, flooding)

Karonga, located near the Livingstone seismic Fault, is prone to earthquakes. According to the USGS Earthquake Catalogue, there were 34 earthquakes within a 100 km radius of Karonga between 1980 and 2018. The highest intensity, a magnitude of 6.0, recorded in 2009, caused the collapse of 1,557 buildings in the area. The Livingstone Fault runs through steep rocky hills on the eastern shore of Lake Malawi in Tanzania and may cause even higher magnitude earthquakes (albeit that there is considerable uncertainty around this). A high magnitude earthquake in Karonga could trigger landslides along the Eastern shore of Lake Malawi. Should such a very large landslide occur, it could send large waves across Lake Malawi and cause flooding in Karonga on the opposite shore of the lake. The actual likelihood of a large magnitude earthquake triggering landslides and subsequent flooding remains unclear without more fieldwork, research and computer modelling. Given the potentially catastrophic impact of this low-likelihood scenario, urban managers should decide whether it is appropriate to spend resources on better understanding the probability of this scenario, and whether to improve the resilience of Karonga to such an event.

The case-study reports of Nairobi and Karonga along with a template that can be used for other locations are available from the Urban ARK Work Programme 2: Hazards Assessment at <http://bit.ly/WP2-UArk>. Together, they:

- Provide a brief background to each of the 21 natural hazards in Text Box 1 for each city;
- Review the likelihood of any of the 21 hazards occurring in each case-study city, primarily based on literature or globally available datasets; and
- Specify which other natural hazards could be triggered or potentially have their likelihood increased by any of the 21 hazards, given the local conditions in the two case study cities.

Multi-hazard risks to infrastructure

Towns and cities contain many different types of infrastructure, including roads, electricity supply systems and open spaces, that all provide particular services and which, for the purposes of this research, comprise many sub-types. Each of these infrastructure types may be affected by natural hazards in different ways. For example, flooding may temporarily block access to a highway and an unpaved track may be rendered impassable for a prolonged period. Likewise, a drought may result in reduced power output by a hydroelectricity power plant.

As part of the Urban ARK research project, we created an extensive database with qualitative descriptions of potential impacts of each of the 21 different natural hazards on 157 subtypes (in 13 categories of infrastructure (as shown in Box 3). For each of the 21 hazard and 157 infrastructure sub-types, a description of the potential impact is provided, based on literature or records of previous events published in newspapers or derived from responder reports.

Different parts of a town or city all have unique infrastructure configurations and are therefore affected differently by a natural hazard event. For example, the impacts on infrastructure in a city's central business district will differ to those in an informal settlement. Due to rapid (often informal) growth, African urban centres often have the added challenge of lacking access to precise and updated data on what infrastructure is present in different areas.

Box 3. Categories of infrastructure considered, with each category having multiple sub-types of infrastructure

- Roads
- Electricity
- Freshwater
- Wastewater
- Communications
- Rail
- Waterways
- Open Space
- Critical Infrastructure
- Buildings
- Pipelines
- Air Transportation
- Hazard Producing / Dampening Infrastructure

Urban Textures

To assess on a coarse scale what types of infrastructure are present in different parts of the city, we developed the Urban Textures methodology: a low-cost data and free software technique using remote sensing and spatial analysis (GIS) (based on Bechtel *et al.*, 2015). Applying this methodology we divided Nairobi and Karonga into ‘urban texture zones’ (see Figure 1 for the example of Nairobi with 17 urban texture classes). Each urban texture corresponds to a unique infrastructure configuration. For example, informal settlements are likely to have buildings made of wood and metal sheets,

with informal electricity and water connections. This methodology takes a non-expert about two weeks to apply in the case of a ‘new’ region. It uses free data and only needs some validation of the local infrastructure within the different urban texture classifications (training materials are available at <http://bit.ly/WP2-UArk>).

In combination with multi-hazard assessments, the urban texture maps can be used by urban planners, infrastructure managers, emergency responders and others to consider different impact scenarios. It is particularly useful for analysing disaggregated impacts at the neighbourhood level, as well as to analyse changing scenarios.

Conclusion

This chapter has demonstrated the importance of considering the broad range of risks posed to a city from single and interacting hazards. We show that by using freely available spatial data and software, it is possible to perform a coarse scale assessment of infrastructure risks. This methodology is low-cost and generally applicable to many African towns and cities. It can be used as a starting point for cross-sector discussions about multi-hazard risk. Documents are available on the Urban ARK webpage indicating how this method can be applied to other cities.

Figure 1
Urban texture infrastructure classification for Nairobi and surrounding areas



Chapter 17

Risk beyond the red line: urban risk and large-scale infrastructure in Kenya

By Jo da Silva, Andrew Charles, Kieran Birtill, James Bristow and Caroline Ray

Policy pointers

It is recommended that physical planners and developers:

- Normalise inclusive development in the delivery of large infrastructure projects.
- Plan for the magnetic effect and surrounding service demands of large infrastructure projects.
- Account for the small- and medium-scale projects that come up around large infrastructure projects;
- Understand the complex risk networks linked to large infrastructure projects which can create, compound or mitigate risk; and
- Recognise the need for community engagement to achieve risk-sensitive, inclusive development.





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Cities are at the centre stage of Africa's pathway to prosperity with a majority of the continent's population expected to be living in urban areas by the early 2040s. The infrastructure gap to accommodate this demographic shift and the accompanying economic opportunities are creating a plethora of large-scale projects, mainly in transport infrastructure. In the absence of appropriate governance and regulation, the urban environment is often being shaped by ad hoc project interventions, rather than by holistic planning that recognises the city as a single system (Dodman *et al.*, 2016). Findings from research in Nairobi, Kenya, demonstrate the potential risks posed by the piecemeal, project-based and uncoordinated development of local urban communities and the city at large. This chapter summarises the key research findings which influence urban risk accumulation from large infrastructure projects. In response to the challenges and opportunities identified, five key principles and four pathways towards change are proposed.

Between 2016 and 2017, research was carried out by Arup International Development in Nairobi, Kenya, to explore how the Thika Highway Improvement Project and the Two Rivers Mall Development were creating, compounding or mitigating risks. These two projects represent typical large-scale 'road' and key 'nodal' development interventions that are shaping urban growth in many African cities. This type of project is typically implemented in complex urban systems but has the potential to unevenly create, compound, distribute or mitigate risk at different levels. The research has explored the relationships between the degree to which risk accumulates through projects and risk addressing at the city and neighbourhood level, as illustrated in Figure 1.

- City level: Is urban risk from large-scale projects addressed within existing national and city planning, policy and regulations?
- Neighbourhood: Have the positive and negative impacts of the case study projects on risk accumulation in adjacent communities been considered?
- Project level: Are large-scale projects planned (or at least regulated) with awareness of risk accumulation beyond their project plan boundary?

Key challenges

Both case studies aimed at improving economic productivity in Nairobi. Primary research undertaken within local communities confirmed that anticipated opportunities have been realised through the projects, including local job creation (AWEMC, 2012) and increased connectivity (African Development Fund, 2007). However, while these developments have mitigated certain risks for local residents, they have also created or compounded other risks, such as flooding and lower housing affordability. This is so because the projects have not been required to consider risks 'beyond the red-line' boundary of their sites. Investors, developers, and designers tend to be concerned primarily with risk to their project, rather than risk impacts from their project on the locality or wider city. The following underlying challenges are influencing urban risk accumulation from such projects:

1. Pressure for development

Several lead agencies noted that they are under considerable pressure not to hold up developments in Nairobi, resulting in rushed planning that does not necessarily or adequately consider diverse risks.

