CHAPTER 6: Urban Vulnerability: Experiences and Ways the Urban Poor are Coping with Risks of Climate Change

Abstract

Cities are centres of innovation and prosperity yet they disproportionality bear the impacts of 21st-century challenges such as climate change, inadequate infrastructure, population growth and social and economic inequity. The poor are more likely to rely on child labour and to engage in risky coping strategies, including illegal and criminal activities such as prostitution and smuggling. Accessing public health and education services may pose a financial burden on refugees that exceeds the burden experienced by other urban poor. In many cases, financial shocks come in the form of school fees and hospital bills that exceed their monthly income and may indebt them to their community or employers. The methodology used in this study includes desktop review, secondary data sources, reports and magazines. Planned anticipatory adaptation has the potential to reduce vulnerability and realises opportunities associated with climate change, regardless of autonomous adaptation. Implementation of adaptation policies, programmes and measures usually will have immediate and future benefits. Adaptation measures are likely to be implemented only if they are consistent with or integrated with decisions or programmes that address non-climatic stresses. The costs of adaptation are often marginal to other management or development costs. Adaptation to climate variability from physical, economic and social perspectives at the community level can be scaled up to the local government level through a pro-poor approach in land-use planning and the development of buildings and infrastructure that take climate change risks into account.

INTRODUCTION

Climate change has brought about numerous challenges to the people. These challenges are however, felt mostly by the urban dwellers. This is because most of the changes are being felt in the cities due to the swelling population in cities and increased urbanisation. This has made urban areas vulnerable to the risks of climate change phenomena. In most urban areas, there are increasing cases of heavy rains accompanied by flooding, as well as heat waves that causing these areas to be too hot. The frequent heat

waves breed highly charged thunderstorms that disrupt daily activities in urban areas. The urban poor are the most vulnerable because of their lack of capacity to handle and adapt to climatic changes.

Climate change will lead to increased frequency, intensity and duration of extreme weather events such as heavy rainfall, warm spells and heat, drought, intense storm surges and associated sea-level rise (IPCC, 2007, 2012; Hunt and Watkiss, 2011; Romero-Lankao and Dodman, 2011; Rosenzweig *et al.,* 2011). Adaptation to climate change depends centrally on what is done in urban centres, which now house more than half the world's population and concentrate most of its assets and economic activities (World Bank, 2008; UN DESA Population Division, 2012).

The purpose of this study is to understand the nuances and manifestation of urban vulnerability in Africa regarding ways in which the poor are coping with risks induced by climate change. The term "vulnerability" is also applied to sectors including food processing, tourism, water, energy and mobility infrastructure and their cross-linkages, for instance, the dependency of perishable commodities on efficient transport (Satterthwaite *et al.,* 2014). These groups are often the least resilient and have the least capacity to cope in the short term and adapt over the long term. They are vulnerable because they are poor, live in high-risk areas and have limited social capital and access to resources and institutions—all things that make it harder for them to recover after damaging climate events.

The Population Council is prioritising research to strengthen the evidence on resilience among those who are vulnerable to environmental stressors (Population Council, 2018). The research is designed to fill gaps and generate the evidence decision-makers need to develop and implement effective programmes and policies that can build the resilience and adaptive capacities of those most vulnerable to environmental shocks and stressors. The serious impacts of extreme weather on many urban centres each year demonstrate some of the risks and vulnerabilities to be addressed (UNISDR, 2009; IFRC, 2010).

METHODOLOGY

The study used desktop review, secondary data sources, reports and magazines in coming up with the data. This was in a bid to obtain data on vulnerable groups and their adaptive strategies. Trend tracing through

document analysis was employed. Reviews of policies and frameworks on adaptation to climate change were done.

