

Against the tide: climate change and high-risk cities

In the world's poorest and most vulnerable nations, most cities and towns face a distinct dual pressure: rapidly growing population and high vulnerability to the impacts of climate change. Drought, storms, flooding and sea level rise are likely to hit hardest here. These in turn put water supplies, infrastructure, health and livelihoods at risk in the very cities already struggling to provide or safeguard such key needs. An effective response demands capable local and national government and support from strong international networks in building capacity to cope. Most of the Least Developed Countries lack both.

Policy pointers

- **Climate change is set to** strike particularly hard in the rapidly growing urban centres of Least Developed Countries (LDCs).
- **The health and livelihoods** of their populations are already suffering, as evidence from Africa and Asia attests.
- **Good local and national** governance are key to an effective response, but rare in LDCs.
- **Funding must target** international networks of NGOs and local government to build urban resilience in LDCs now and in the future.

Urban battlefield: climate risk in cities

Climate change poses specific risks for all urban centres. Only a few large cities – for example, London and New York – have been able to document these in detail. Much of the evidence of urban climate impacts in LDCs is anecdotal.

In towns and cities, hotter temperatures push up demand for energy — for instance, to power air conditioning — and intensify heat stress, especially in urban heat islands. Prolonged and/or heavier rainfall triggers more severe flooding and, in many cities, a higher risk of landslides – a particular problem for informal urban settlements built on steep slopes or floodplains. Drought leads to water shortages, disrupted hydroelectricity generation and higher food prices, as agriculture suffers. And sea level rise can flood coastal cities and contaminate freshwater aquifers.

But with towns and cities in LDCs so under-resourced, these effects are magnified. The people hardest hit are those least able to avoid or cope with the damage caused by climate change. These are the very young

and very old, who are more vulnerable to heat stress and hazards; and the urban poor, who lack the financial resources to access safe housing and deal with the illness, injury, loss of income and damage to property resulting from extreme climate-driven events. Worldwide, 900 million people live in informal or slum settlements, and in LDCs a high proportion of urban populations live in such settlements.

The following case studies reveal the extent of vulnerability in urban centres in LDCs covered by IIED's CLACC programme (see 'Jargon buster' box, page 4).

Droughts LDCs are among the countries most affected by recent droughts. Drought is predicted to become more frequent and severe as rainfall becomes more scant or irregular with climate shifts. Dramatic impacts from drought are already being seen in Africa, from the south to the Sahara.

Zimbabwe has seen a decline in rainfall of nearly 5 per cent since 1900, and between 1990 and 2005 there was below-normal rainfall over six seasons. Harare and Bulawayo are now affected by water stress, and residents face frequent water cuts and low water

Backstory

More than a quarter of LDCs' population now live in urban areas – a staggering rise since 1950, when the figure was just 7 per cent. Numbering 15 million in 1950, urban populations in LDCs have

grown to 234 million today. The concentration of people in these settlements – densely populated, with limited infrastructure and weak governance – means there is a concentration of risk from climate change. In some cases, these conditions may even intensify the risks from climate change, as the pressures on land and resources are harder.¹

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pressure. In Uganda, 4.2 per cent less rainfall than average fell between 2001 and 2004. Bamako in Mali is seeing widespread difficulties in accessing water throughout the city – although 90 per cent of families have their own wells, the availability of water in these is declining as groundwater levels have fallen. And in Diourbel, Senegal, the River Sine has dried up completely since the 1970s, while groundwater salinity is on the rise with the increasing exploitation of underground water.

Droughts can also disrupt energy generation and damage infrastructure. The Kariba hydropower plant serving Harare has been affected, resulting in load-shedding by the electricity providers.

Meanwhile, Lake Victoria – at nearly 69,000 square kilometres Africa's largest, ringed by Kenya, Tanzania and Uganda – has dropped nearly a metre since 2005,² curtailing hydroelectric generation at Nalubaale and Kiira power stations near Kampala, Uganda. Many hydraulic and other structures along the lake's shoreline, including docking facilities at Port Bell near Kampala, now need costly modification if they are not to become obsolete.