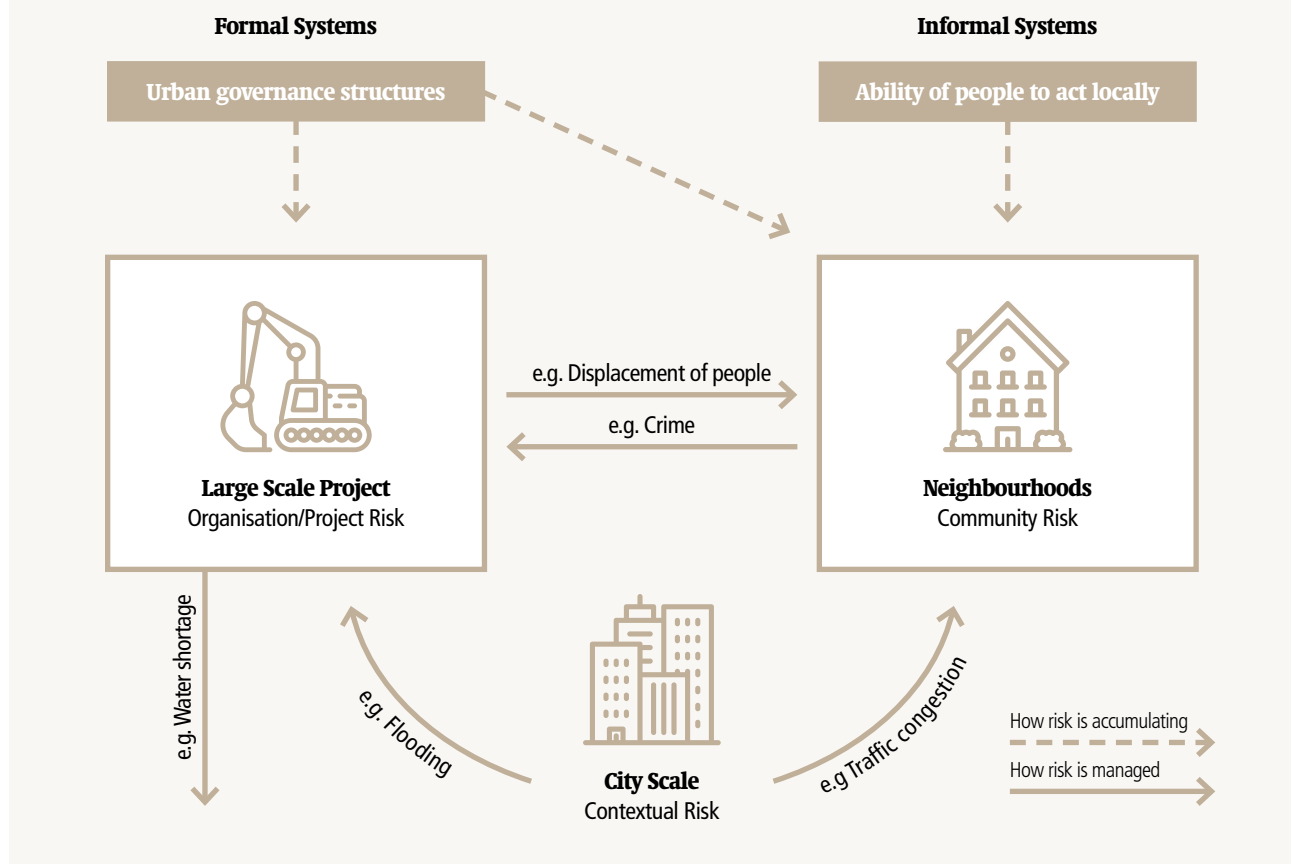
2. Gaps in the current planning process

- Fragmentation of the planning system was the principal risk cited by the majority of city stakeholders. Currently, the Nairobi city masterplan (Nairobi City Council and JICA, 2014) is not supported by detailed local area plans, zoning or development guidance. Therefore, each new development is negotiated between the developer and the Nairobi City County (NCC) and risk is, at best, managed on a case-by-case basis.
- Planning departments lack the capacity to enforce regulation, while rapidly changing land use is not adequately addressed in the current guidance.
- The case study projects complied with the legal requirements for consultation, but public consultation is often carried out merely to achieve compliance. Given the scale of the projects, the level of consultation was minimal.
- The Environmental Impact Assessment (EIA) process is ineffective because: a) the EIA and planning approval processes are not linked; b) small to medium developments often fall between the cracks; c) developers themselves are responsible for appointing an EIA consultant; and d) enforcement capacity is insufficient.

3. Insufficient detail in project design and implementation

- The key step in project design, when risks are addressed before the costly construction stage begins, is often skipped to save money and to speed up development. Consequently, projects can be exposed to risks that are much more difficult and expensive to address during construction or operation.
- The quality and quantity of data used to understand key risks on case study projects was limited. On the Thika Highway project, it was mostly impossible to plan around existing utilities since no records of their location existed. Disruptive, intrusive and

Figure 1
Risk generation and accumulation relationships



costly investigations were required to identify these utility constraints. Projects did not obtain nor generate sufficient data on rainfall, run-off and aquifer geology for flood and groundwater risk modelling and analysis.

4. Ineffective contracts and project finance

- Given the complexity of risk management in large projects, contractual arrangements play a significant role in mitigation. The appropriate allocation of risk apportionment to the relevant project stakeholders is key, as is the management of the financial resources to address risks.
- In the case of the Thika Highway, the funder, the African Development Bank (AfDB), had in place a policy that the recipient country carries the risk by being responsible for procurement, early works and due diligence at the project start. This can create risk if the government struggles to

finance such enabling or preparatory works and pushes these to the contractor, who may have different priorities.

- In comparison, privately-financed infrastructure projects tend to go to significant efforts in agreeing contracts and risk apportionment. Risk is being quantified as far and as accurately as possible through precise technical assessments. These processes reduce risk to investors and developers and, by extension, surrounding neighbourhoods.

Principles for risk-sensitive development

The above key challenges require continued institutional reform and capacity building. The negative impacts of large infrastructure projects can be avoided, or at least reduced, if planners and developers place greater emphasis on the following five principles.

1. Normalise inclusive development

It is important to consider who the infrastructure is serving. Good urban governance aims to broker this dynamic and ensures, where possible, that development is equitable and inclusive. Full consideration needs to be given to the direct and indirect impacts of a large-scale project and how it affects the most vulnerable (e.g. whose employment opportunities will improve and whose will suffer; home owners versus renters, and those living near hazard hot spots versus those living further away).

2. Plan for the magnetic effect of large-scale projects

Both the Thika Highway and Two Rivers projects have added desirability to surrounding locations. This has affected land and house prices, population growth and related infrastructure demand. Residents with adequate financial capacity are able to absorb the impact. For the less wealthy, more vulnerable parts of the community the day-to-day that they experience can be compounded by rapid development.

3. Do not forget small to medium-scale projects

Large-scale projects are being delivered locally to a higher standard and tend to capture the attention of the public. Numerous small- and medium-scale developments are typically popping up around these large-scale projects; often designed and constructed rapidly without planning permission and often dodging the building regulations. These construction developments frequently ‘fly under the radar’ and pose a risk to the occupants or those residing nearby. Urban authorities should be aware of the risks involved and anticipate the need for greater building control once a large-scale project is planned for an area.

4. Understand the complex risk network

The research highlights complex project-risk relationships with some risks mitigated but others created, compounded or transferred with cascading impacts. A robust risk analysis should be undertaken before any large-scale project is approved and should consider both internal risk to a project and the project’s relationship with the wider environment outside the project boundary. This implies not only considering local risks created or compounded by the project, but also mitigation of existing risks faced by local communities. Such as risk-sensitive approach can be achieved by rigorous and methodical consideration

of the potential direct and indirect benefits of the project during the design process.

5. Recognise the need for quality engagement

Several of the areas for improvement discussed in this chapter can be addressed through improved engagement with communities and between agencies. In Kenya, there are positive signs that public consultation and engagement is improving and there is growing evidence of community-based planning, including a network of neighbourhood actors supported by evolving legislation, which should be built on.