BACKGROUND AND OVERVIEW

In situations of conflict and unstable governance, a sudden climate-related hazard, or successive occurrences of multiple climate hazards, might aggravate tensions and displace people for longer periods or contribute to decisions to migrate internally to urban areas (Moench and Dixit, 2007; Hunter, 2001). In some instances, people are displaced for months or years post-hazard due to underlying vulnerability and inadequate responses (Crawford *et al.,* 2015). Examples include the 2016 floods in Louisiana in the United States of America, when some households were displaced for months due to damaged homes and assets and shortcomings in government relief systems (Domonoske, 2016), or the 2008 Kosi floods in Nepal and Bihar, India, where many of the displaced were still living on embankments up to a year after the flood due to slow relief and recovery responses (Ghimire and Chautari, 2010).

In 2008, more than half the world's population was living in urban centres and the proportion continues to grow (UN DESA Population Division, 2012). Three-quarters of the world's urban population and most of its largest cities are now in low- and middle-income nations. The gross domestic product (GDP) of most nations is generated in urban centres and most new investments have concentrated there (World Bank, 2008; Satterthwaite *et al.,* 2010). In terms of the population, economic activities, assets and climate risk, they increasingly concentrate on, adapting urban areas to climate change require serious attention Satterthwaite *et al.,* 2014). Most urbanisation is underpinned by economic logic. All wealthy nations are predominantly urbanised and rapid urbanisation in low- and middle-income nations is usually associated with rapid economic growth (World Bank, 2008; Satterthwaite *et al.,* 2010). Most of the world's largest cities are in their largest economies (World Bank, 2008; Satterthwaite *et al.,* 2010).

LITERATURE REVIEW AND THEORETICAL PERSPECTIVES

For each of the direct and indirect impacts of climate change, there are groups of urban dwellers that face higher risks (illness, injury, mortality, damage to or loss of homes and assets, disruption to incomes) (Hardoy and Pandiella, 2009; Mitlin and Satterthwaite, 2013). Age may be a factor (for instance infants and elderly people are more sensitive to particular

hazards such as heat stress) or health status (those with particular diseases, injuries, or disabilities may be more sensitive to these impacts). It may also be that they live in buildings or locations facing greater risks—for instance, on coasts or by rivers with increased flood risks—or that they lack coping capacities. Women may face higher risks in their work and constraints on adaptation if they face discrimination in access to labour markets, resources, finance, services and influence (Satterthwaite *et al.,* 2014).

In urban centres, where virtually all buildings meet health and safety standards, where land-use planning prevents developments on sites at risk and where there is universal provision for infrastructure and basic services, the exposure differentials between high- and low-income groups to climate-related risk are quite low. Having low income and few assets in such urban centres does not necessarily imply greater vulnerability to climate change (Mitlin and Satterthwaite, 2013). Typically, the larger the deficit in infrastructure and service provision, the larger the differentials in exposure to most climate change impacts between income groups (Satterthwaite, 2014). Low-income groups in low- and middle-income nations are often disproportionately vulnerable because of poor quality and insecure housing; inadequate infrastructure; and lack of provision for health care, emergency services and disaster risk reduction (UNISDR, 2009; IFRC, 2010; UN-HABITAT, 2011a; IPCC, 2012; Mitlin and Satterthwaite, 2013). Most deaths from disasters are concentrated in low- and middle-income countries—including more than 95% of deaths from natural disasters between 1970 and 2008 (IPCC, 2012).

The urbanisation-climate change connection has important implications for ecological sustainability (Satterthwaite *et al.,* 2014). Climate change can accelerate ecological pressures in cities and interact with existing urban environmental, economic and political stresses (Wilbanks and Kates, 2010; Leichenko, 2011). This is especially important in a world where transgressions of key planetary boundaries such as climate change and biodiversity may take humanity out of the globe's "safe operating" space (Rockström *et al.,* 2009:1) into an unsafe and unpredictable future. A study by Trusilova *et al.* (2008) analyses the urbanisation-induced disturbances of the carbon cycle in Europe through land-use change, local climate modification and atmospheric pollution. This study shows that urban effects spread far beyond the city's boundaries and trigger complex feedback/responses in the biosphere (*ibid.*). Urbanisation changes land-

use cover, generally reduces the amount of ecologically intact land and causes fragmentation of the remaining land, which reduces habitat value for species and increases the likelihood of further ecological degradation (Satterthwaite *et al.,* 2014).