In Mauritania, the Sahara-bordered country in Africa's northwest, large areas of its biggest city, Nouakchott, are buried in sand because of prolonged droughts. This process, known as *ensablement*, also threatens the country's main airport despite the construction of a barrier wall.

Flooding Even in towns and cities where overall rainfall totals are declining, precipitation is tending to occur in shorter, more intense bursts that can overwhelm urban drainage systems and trigger flash floods. When informal settlements are built in flood-prone areas, the consequences can be disastrous.

Intense rainfall in Harare between December 2007 and February 2008 resulted in serious flooding that caused more than 30 houses to collapse in Jacha and around the Mukuvisi River. Frequent flooding also strikes the congested slums of Kampala, particularly Kawempe, where almost half the houses are built on wetland.³ The catastrophic flooding of November 2007 killed four people here.

The Msimbazi Valley in Dar es Salaam, Tanzania, is another flood-prone area where makeshift settlements continue to spring up. Planned areas such as Msasani Bonde la Mpunga, where development has disrupted natural drainage patterns, have also experienced more frequent and extreme flooding.

In 2006, eastern Africa saw severe flooding that affected over 1.5 million people.⁴ The October floods in Mombasa, Kenya, alone – East Africa's largest seaport – left 60,000 people struggling, caused a cholera outbreak and destroyed water supply systems

and drains. In West Africa, the floods of 2002 left 4000 houses in Bamako in ruins.

Catastrophic flooding has hit many Asian cities. A number of urban centres in Bangladesh have suffered – no surprise in a low-lying, storm-prone country with vast floodplains. In Dhaka, the floods of 1988, 1998 and 2004 were particularly severe.

Even where flood protection systems are in place, they have proved inadequate or have failed to take into account low-income or informal settlements. For example, a large dyke built under the Dhaka Integrated Flood Protection Project has actually impeded the escape of flood water from slums in the area that it was designed to protect. In Khulna, chronic waterlogging affects many households.

Heavy monsoons can lead to landslides: in Kathmandu, Nepal, 207 millimetres of rainfall in a single day in 2002 led to a landslide in nearby Matatirtha that killed 16 people.

Rising sea level and coastal erosion These climate-driven impacts can affect towns and cities in the LDCs particularly severely because a relatively large proportion of their populations live in the Low Elevation Coastal Zone – the continuous area along the coast lying less than 10 metres above sea level.

Fourteen per cent of the entire population of LDCs – and 21 per cent of their urban populations – live in this zone, compared to 10 per cent of the global population as a whole.⁵ The 11 LDCs that are also Small Island Developing States are particularly vulnerable to this phenomenon.