Much progress has been made in Nairobi in creating plans, policies, legislation and regulation since the 2010 Constitution and the political devolution process

— Pathways towards change Thinking beyond the ‘red line’

Case studies highlighted the need for both project stakeholders, developers and regulators to apply better systemic-thinking in considering ‘risk beyond the red line’ of their project boundary. Such tools as the Nairobi Hazard Lens applied for this study (to consider the direct and indirect of impacts of case study projects beyond their boundary), could potentially be used to engage developers and regulators. For more information on the Nairobi Hazard Lens, please see the main research report at www.urbanark.org/risk-beyond-red-line-urban-risk-and-large-scale-infrastructure-projects-kenya

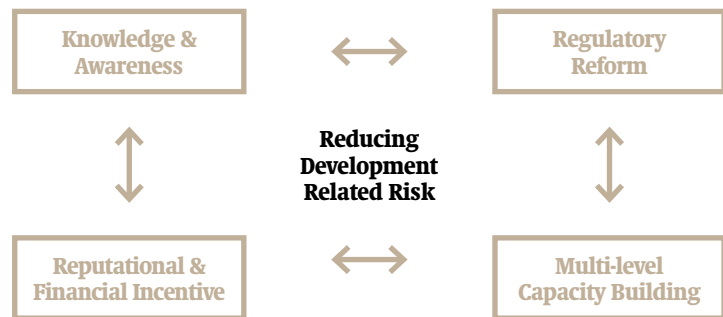
Regulatory reform, systems and processes

Much progress has been made in Nairobi in creating plans, policies, legislation and regulation since the 2010 Constitution and the political devolution process. Our research highlighted examples of recent road projects, such as the Western Bypass (a part of the Nairobi ring road), which appear to have received greater integrated thinking. However, considerable further progress is still needed to include up-to-date and detailed plans, policies and regulations for effective development control.

Figure 2
Pathways towards change

The majority of the underlying issues behind the development-related risks described in this paper can largely be categorised as:

- Those inhibited by lack of awareness;
- Those requiring regulatory reform;
- Those requiring increased capacity; and
- Those which do not align with financial objectives.



Identifying actors and mechanisms that can be engaged to influence project-related risk management is crucial. While the research highlights how strengthening the planning process, including linkage with EIAs, would help regulate risk beyond the projects’ immediate area, new actors who hold significant influence over development may also need to be found and included. For example, in Kenya the Special Economic Zones Authority – a national body formed in 2015 to establish and regulate these zones – is in a powerful position to influence developers’ red-line thinking.

Capacity building at different levels

The limited capacity of development control agencies is blocking robust regulation of risk. Apart from capacity-building interventions, actions can help. Quantifying the problem through considering key issues will aid awareness. Do development control entities have sufficient staff? Capacity building needs to consider not just the human resources capacity of departments responsible for Nairobi’s development regulation but also the tools at their disposal, the level of training and the opportunities available for continued professional development.

It is important to develop tools and processes to help planners consider and regulate the full spectrum of project risks. To inform and engage local neighbourhoods, the research in Nairobi used hazard mapping and open-source satellite imagery to analyse urban growth patterns and the evolution of certain local risks. It is also important to identify the gaps in existing city planning tools, including

planning handbooks, local area development plans and EIA processes that are either out of date, missing or lacking in sufficient detail.

Community-level civil society actors can also play an important role in the mitigation of development risk, especially if national-, city- and project-level actors cannot be engaged or do not have the capacity to engage. In Nairobi, some neighbourhoods already have up-to-date local plans and zoning. These neighbourhoods typically have influential residents with the knowledge and leverage to prevent unsuitable development. It is, therefore, important for civil society actors and NGOs to explore the support that can be provided for harnessing community potential.

Reputational and financial incentives

The long-term value of an expanded project brief that considers ‘risk beyond the red line’ needs to be clearly articulated, especially in the case of privately-financed projects where investor returns dictate decisions. Investment ‘beyond the red line’ can lead to gains in local workers’ productivity, reduction in lost time and improved wellbeing through safer environments. Globally, incentives exist for meeting sustainability criteria. Is it possible to incorporate ‘red-line thinking’ criteria or adopt it as a parallel standard?

As land within Nairobi becomes more and more desirable, there is the opportunity to demand that private developments are part of an inclusive, sustainable community project. The corporate social responsibility and public image of large corporations

setting up business in East Africa is something which can be capitalised on by a growing civil society engaged in planning decisions.

Conclusion

Nairobi is continuing to develop at a rapid rate, underpinned by a fragmented planning process with critical gaps in the level of detail, particularly at the local level. These undermine integrated planning and lead to gaps between large infrastructure projects and the needs beyond the red line of the project boundary. Those seeking to improve the consideration of such risk need to identify actors at the national, regional, city and community levels and support them through education and capacity building while creating incentives for developers to embrace a fully holistic risk-sensitive approach. Together with regulatory, planning and

Nairobi is continuing to develop at a rapid rate, underpinned by a fragmented planning process with critical gaps in the level of detail, particularly at the local level

policy reforms, consistent application of the key principles suggested above will help to ensure that future developments benefit the city as a whole. Addressing the challenge of risk accumulation from large-scale projects will not be achieved through a single, standalone solution but through a series of interconnected actions that result in a more robust system and behaviour change. These ideas are applicable not just to Nairobi but to other cities across Kenya, East Africa and sub-Saharan Africa.



Nairobi's rapid growth is underpinned by fragmented planning processes

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Chapter 18

Enabling self-led resilience planning in African cities: the CityRAP tool

By Mathias Spaliviero, Katharina Rochell, Linda Zardo and Alexander Chileshe

Policy pointers

- Promoting mechanisms that leverage local knowledge and build on data that may not necessarily be comprehensive but are good enough should be promoted given the increasing complexity of the urban resilience challenge in addition to financial and human resource capacity constraints at local government level.
- Bringing together local administrations and community representatives around collective and inclusive data collection, analysis and prioritisation of key issues can increase ownership and validity of a resilience strategy, and thereby its long-term success.
- In view of the multiple challenges faced by many countries in improving their literacy levels, developing resilience planning processes that are inclusive and participatory regardless of the literacy level, may yield the best results.
- In light of the competing fiscal needs in many countries and cities, resilience planning processes that emphasise creating space for the involvement of multiple stakeholders may not only improve support and ownership for required actions but may also serve as examples in other areas of economic and social development of a city or country.
- Resilience planning processes that utilise participatory methodologies are likely to achieve greater validity and may therefore serve as a powerful tool for resource mobilisation.

Bringing together local administrations and community representatives around collective and inclusive data collection, planning and prioritisation of key issues will enhance resilience
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Resilience planning has become increasingly important as different countries and regions of the world face recurrent and intense natural and human-induced disasters. This has become even more critical for fast growing African cities and towns, in which investments and populations are more concentrated compared to rural areas. However, with well-documented gaps in capacity and information/data related to resilience, how can decision-makers and planners prepare these cities and towns for the inevitable effects of climate change? Is there any experience with tools that can provide information even in the face of the glaring gaps in resilience knowledge, capacity, information and data? This briefing shares the experiences of the City Resilience Action Planning (CityRAP) Tool, developed by UN-Habitat, including within the Urban Africa Risk Knowledge (Urban ARK) programme, which has been implemented in 29 African cities and 11 countries since 2015.

African cities and towns are growing rapidly, mostly without strict planning and in an informal manner, thus accumulating risks. It is estimated that the urban population of the continent will almost triple within the next thirty years (UNDESA, 2018). Local governments are ill-prepared to mobilise resources and put in place systems and measures to build the resilience of their city in conditions of growing informality, poverty, complex interdependencies and gaps in data and information. Lack of technical and financial capacity often compels them to seek external expertise (Castan Broto, 2014), which shifts the decision-making power away from the citizenry and elected leaders (Pelling *et al.*, 2017). To enable cities to lead their own resilience planning processes, decision-support tools are required that can operate within the above-described conditions, enhancing inclusion and local ownership.