RESULTS AND DISCUSSION

The level of funding needed for sound urban adaptation could exceed the capacities of local and national governments and international agencies (Parry *et al.,* 2009; Brugmann, 2012). Much of the investment will have to come from individuals and households, communities and firms through their decisions to address adaptation and resilience (Agrawala and Fankhauser, 2008; Fankhauser and Soare, 2013). This might suggest a role for governments, especially local governments. Whether these small-scale decisions by households, communities and firms do contribute to adaptation depends, in large part, on what local governments do, encourage, support and prevent—and their contribution to providing required infrastructure and services. An important part of this is the provision by local governments of appropriate regulatory frameworks and the application of building standards, to ensure that the choices made by individuals, households and firms support adaptation and prevent maladaptation (Satterthwaite *et al.,* 2014). For instance, land-use planning and management have important roles in ensuring sufficient land for housing that avoids dangerous sites and protects key ecological services and systems (UN-HABITAT, 2011a).

Recent analyses of disaster impacts show that a high proportion of the world's population most affected by extreme weather events is concentrated in urban centres (UNISDR, 2009, 2011; IFRC, 2010).About one in seven people in the world live in poor quality, overcrowded accommodation in urban areas with inadequate provision (or none) for basic infrastructure and services, mostly in informal settlements (UN-HABITAT, 2003a; Mitlin and Satterthwaite, 2013). Much of the health risk and vulnerability to climate change is concentrated in these settlements (Mitlin and Satterthwaite, 2013). Their low-income households may need particular assistance because of greater exposure to hazards, lower adaptive capacity, more limited access to infrastructure or insurance and fewer possibilities to relocate to safer accommodation, compared to wealthier residents (Satterthwaite *et al.,* 2014).

Adaptation in a particular area or settlement may have clear benefits for the inhabitants, but can also have knock-on effects on the wellbeing of inhabitants in other areas. Diverting a river course or building an embankment to protect new development, may prevent flooding in one location, but cause or increase flooding somewhere else (Revi, 2005, for Mumbai; Alam and Rabbani, 2007, for Dhaka). Assessments of vulnerability to climate change draw on assessments in other contexts—including the vulnerability of low-income groups to stresses and shocks (Chambers, 1989; Pryer, 2003) and disasters (Cannon, 1994; Manyena, 2006). This includes people's inability to avoid the hazard (exposure), anticipate it and take measures to avoid it or limit its impact; cope with it; and recover from it (Hardoy and Pandiella, 2009).

Mainstreaming adaptation into urban planning and land-use management and legal and regulatory frameworks is key to successful adaptation (Lowe *et al.,* 2009; Kehew *et al.,* 2013). It can help planners rethink traditional approaches to land-use and infrastructure design based on past trends and move toward more forward-looking risk-based design for a range of future climate conditions (Kithiia, 2010; Solecki *et al.,* 2011; Kennedy and Corfee-Morlot, 2013) and reducing administrative cost by building resilience through existing policy channels (Urwin and Jordan, 2008; Benzie *et al.,* 2011; Blanco *et al.,* 2011). Mainstreaming through local government policies and planning ensures that investments and actions by businesses and households contribute to adaptation (Kazmierczak and Carter, 2010; Sussman *et al.,* 2010; Brown, 2011; Mees and Driessen, 2011). But this must avoid overloading complex and inadequate planning systems with unrealistic new requirements (Roberts, 2008; Kithiia, 2010); particularly in many low and middle-income countries, these systems are stressed by lack of information, institutional constraints and resource limitations.