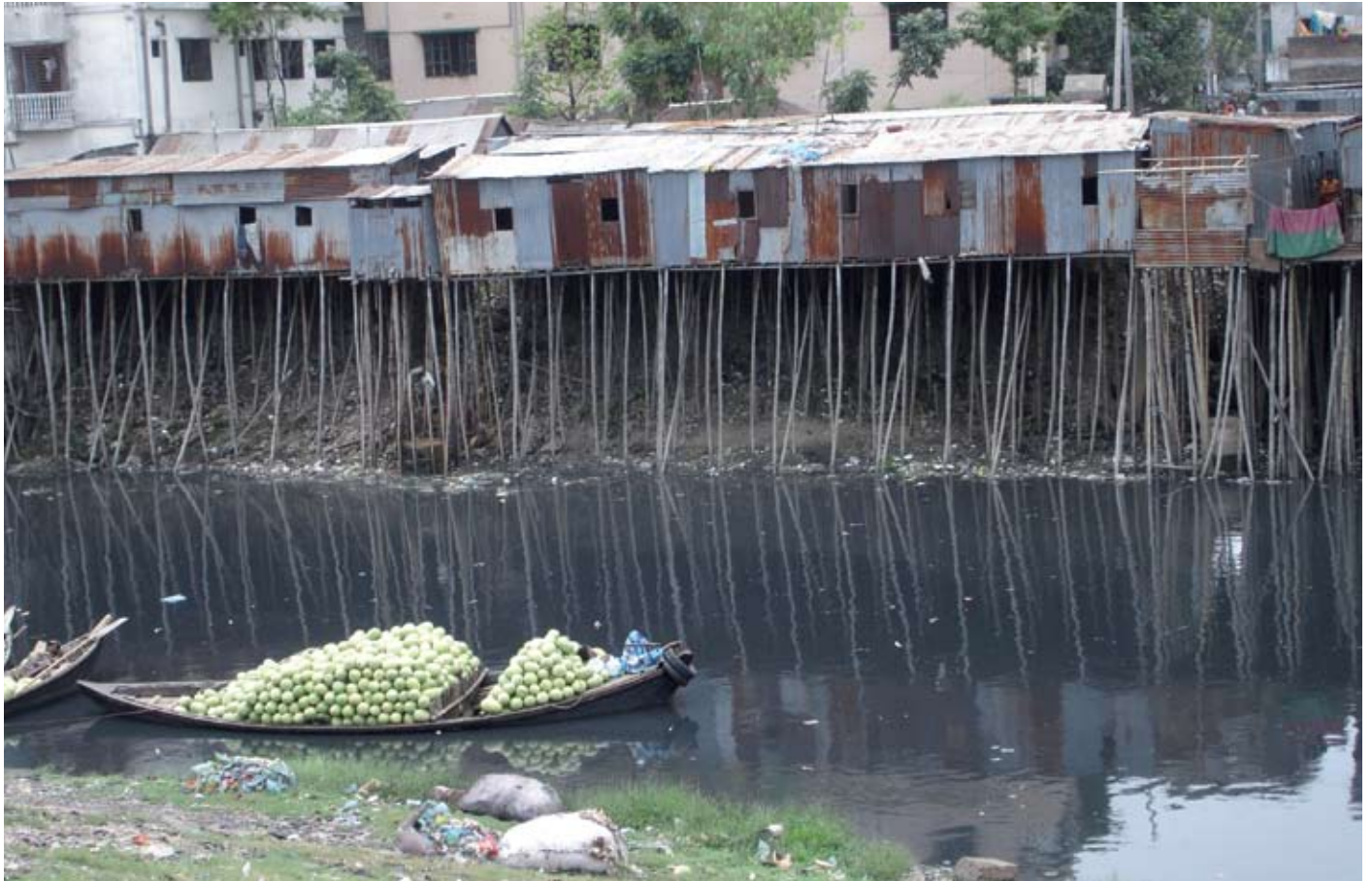
Erosion of two beaches in Dar es Salaam, Kunduchi and Bahari, has necessitated heavy investment in coastal protection. In Mombasa, a rise of just 0.3 metres in sea level could flood 17 per cent of the city and render a much larger area uninhabitable or unusable because of waterlogging and salination.

One of the LDC cities most at risk from sea level rise is Cotonou in Benin. Beaches, roads and buildings have already been destroyed by the coast's regression over the last 10 years and many more homes and hotels, the fishing port, presidential buildings, the international conference centre and the international airport could be inundated.

Heat is on: the impact on health and livelihoods

From waterborne diseases to disrupted industry, the impacts of these climate-driven processes on the health and livelihoods of urban populations in the LDCs are legion.

Impacts on health in cities in the LDCs are likely to include more frequent and severe heat stress; a greater



Rising risk: stilt houses on a river in Dhaka, Bangladesh, attest to local climate vulnerability

incidence of disease and death related to air pollution and of water- and food-borne diseases; and greater frequency of mosquito and tick-borne diseases.⁶

The impacts can already be seen. Hospital admissions of people with diarrhoeal disease increase during both high and low extremes of rainfall in Dhaka; cholera outbreaks in the poorer areas of Kawempe, Makindye, Rubaga, Nakawa and Central divisions in Kampala have been noted after heavy rains; and cases of typhoid in Kathmandu rise along with increasing temperatures in spring and summer, suggesting that climate change will generate similar effects.