Planning for urban resilience in Africa: the need for innovative approaches

The emergence of urban resilience as a central concept to promote sustainable development in the context of increased risks due to the combination of fast urbanisation and the growing impact of climate change effects has resulted in the production of several tools and guidelines (UN-Habitat 2017). The latter are often complex and require robust technical expertise as well as a lot of data, which are costly to collect. As a result, when they have the means, African city managers tend often to rely on outside expertise to design resilience-building strategies. This creates a disincentive to local governments in kick-starting the process by themselves. This also undermines self-reliant capacity that lies at the core of resilience thinking and action.

The Sustainable Development Goals and the New Urban Agenda highlight the need to respect the principles of inclusive decision-making and to promote urban development based on local priorities. Considering the conditions experienced in many African cities, fostering demand-led urban resilience planning requires innovative approaches that build on existing local knowledge and capacity and data that may not be comprehensive but are good enough.

The CityRAP as enabling tool

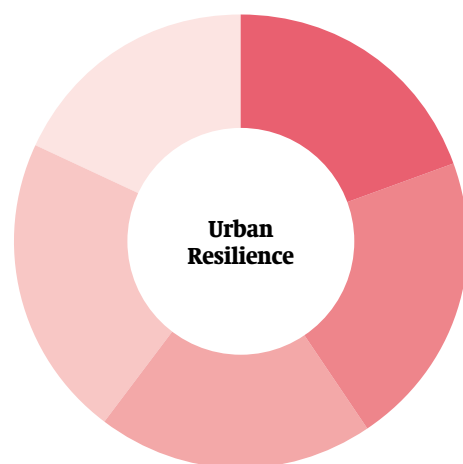
The City Resilience Action Planning (CityRAP) tool was initially conceived by the United Nations Human

Settlements Programme (UN-Habitat) and then co-designed through various tests and interactions with technicians working in several African cities and towns. It is meant to open spaces for demand-led urban resilience planning, with minimal external support. A team of trainers is mobilised to facilitate the tool implementation in key moments of the process, while most of the work is carried out by the city government itself.

At first, the tool aims to create a common understanding of urban resilience and establish solid cooperation among the different local actors, i.e. local government officials, urban dwellers, civil society, the private sector and academia. The city resilience planning process leverages local knowledge and expertise, and is structured around five pillars (see Figure 1).

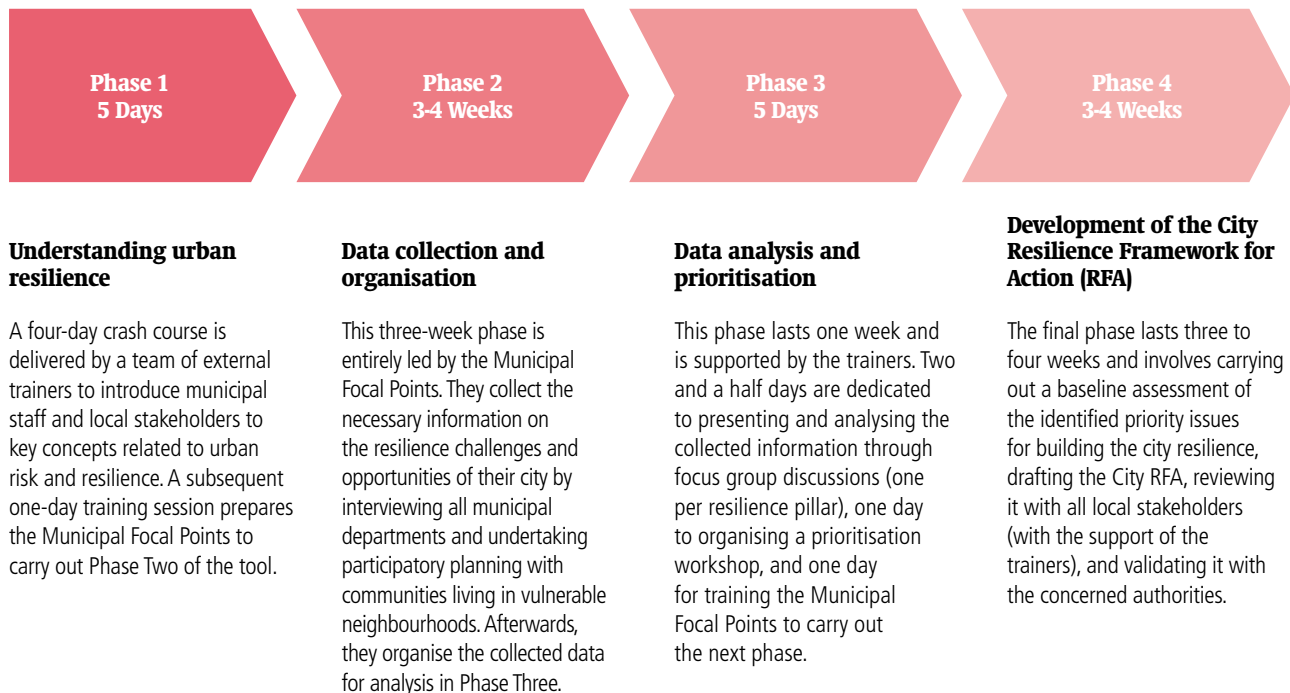
Through a fully participatory and consultative approach, CityRAP helps to prioritise concrete actions, by identifying underlying issues that can serve as entry points to address multiple interrelated aspects of urban resilience, for progressively building the city's resilience. The tool culminates in the preparation of a ten-year city Resilience Framework for Action

Figure 1
Resilience pillars of the CityRAP



- Urban planning and environment
- Resilient infrastructure and basic services
- Urban economy and society
- Urban disaster risk management
- Urban governance

Figure 2
The four phases of the CityRAP process



(RFA), including short- (0-2 years), medium- (3-5 years) and long-term (6-10 years) activities in the form of bankable projects.

The balance between city government work and external facilitation is key to CityRAP's positioning as a tool that enables rather than circumvents city leadership, strategic thinking and action planning. The implementation of the tool is ideally completed within two to three months through four phases (see Figure 2) and requires minimal financial resources for supporting the costs related to the trainers' fees and travel, municipal staff time and workshops.

Findings and conclusions

From the implementation of the CityRAP tool in 29 cities and towns scattered over 11 African countries, a number of findings and conclusions can be derived:

- Bringing together local administrations and community representatives around collective and inclusive data collection, analysis and prioritisation of key issues to enhance resilience can increase

ownership and validity of a city's resilience strategy, and thereby its long-term success.

- Where relationships between city councils and stakeholders were hampered by mistrust, including due to matters relating to poor service delivery, the CityRAP process provided a platform for engagement and resulted in insightful debates around agency and legitimacy in governance processes, which has been a key advantage of this process.
- The CityRAP process revived interest in resilience planning among city managers and community members. The tool raises awareness and creates a starting point for better-trained local authorities and communities on urban resilience issues. This is a fundamental start to enhancing the resilience of a city. For example, the tool triggered self-mobilisation of communities, including for road opening and improvement of drainage in flood prone neighbourhoods in Lilongwe, Malawi, and Chókwè, Mozambique.

- Multiple examples exist where cities mobilised funding through the CityRAP tool process:
 - Cities in Madagascar, Malawi, Mozambique and the Union of Comoros will soon benefit from physical interventions under a USD14 million regional Adaptation Fund project starting in March 2020;
 - In Lilongwe, the Department for Disaster Management Affairs has received funds for green and grey infrastructure to reduce flooding in informal settlements; and
 - In Morondava, Madagascar, the city council mobilised EUR1.5 million to reduce coastal erosion.