RECOMMENDATIONS AND OPTIONS

All successful urban centres have had to adapt to environmental conditions and available resources, although local resource constraints have often been overcome by drawing on resources and using sinks. This includes importing goods that are resource-intensive and whose fabrication involves large greenhouse gas (GHG) emissions. The growth of the urban population over the last century has also caused a very large anthropogenic transformation of terrestrial biomes. Urban centres cover only a small proportion of the world's land surface, only 0.51% of the total

land area. Only in Western Europe do they cover more than 1%. However, their physical and ecological footprints are much larger. The net ecological impact of urban centres includes the decline in the share of wild and semi-natural areas from about 70% to less than 50% of land area, largely to accommodate crop and pastoral land to support human consumption. It has led not only to a decrease in biodiversity, but to fragmentation in much of the remaining natural areas and a threat to the ecological services that support both rural and urban areas. Future projections suggest that, if current trends continue, the urban land cover will increase by 1.2 million km^2 by 2030, nearly tripling global urban land area between 2000 and 2030. This would mean a considerable loss of habitats in key biodiversity hotspots, destroying the green infrastructure that is key in helping areas adapt to climate change impacts and increasing the exposure of population and assets to higher risk levels.

Many of the challenges and opportunities for urban adaptation relate to the central features of city life—the concentration of people, buildings, economic activities and social and cultural institutions. Agglomeration economies are usually discussed with the advantages for enterprises locating in a particular city. But the concentrations of people, enterprises and institutions in urban areas also provide potential agglomeration economies in lower unit costs for piped water, sewers, drains and a range of services and in the greater capacity for people, communities and institutions to respond collectively. Agglomeration is essential in cities as it encourages the growth of economic outputs. However, it can come with a lot of vulnerable people who become the urban poor. The Outline Development Plan for the Guangdon Greater Bay Area in Hong Kong-Macau has been an initiative to try and combat climate change issues in the city with agglomeration of economies (Yu, 2021). The plan is successful in wealthier areas because they have the means to construct housing on allocated land. However, the urban poor find it difficult sometimes to maintain green spaces because they need cheaper land to settle on and so they end up utilising the open spaces, which have been termed to be the right way of combating some climatic issues (Wang *et al.,* 2022).

The advantages that come with these concentrations of people and activities are also accompanied by particular challenges, for instance, the management of storm and surface runoff and measures to reduce heat

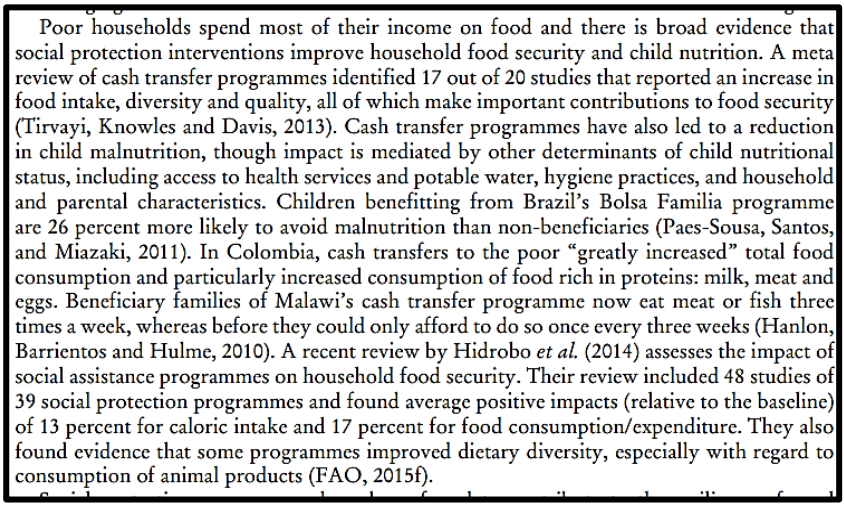
islands. Large cities concentrate demand and the need for ecological services and natural resources (water, food and biomass), energy and electricity and many city enterprises rely on lifeline infrastructure and supply chains that can be disrupted by climate change.