Overall, the tool tries to bridge the complexity-capacity gap as an enabling tool for identifying resilience building entry points. Inherent opposing ambitions behind the tool create inevitable tensions between the aim of building capacity and creating ownership and momentum versus the quality of the output that captures strategic resilience building interventions under a holistic city vision for resilience. The tool design

The balance between city government work and external facilitation is key to CityRAP's positioning as a tool that enables rather than circumvents city leadership, strategic thinking and action planning

has opted for leveraging local knowledge and using existing information, drawing in the perceptions of municipal staff as well as the communities. It will inevitably not lead to scientific rigorous outputs which could be achieved only if much more time, funding and data were available. However, it provides opportunities for cities to prioritise resilience building actions and bankable projects in the short and medium term within a long-term resilience vision established in a participatory manner.



In Lilongwe, the CityRAP has helped mobilise stakeholders to invest in green and grey infrastructure in the largest flood-prone informal settlement

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Chapter 19

Communicating risk from the frontline: projecting community voices into disaster risk management policies

By Emmanuel Osuteye, Hayley Leck, Cassidy Johnson, Tim Ndezi, Festo Dominick Makoba and Mark Pelling

Policy pointers

- Cycles of risk accumulation need to be addressed through effective and participatory bottom-up as well as top-down communication. This should include adequate community voices in decision-making processes.
- Policy provisions and funding for disaster risk management need to reach down to the sub-ward/neighbourhood level given the centrality of this government level in dealing with everyday experiences of risk and developmental challenges.
- City planning and policies require greater consideration of informal settlements, since these tend to bear disproportionate burdens of extensive and everyday urban risks.
- For better-informed planning decisions, local-level decision makers need to collaborate with communities to capture the experiences of risks and to measure the burdens arising from these risks.





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Research on cross-scalar risk communication and disaster risk governance was carried out in Dar es Salaam, Tanzania. The research revealed that while there is considerable potential for communities to measure and communicate risk and to prioritise actions, there is little actual scope for them to influence disaster risk governance. Although disaster risk management (DRM) has been devolved in Tanzania, it has not gone deep enough to transfer adequate powers and financing to the sub-wards - the lowest level of government, which is at the frontline of managing the majority of everyday risks. Effective communication of risk upwards from communities to higher levels of governments and of DRM policies and opportunities downwards to communities and across sectors is crucial to overcoming the communication gaps. If communication is participatory and collaborative, there is scope for local actors to reflect on the need for action and be recognised across governance scales to ensure communication plays a key role at and among all levels.

Addressing the risk-development nexus requires coordinated approaches that interlink various sectors, including urban planning, environmental management, public health, disaster management and climate change adaptation. It must transcend the formal and informal boundaries of governance. Central to this is ongoing effective communication and coordination between all levels of governance, especially between sub-ward/ neighbourhood government and communities..

Research carried out in Dar es Salaam, Tanzania, reiterates the importance of understanding risk across a spectrum that encompasses everyday, small and large disaster events. It also emphasizes the importance of effective risk communication and co-ordination across geographical scales and administrative levels. Such an overview helps to forge better understanding of the interactions between multiple hazards and the underlying drivers of risk (which are often linked to poorly planned and managed urban growth, poverty and climate change). This is particularly pertinent in the context of Dar es Salaam, where informality is widespread.

People in towns and cities across sub-Saharan Africa are becoming increasingly vulnerable to, and impacted by, a wide range of hazards which include everyday hazard events (e.g. infectious/ parasitic diseases and road traffic injuries), small disasters (e.g. structural collapse of buildings or soils and flash floods), and large disasters (e.g. tropical storms, earthquakes and major floods). Everyday hazard events, comparatively small as they may be, can nevertheless have a considerable and, in some cases, an even higher aggregate impact on human health and wellbeing than larger catastrophic events. This leads to cycles of risk accumulation that trap individuals and communities in conditions of vulnerability. It is imperative that these vulnerabilities are better understood and adequately addressed in urban development policy and planning.

This chapter reflects on findings from two related research initiatives undertaken in Dar es Salaam between 2015 and 2018. The first, *AXA Outlook Metrics for Policy Action in Urban Areas: Characterising risks facing low-income groups* seeks to bring into public and policy debates a discussion of how to measure the impacts of environmental risks on informal settlement dwellers, and how to join policy and community action on addressing these risks in Dar es Salaam. The second, the Urban Africa: Risk Knowledge Programme (Urban ARK) is a three-year research and capacity building

programme funded by DFID and ESRC. It seeks to establish an applied research and policy agenda for risk management with the main objective of reducing disaster risk in urban sub-Saharan Africa by breaking cycles of risk accumulation. Broadly speaking, both research projects focused on analysing cross-scalar risk communication and governance in Dar es Salaam.

— Capturing community experiences of risk and risk management

Two sub-wards in Dar es Salaam were selected for the AXA Outlook study: Mtambani and Bonde la Mpunga (see Box 1). They were chosen because of their risk profiles and the presence of an active federation, in this case the Tanzanian Urban Poor Federation (TUPF), which comprises community-based organisations that are based on savings groups to address members' and communities' needs for basic services and infrastructure.

Using the 'Action at the Frontline' methodology developed by the Global Network of Civil Society Organisations for Disaster Reduction (GNDR), the local NGO Centre for Community Initiatives (www.ccitanzania.org) undertook interviews and focus group discussions with the communities to capture and rank the threats/risks and impacts experienced. They also looked at some coping strategies and the perceived barriers to remedial action by both the authorities and the communities themselves. The community-generated data from this AXA Outlook study was presented and discussed at a series of policy workshops with the communities, sub-ward governments, municipal and national DRM government counterparts, and other stakeholders in 2017 and 2018.

The threats and risks identified by the communities emphasised several small-scale disaster events, such as flash flooding and persistent water inundation. This revealed a potential correlation between the precarious socioeconomic and living conditions of residents as driving factors for some of the risks. For instance, low income levels and unemployment have an influence on crime incidence and drug abuse. Likewise, the lack of storm drainage and drains blocked by uncollected waste are closely tied to flood events.

The participants stated that the most common negative impact is the high incidence of water- and vector-borne diseases such as cholera, typhoid and

Box 1. Mtambani and Bonde la Mpunga: Basic data and risks identified by the communities

Mtambani

- Located in Vingunguti ward, Ilala municipality
- Population: 13,900
- Houses: 960
- Households: 3,557
- Informal settlement (uniformly unplanned) with poor infrastructure, poor services

Bonde la Mpunga

- Located in Msasani ward - Kinondoni municipality
- Population: 17,553
- No. of houses: 1,659
- Mixed planned and unplanned area
- High water table

The main risks identified in the two settlements include:

- Crime
- Poor solid waste management
- Lack of storm water drainage infrastructure
- Lack of waste water (and toilet) infrastructure
- Lack of basic health services/hospitals
- Flooding
- High living costs
- Drug abuse

malaria. Other negative outcomes, such as persistent pungent smells, a sense of insecurity and fear, loss of sleep or damage to property, all underscore the multiple challenges faced daily by the residents.

Although all residents of the community are affected, the distribution of risk within households showed that children were the most affected in Bonde la Mpunga, followed by women and then men. One of the notable reasons for this was the periodic flooding of the local primary school which disrupts attendance during the rainy season. In Mtambani, women were found to be the most affected, followed by children and men. This is likely linked to the fact that women typically bear the burden of the household's domestic tasks and responsibilities, which become significantly more complex during and immediately after these events.



People in cities across sub-Saharan Africa are becoming increasingly vulnerable to everyday hazard events such as infectious or parasitic diseases



The high turnover of government officials across all levels of governance hinders the formation of lasting relationships and the establishment of communication channels between community actors and DRM officials

Nevertheless, everyday risks are inadequately accounted for in DRM policies at national and local levels, since the major focus is on large, intensive events and disasters. Furthermore, the DRM policy structures are not devolved below the ward level in urban areas in Tanzania and have no specific provisions to recognise or cover informal settlements. Additionally, there is both limited financing for, and awareness of, the prominence of these everyday risks at the high levels of decision-making. While most government policies are translated into Swahili, many community residents were unaware of the provisions and felt that they had neither been adequately consulted nor involved in the preparation of such important documents.

The high turnover of government officials across all levels of governance hinders the formation of lasting relationships and the establishment of communication channels between community actors and DRM officials. It was felt by the communities that more dedicated and structured communication is needed to create awareness among the higher levels of governance (where policies are currently decided upon) and to build relationships. Inadequate funding for proactive disaster risk planning and politically filtered funds disbursement were other shortfalls identified by the communities. Historically, funding and disaster risk planning do not target residents in declared hazard-prone, informally settled urban areas. Consequently, the most vulnerable may neither be prioritised nor receive support in the event of a disaster, nor be supported in their planning for disasters.

Both case study communities have an active presence in the Tanzania Urban Poor Federation (TUPF), which sometimes works in partnership with the Mtaa (street and neighbourhood level government). This indicates that some local coordination and action towards DRM activities at the sub-ward level exists, albeit significantly challenged

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for resources. Well-functioning community-based organisation and governance structures, through the support of the federations and others, can be a major determinant of disaster risk reduction (DRR) capacity (Satterthwaite, 2017). Responses can be very effective with joint initiatives by residents and the city government or other public agencies. However, such collaborative initiatives still face multiple constraints. More emphasis is required for enhancing local government capacity to concurrently develop city-wide risk reduction systems and to address the underlying structural causes of risk, beyond individual communities.

— Local-led action and risk communication/ coordination across scales

Like many African countries, Tanzania promotes a decentralised DRM governance approach but implementation of the complex devolved structures has proved challenging. Research by the Urban ARK project found, however, that empowering the lowest level of DRM actors in communities can help address key operational and implementation deficiencies in these elaborate structures. The Urban ARK data was acquired primarily through semi-structured interviews and focus group discussions with key state and non-state actors across scales. Local governments collaborating with groups at risk is key to promoting equitable dialogue and solutions. For example, as shown by TUPF members, people can mobilise and mitigate everyday risks and strengthen DRM if their efforts are acknowledged and their rights recognised. While a number of collaborative governance initiatives have emerged across Dar es Salaam involving local governments, communities in informal settlements, NGOs, researchers and other actors, these remain limited in scope, fragmented and hampered in their inability to scale up (Pelling *et al.*, 2018).

More cross-level collaboration and information sharing is required between stakeholders such as ward executives and municipal officers. This should occur through ongoing, structured meetings and planned initiatives and not only after a disaster has occurred. Major challenges to such sustained interaction and more impact for resilience building include high staff turnover in the government and a lack of clarity among representatives at the various engagement levels on their roles and responsibilities. There is also poor coordination between departments

and sectors responsible for addressing risk reduction, such as between the health and environment sectors or the municipal water/sanitation and engineering departments. Government representatives recognise the challenges and emphasize a need for capacity building as well as guidance on how to achieve greater collaboration. Collaboration is currently restricted by non-conducive departmental funding structures, specific remits and responsibilities.

Risk communication channels do exist but are not being used effectively for bottom-up communication of risks. This is due to various reasons, including community frustration and fatigue with the perpetuation of challenges or formally reported problems that have not been addressed or responded to. According to research participants, monthly and quarterly meetings between the communities and DRM committees at the ward level are often poorly attended or not regularly organised in some areas.

The Disaster Management Act of 2015 operationalised a DRM structure devolved from the national to the local level and stipulated that a DRM committee is to be set up at each level (see www.preventionweb.net/english/policies/v.php?id=48822&cid=184). In urban areas, the structure is devolved to the ward level. Yet, in rural areas it extends further down to the village level (equivalent to the neighbourhood and street/Mtaa level in urban areas). Consequently, there is a disconnect between the formal DRM structure and the practicalities of addressing disaster risk in (urban) informal settlements because the devolution does not reach low enough. Actors at the Mtaa level are the key, as they straddle the informal-formal interface of community members and the local government in dealing with everyday experiences of risk and developmental challenges. Together with local communities, the Mtaa leadership is often the first responder during times of crisis and are at the frontline of the risks faced by communities. Yet within the current formally devolved structure, there are inadequate explicit formal provisions for DRM, as well as inadequate funding deployed at this Mtaa level, both pre- and post-crisis.

— Conclusions

To break cycles of risk accumulation and to prevent or reduce the impacts of disasters, a better understanding is needed of how knowledge of risk can inform mitigation action. This requires collaboration and

To break cycles of risk accumulation and to prevent or reduce the impacts of disasters, a better understanding is needed of how knowledge of risk can inform mitigation action

ongoing communication between state and non-state actors in partnership with local communities and reaching out to both the formal and informal sectors. Local governments, academia, research centres and civil society organisations working in partnership with local communities can help establish sustained local action and collaboration in informal settlements. This will promote the strengthening of capacities at all levels, including technical and practical knowledge, and can encourage sustainable long-term support through partnerships. This will also facilitate that community voices on risk experience in informal settlements are better heard and fed into policy action, particularly with the inclusion of decision-makers at the Mtaa level and above.

A key insight emanating from this research is the significant opportunity that comes with deploying both community-based (bottom-up) and structural (top-down) analyses. When both are participatory,

it provides further scope for local urban actors to reflect on the need for joint-action in the vital middle governance space. Effective ongoing communication is a critical part of this - at and between both levels. Community-based risk information is valuable and needs to be prioritised through more effective upward channelling of information. Currently, DRM policies do not enable sub-wards' meaningful involvement in key decision making while communication between levels and across sectors remains patchy.

Given the diversity of actors and institutions involved in DRR across all levels in Dar es Salaam, it would be beneficial to develop information-sharing platforms. This can be achieved through regular fora and face-to-face interactions, as well as virtual contact, such as through centralised data repositories. Ongoing funding and institutional support will be critical to operationalisation and sustaining momentum. Recognition of the centrality of participatory and community-led approaches to account for everyday risks is important, as is consideration of how the broad spectrum of risks faced by communities can be better captured and addressed by policy. At the same time, the wider DRM policy environment needs to address the challenges of devolution and duplication of responsibilities, as well as institutional inertia, including the ongoing delays in signing off DRR and related policies.



A number of collaborative governance initiatives have emerged across Dar es Salaam involving communities in informal settlements, local governments, NGOs and researchers

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Chapter 20

Reducing risk in the city: an agenda for integrated risk management

By Mark Pelling

Policy pointers

- The integration of risk reduction into urban development processes can be advanced by working on urban risk planning and decision-making practices. These are complementary activities.
- Participatory strategies for scoping risk and resilience planning are key mechanisms for shifting urban risk culture towards integrated risk management.
- Reducing risks can benefit doubly from approaches that reduce the urban poor's vulnerability and exposure to risks while simultaneously containing losses and enabling pro-poor development.
- Working on risk root causes, loss data management and household resilience are key entry points for the practical integration of risk management into sectorial policy and local practice.

In Dar es Salaam, Tanzania, modelling for sea level rise has helped focus the attention of city planners on the tensions between relocation and upgrading coastal, low-income settlements at risk
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In African cities the challenges of disaster risk management are exacerbated by rapid population growth and deep and persistent poverty. Orienting risk management towards a developmental agenda can help confront the root causes of both poverty and risk. Transition to a more integrated approach has most chance of success when it combines interventions working on the risk culture of a city, which include planning and specific sectorial and local decision-making. Risk cultures that prioritise and combine integrated poverty reduction and risk management with examples of successful outcomes of decision-making at sectoral and practical levels can be compelling and make back-sliding more difficult. This chapter summarises experiences from African cities in which advances have been made through demand-driven and participatory planning, with a focus on the root causes of risk, the strengthening of loss data, and a better understanding of the ways in which poor urban households access critical resources during times of crisis.