In recent years, literature has emerged discussing resilience to climate change for urban centres and what contributes to it. Addressing resilience for cities is more than identifying and acting on specific climate change impacts. It looks at the performance of each city's complex and interconnected infrastructure and institutional systems, including interdependence between multiple sectors, levels and risks in a dynamic physical, economic, institutional and socio-political environment. When resilience is considered for cities, certain systemic characteristics are highlighted, for instance, flexibility, redundancy, responsiveness, capacity to learn and safe failure.

An important aspect of resilience is the functioning of institutions to make this possible and the necessary knowledge base. The emerging literature on the resilience of cities to climate change also highlights the need to focus on resource availability and seeps beyond the urban boundaries. It may also require coordinated actions by institutions in other jurisdictions or higher levels of government, for example, watershed management upstream of a city to reduce flood risks. There are also the slow onset impacts that pose particular challenges and that may also be outside the jurisdiction of urban governments, for example, the impact of drought on agriculture, which can raise food prices and reduce rural incomes and demand for urban services.

Climate change impacts can have far-reaching influences on food security and safety, but these will crucially depend on the future policy environment for the poor. Agriculture has managed to keep up with rising demands worldwide, despite rapid population growth, the reduction in agricultural workers that accompanies urbanisation and dietary shifts that are more carbon and often land intensive. But food security may be eroded by competing pressures for water or bio-fuels. In addition, there may be tensions between managing land-use to reduce flood risk and food and energy policies. Adapting urban food systems represents a major challenge and will necessitate radical changes in food production, storage and processing (and in reducing waste), transport/the supply chain and access. With the aid of early warning systems, the nation can be alerted of

dry spells and prepare for irrigation schemes in order to provide food security to the people, especially the vulnerable groups. Some use social protection interventions in countries such as Colombia, Brazil and Malawi, as a way to provide food security to vulnerable groups (Akurugu, Damba and Mohammed, 2022).



Poor households spend most of their income on food and there is broad evidence that social protection interventions improve household food security and child nutrition. A meta review of cash transfer programmes identified 17 out of 20 studies that reported an increase in food intake, diversity and quality, all of which make important contributions to food security (Tirvayi, Knowles and Davis, 2013). Cash transfer programmes have also led to a reduction in child malnutrition, though impact is mediated by other determinants of child nutritional status, including access to health services and potable water, hygiene practices, and household and parental characteristics. Children benefitting from Brazil's Bolsa Familia programme are 26 percent more likely to avoid malnutrition than non-beneficiaries (Paes-Sousa, Santos, and Miazaki, 2011). In Colombia, cash transfers to the poor "greatly increased" total food consumption and particularly increased consumption of food rich in proteins: milk, meat and eggs. Beneficiary families of Malawi's cash transfer programme now eat meat or fish three times a week, whereas before they could only afford to do so once every three weeks (Hanlon, Barrientos and Hulme, 2010). A recent review by Hidrobo *et al.* (2014) assesses the impact of social assistance programmes on household food security. Their review included 48 studies of 39 social protection programmes and found average positive impacts (relative to the baseline) of 13 percent for caloric intake and 17 percent for food consumption/expenditure. They also found evidence that some programmes improved dietary diversity, especially with regard to consumption of animal products (FAO, 2015f).

Figure 2: *Social Protection Intervention to Improve Food Security* (FAO, 2015)

Urban centres that are seriously impacted by extreme weather face serious challenges in ensuring that those affected have access to adequate and safe food and water supplies. Flooding, drought, or other extreme events, often lead to food price shocks in cities and spoiling or destroying food supplies for many households. After the 2004 floods in Bangladesh, Dhaka's rice prices increased by 30% and vegetable prices more than doubled, with urban slum dwellers and the rural landless poor the worst affected. When facing increased food prices, the urban poor adopt a range of strategies such as reduced consumption, fewer meals, purchasing less nutritious foods, or increasing income-earning work hours, particularly for women and children. But these erode nutrition and health status, especially of the most vulnerable and fail to strengthen resilience, particularly in the context of more frequent disasters.