Integrating risk reduction into urban development processes requires action at the levels of urban risk planning and decision-making for urban risk policy and practice. Both are equally important. Where risk planning is limited, the integration of risk management is more difficult to sustain in the long run. Where decision-making policy and practice are underdeveloped and limited to individual policy areas, integrated planning can lack grounding in professional practice and may more easily be reversed. The integration of risk management into urban planning also includes working on the role of science and its communication with both policy and the public, on the relationship between civil society and urban administrations and through leadership that is locally accountable. A range of participatory methods exist that can combine these elements in practical activities to promote thinking and action on risk planning amongst local communities, city level actors and the scientific community. Urban decision-making involves activity and reform for those sectors contributing to the root causes of risk (hazard mitigation, land-use and ownership, critical infrastructure and its accessibility, social and political relationships), by tracking the impacts of events and working to support households to recover and, ideally, to bounce back better from events.

The examples of action presented in this final chapter highlight where research can help open up debate and facilitate impacts on the risk-planning culture and decision-making policy/practice. The examples are drawn from African urban experience detailed throughout the chapters of this book, and reflect the region's predominance of vulnerability-driven risk. Vulnerability-driven risk is a product of widespread urban poverty and, in Africa, is associated with high-frequency low-impact events (everyday risk). For example, high vulnerability population segments suffer even with everyday, modest rainfall which can cause frequent waterlogging and localised flooding. In contrast, the general literature on urban risk management draws overwhelmingly from Asian and Latin American experience and from catastrophic events, resulting in an overbearing focus on hazard-driven systems and large-scale disasters.

African cities are less exposed to earthquakes, tropical cyclones or hurricanes and their catastrophic losses. Risks in African cities and settlements are more driven by vulnerability resulting from economic poverty, marginalisation through decision-making processes, inadequate access to basic infrastructure

(e.g. safe sanitation and drinking water) and ineffective infrastructure maintenance (especially of solid waste management and drainage) (Fohlmeister *et al.*, 2014). This implies that climate change with even small variations beyond pre-industrial weather patterns is potentially tipping African urban populations into risk from flood, drought, heat or cold shock and wind.

Reducing risk can benefit from twin approaches that reduce vulnerability and exposure for the urban poor, while simultaneously containing loss and enabling pro-poor development. The Sustainable Development Goals (SDGs) capture this in their ambition to 'leave no-one behind' and in Goals 1, 11 and 13, which each include the same indicator for 'the proportion of local governments that adopts and implements local disaster risk reduction strategies

Risks in African cities and settlements are more driven by vulnerability resulting from economic poverty, marginalisation through decision-making processes, inadequate access to basic infrastructure and ineffective infrastructure maintenance

in line with national strategies'. This is a 'systems approach' that brings together place-based actions, infrastructure-wide interventions and broader engagement with the urban and national risk culture.

While such a systems-wide view of risk management is necessarily ambitious, evidence suggests that it also brings an opportunity to work at both multiple locations and scales and in ways that can be mutually reinforcing. This would be important for African cities with limited human resources and where the priorities of donor agencies needs to be considered. Recognising that risk culture and policy/practice can be moved forward through a diverse range of pathways is an advantage. Once risk planning cultures are established, the politics of decision-making, policy-setting and practical priorities can align with a more integrated approach to risk

management. Similarly, as examples of successful project and policy-level risk management arise, they can sustain shifts in risk culture.

Integrating risk management into African cities' development is important. The rapid expansion of urban populations, building stock and infrastructure (formal and informal) provides a unique opportunity for African communities to build risk reduction into the planning priorities, processes and practices of the region. With up to 60 percent of the urban fabric anticipated for 2030 yet to be built, such an agenda requires engagement not only with city authorities but also with organised community actors and the private sector. All are important in shaping Africa's future cities; none should dominate.

Building disaster risk planning culture for integrated risk management

Shifting focus for the responsibility of risk and its policy formulation from risk management to integrated development is as much a socio-cultural as a technical concern. For many African cities, building capacity for this transition has begun with innovative multi-partner governance arrangements. These have taken advantage of opportunities to creatively link new agendas to existing goals, plans and programmes (Carmin, Anguelovski and Roberts, 2012). The emergent framings can support the incorporation of social justice concerns in towns and cities as a critical dimension of inclusive and equitable development and risk reduction (Fraser *et al.*, 2017).

Figure 1 identifies three blockages and three mechanisms for overcoming obstacles in the transition of risk management from an external practice outside development to an intrinsic practice within integrated development planning.

Key identified constraints are:

1. **Existing donor priorities.** Very often the city is either not a priority at all for global civil society and international development actors (if compared to rural livelihoods and risk management) or the city is reduced to a technical system with interventions seldom expanding beyond investments in physical infrastructure.
2. **Fragmented city governance.** Blockages to urban risk reduction can include priorities imposed on community-led action by urban authorities, as

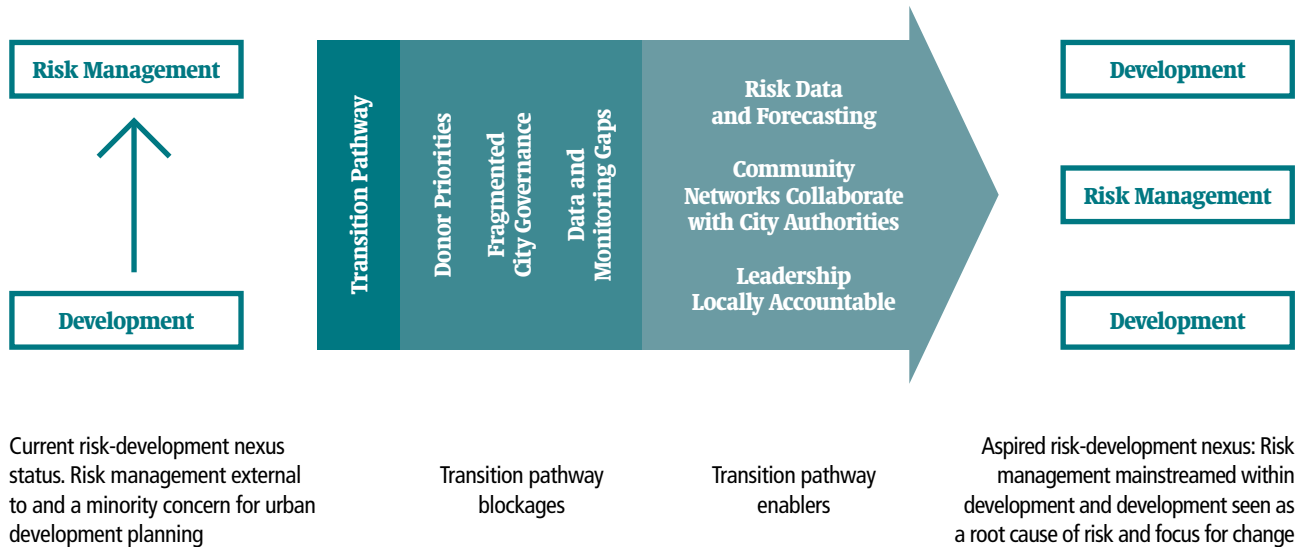
well as tensions that might exist between urban and national agencies. Where urban planning is constrained, the city is shaped by multiple single acts of development, from large shopping malls to individual informal sector dwellings. In this way fragmented city governance leads to a fragmented urban morphology. A mosaic of interacting urban land-uses is produced where risk can spread and act to reduce risk in one location while increasing risk in another one (e.g. drain cleaning can be frustrated by a lack of action in neighbouring areas).

3. **Data and monitoring gaps.** Evidence-based policy formulation becomes difficult where systematic and long-term data archives are not available. This is most pressing for event loss data. Without georeferenced data, disaggregated by gender, planning becomes open to value rather than evidence-based planning. That creates the potential for capture by urban interest groups and, in extremes, this can include the denial of risk, its exaggeration to increase land value or to justify forced relocation.