Adaptive local responses include support for urban and peri-urban agriculture, green roofs, local markets and enhanced safety nets supplies. Food price increases may be moderated by improving the efficiency of urban markets, promoting farmers' markets and investing in infrastructure and production technologies. Food security may be enhanced by support for urban agriculture and street food vendors and access to cheaper food or measures such as cash transfers (for example, Brazil's Bolsa Familia Programme) or, for older groups, pensions. Initially rural in focus, cash transfer programmes have expanded in urban areas, in some places reaching much of the low-income population.

Passive cooling can be used in both new-build and retrofitted structures to reduce solar and internal heat gains, while enhancing natural ventilation or improving insulation. Passive designs, using super-insulation, ventilation and other measures to ensure energy is not required for most of the year, as in the Beddington Zero Energy Development (BedZED) in London or Germany's Passive Haus standard have set precedents for mitigating household emissions but they can simultaneously contribute to adaptation. Thermal mass can be used for cooling, because it introduces a time-delay between changes in the outside temperature and the building's thermal response necessary to deal with high daytime temperatures. Structures in southern Europe use solar shading, ventilation and thermal mass to promote enhanced cooling. Simulations for London (under UKCIP02 Medium-High emissions scenarios) suggest that passive designs are an eminently viable option for the UK, at least over the next 50 years or so. There are several obstacles though: opening windows may be hampered by security concerns or noise pollution. Modern windows may not ventilate well and site restrictions and cost can impede the use of passive cooling in refurbishing existing buildings.

Policies and incentives need to be aligned to work coherently across multiple levels of government to define and deliver effective urban adaptation. This often involves institutions at different levels with different scopes of authority. Water authorities, for instance, may operate at the water-basin level, representing both national and local interests, while operating independently of urban authorities. Failing to ensure consistent alignment and integration in risk management can lock in outcomes that raise the vulnerability of urban populations, infrastructure and natural systems even where pro-active adaptation policies exist. Local

government capacity is important and the institutions that facilitate coordination across multiple, nested, poly-centric authorities with potential to mainstream adaptation measures and tailor national goals and policies to local circumstances and preferences are also vital as they facilitate the process from the government to the people in their local areas. Horizontal coordination and networking across actors and institutions in different municipalities and metropolitan areas can accelerate learning and action.

CONCLUSION

To fully understand and address the needs of vulnerable communities, the local government is building on its existing research, deep global research expertise and proven approaches in reaching and working with vulnerable populations to examine how humans interact with their environments and explore how to test and develop successful strategies for building resilience. In reviewing adaptation needs and options for urban areas, the documentation reviewed for this study points to two key conclusions. The first is how much the adaptive capacity of any city depends on the quality of provision and coverage of infrastructure and services; the capacities for investments and land-use management; and the degree to which buildings and infrastructure meet health and safety standards. This capacity provides a foundation for city resilience on which adaptation can be built. There is little of this foundation in most urban centres in low-income and many middle-income nations.

The second conclusion is the importance of the city and municipal governments acting now to incorporate climate change adaptation into their development plans and policies and infrastructure investments. This includes mobilising new resources, adjusting building and land-use regulations and continuously developing the local capacity to respond. This is not to diminish the key roles of other actors. But it will be up to the city and municipal government to provide the scaffolding and regulatory framework within which other stakeholders contribute and collaborate. Thus, adaptation in urban areas depends on the competence and capacity of local governments and a locally rooted process of learning about changing risks and opportunities, identifying and evaluating options, making decisions and revising strategies in collaboration with a range of actors.