Opportunities to move beyond these constraints have been observed where there is:

- **Risk data and forecasting.** Providing not only data but also institutional architecture and human resources for the collection, management and analysis of data that is connected to key planning processes. In some cities this might be motivated by opportunities for early warning and scope for early action. Elsewhere a more basic priority might be for loss data to track policy and to hold decision-makers to account. There are also roles here for academia, for citizen's science and for government agencies to collaborate by sharing resources and data.
- **Community networks collaborating with city authorities.** These actors bring different resources into risk management. Community networks can offer detailed knowledge of vulnerability and its drivers, as well as scope for co-benefits when action embedded in the community strengthens leadership, livelihoods or infrastructure access. City authorities have a legal mandate and bring the ability to work at scale to address structural root causes. Where communities and city authorities work in partnership, opportunities open up for integrated risk management.

Figure 1
Strategic opportunities for transitioning to integrated risk management



Source: Pelling et al., 2017

- Locally accountable leadership.** Risk and loss are felt locally and, in African cities, are tied to vulnerability rooted in poverty and inadequate development opportunity. At the same time, especially in larger cities, decision-making for urban investment tends to be more focussed on global markets and land-speculation than on enabling opportunities for endogenous economic development. Locally accountable leadership can help reverse this trend and prioritise investments that provide economic growth and support demand for adequate urban services and infrastructure.

These opportunities are achievable, meaning that reducing risk is within the grasp of city actors. Action planning tools at the community and city levels provide mechanisms to do this. For instance, in Dar es Salaam, Tanzania, the availability of data, including modelling for sea level rise, has helped focus the attention of city planners and organised civil society on the tensions between relocation and upgrading in coastal, low-income settlements at risk. In Nairobi, Kenya, organised civil society, in collaboration with the City County, have developed innovative approaches to the re-planning and upgrading of informal settlements. For example, in March 2017

the Nairobi City County declared Mukuru informal settlement a Special Planning Area (SPA). This was a direct outcome of a recently formed collaborative approach to governing this area initiated by the Akiba Mashinani Trust (AMT) (an SDI affiliate). The intent is to integrate risk management into securing land tenure, settlement upgrading and redevelopment schemes through innovative multi-level governance, linking community members with both low and high levels of government. This is a notable transition in state-civil society relations in Nairobi and could serve as a catalyst for similar shifts in governance relations across sub-Saharan Africa. Karonga, Malawi, illustrates the importance of relations between traditional tribal chiefs and regional authorities for opening discussions on risk management, presenting a small-town version of multi-level governance.

Science has a key role to play in facilitating reflection amongst local and city level actors on ways in which existing development produces risk and how such processes might be redirected to reduce risk. These are a practical measure that can lead the way in simultaneously delivering integrated development planning for reducing risk and enhancing inclusive pro-poor development. Examples include UN-Habitat's City Resilience Action Planning (City RAP)

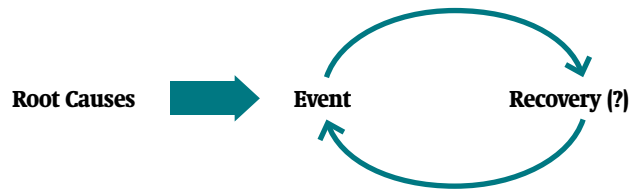
tool that works with city-level planners to define key risks, available resources and a realistic action plan. City-level science engagement can also be helpful in bringing diverse stakeholders around the table. In many cities there is a lack of interaction and trust between departments of the same city authority as well as between the city and community organisations. City-level science engagements based on urban risk data and analysis can be a part of building trust and collaboration. A range of community level approaches exists. The ‘Views from the Frontline’ tool mirrors the City RAP tool in facilitating local actors to think through risk priorities and reflect on what resources can be made available to enhance resilience. Where this works well, community strengthening and leadership will be built. The ReMapRisk tool works through local leadership, including traditional leaders, to define risk and plan local interventions which themselves become capacity building exercises.

Entry points for integrated risk management in urban policy and practice

Figure 2 summarises key entry points for urban decision-making policy and practical action to reduce risk. It illustrates these with examples and identifies cities where capacity has been built, data has been generated or actors have collaborated in applied research for planning or action. These entry points are considered around the logic of the ‘disaster cycle’. This emphasises the importance of working to tackle risk root causes, of recording losses and of enabling recovery and resilience. In so doing, this overcomes the false dichotomy of development and humanitarian work which all too often separates risk reduction from everyday development planning and practice.

- **Addressing risk root causes.** Figure 2 identifies four domains of risk root cause. The first concerns the natural and physical environment with city climate downscaling that aims at translating global and regional scale climate models so that they become useful for city planners. This requires both rescaling and communication of science processes. City planners are more interested in the impacts of climate change and how these might be prepared for in disaster risk or public health sectors, than in statements about climate change itself (Fraser *et al.*, 2017). The second relates to land-use change e.g. accounts of urban texture drawn from satellite

Figure 2
Practical entry points for integrated risk management



Root Causes

Hazard: City climate change assessments (Dar es Salaam, Nairobi, Karonga)
 Land-use: Urban textures analysis (Nairobi, Karonga)
 Critical Infrastructure: Solid waste management (Nairobi, Mombasa, Dakar)
 Social Conflict: Power analysis (Dar es Salaam, Nairobi, Dakar)

Event

Loss Inventory: Desinventar (Ibadan, Niger, Nairobi)

Recovery > Event

Household Adaptation: Household recovery tracking (Niger)

data to track the growth of the city, changing land-use and so better interpret the dynamics of land-use and associated risks, including the shifting of risk from one part of the city to another as the built form and use of neighbourhoods change. The third domain of risk root causes are those generated by critical infrastructure: e.g. solid waste management systems, the management of which can either reduce or produce and concentrate risk through interactions with drainage, air quality and disease vectors. Finally, there are root causes of risk from the social and political relationships of power e.g. social conflict and power analysis that can highlight the blockages and opportunities for collective action and for collaboration between community groups and the political dynamics of city government.

- **Loss inventory.** Without data on losses and damage it is impossible to track the effectiveness of local and policy interventions or of overall trends in urban development. City records on disaster are almost always very limited. Some emergency response agencies keep records of call outs and some hospitals have detailed data on admission while newspapers and other media report on newsworthy events. But it is rare to find centralised data management systems that can provide the kind of spatially and socially disaggregated data that can make a difference in strategic policy making. Building these linkages and institutions

takes time but can be achieved. UNISDR's promotion of the Desinventar data management tool provides such a mechanism. Although it is mainly deployed for national data archives, it is also appropriate for cities and has been successfully deployed as such.

- **Household adaptation.** Most often household adaptation is presented as a static agenda, whereby risks are defined and solutions to mitigate these are identified. The reality for the urban poor, however, is more dynamic. Resilience arises from the ability of individuals, families and households to obtain at least post-event basic necessities (food, water, security, shelter, companionship) when established access mechanisms may have been disrupted. In African cities where events are small, the humanitarian sector is rarely involved and the urban poor manage the transitional times alone. Social safety nets can help but are rarely in place. Refocussing both the humanitarian and government safety nets to serve the needs of the poor during recovery is a key opportunity to help build resilience into African cities.

Conclusion

Both the causes for risk accumulation and the opportunities for risk reduction in urban Africa lie clearly in development policy and practice. Combining action on overarching urban planning risk culture and the details of decision-making for sectoral policy and local practice can be a powerful and long-lasting way to approach the integration of risk management into urban development. Once these are working together, positive feedback can be built. Success at a project and policy level reinforces the importance of risk culture across the city which, in turn, leads to the prioritisation of inclusive risk-reducing practice and policy.

For risk reduction in urban Africa, the emergence of multilevel governance arrangements (strongly networked civil society organisations acting in concert with local and city authorities to address root causes, to record event losses and to better understand and support household resilience) provides a specific opportunity for equitable and sustainable risk reduction. The lessons reveal practical and achievable mechanisms through which risk reduction can also help in meeting the SDG targets.



In March 2017, Nairobi City County declared Mukuru informal settlement a Special Planning Area as a result of a collaborative approach initiated by the Akiba Mashinani Trust

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Appendix

Authors and further reading

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Chapter 19

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Chapter 20

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