Flooding is already causing serious disruption to a wide range of Dhaka's industries. A survey following the 1998 floods there found that they had contributed to an unemployment level topping 27 per cent, led 7.2 per cent of the population to change their occupation, and forcibly reduced working hours for many others.

In Cotonou, most industry is located in the fourth *arrondissement*, which is exposed to coastal erosion. This puts at risk the livelihoods of 1500 people working in more than 30 state enterprises (brewery, textiles, gas, agricultural development and cement works) as well as those of many others working in private or small-scale enterprises, such as hulling cotton, producing textiles, and pharmaceuticals. More than 15,000 traditional fishermen and women here are also facing lean times, as

many fishing settlements have been swept away by the sea.

The response: towards effective adaptation

How can urban areas in the LDCs best respond to climate risk? Many strategies to build resilience in low-income urban areas also meet more general development needs: safe and efficient water supply, sanitation and drainage, good housing and working emergency response mechanisms.

These are taken for granted in more affluent cities in Europe and North America, but the urban and national authorities in LDCs often lack the financial and technical capacity to make these improvements. A few cities in developing countries have made substantial efforts to develop urban adaptation plans (see in particular Durban)⁷, but these have not yet spread to the LDCs.

One way to develop that capacity in the LDCs is by creating and fostering international networks of local government officials and NGOs. Several such networks exist, but until now have mainly focused on mitigation – that is, reducing greenhouse gas emissions – and have tended to include larger and better resourced cities. CLACC is a notable exception.

This kind of network needs to include urban officials and decision-makers, both to build awareness and to identify appropriate responses. But this is only meaningful if it is associated with appropriate funding streams — an area that as yet has received very little attention through the main adaptation financing channels.

CLACC members have shown the wide-ranging and context-specific implications of climate change for urban areas in the LDCs, and have vividly illustrated

the potential benefits of working collaboratively across national and disciplinary boundaries. The challenge for similar networks is to develop broader links – for example, with federations of the urban poor, local authorities and national governments – to build more resilient cities and ensure adaptation for the most vulnerable groups within them.

■ **DAVID DODMAN**

Jargon buster

CLACC (Capacity Strengthening of Least Developed Countries for Adaptation to Climate Change): a network developed by IIED and partner organizations. Through CLACC, IIED works with researchers in 15 Least Developed Countries (LDCs) to generate knowledge, strengthen capacity and encourage action in these countries. (Much of the information in this briefing was generated through CLACC.)

Governance: Although in its broadest sense, governance can be defined simply as the action or manner of governing, in practice it is used to refer to the ways in which a broader range of actors – including citizen groups, nongovernment organizations

and the formal institutions of government – function in order to achieve a broad range of policy outcomes.

Least Developed Countries (LDCs): the 49 nations (as of October 2008) identified by the UN as low-income and having human resource weaknesses and high economic vulnerability. Their gross national income per person stands at less than US\$750 over a three-year average; indicators for nutrition, health, education and adult literacy are low; and economic vulnerability – defined by criteria such as unstable agricultural production and the percentage of their population displaced by natural disasters – is severe. Thirty-three LDCs are in sub-Saharan Africa.

Further reading & websites

Satterthwaite, D., Huq, S., Reid, H., Pelling, M., Romero Lankao, P. 2007. *Adapting to Climate Change in Urban Areas: The possibilities and constraints in low- and middle-income nations*. Human Settlements Discussion Paper Series. IIED, London. ■ CLACC: www.clacc.net ■ Adapting Cities to Climate Change (IIED Climate Change group web page): <http://tinyurl.com/5ufhr5>.

Notes

- ¹ Wilbanks, T.J. *et al.* 2007. Industry, settlement and society. In *Climate Change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. ■ ² See <http://earthobservatory.nasa.gov/Study/Victoria/>.
- ³ See <http://tinyurl.com/55gr95>. ■ ⁴ See www.alertnet.org/db/crisisprofiles/ET_FLO.htm. ■ ⁵ McGranahan, G., Balk, D., Anderson, B. 2007. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. *Environment and Urbanization* 19(1): 17-37. ■ ⁶ Kovats, S., Akhtar, R. 2008. Climate, climate change and human health in Asian cities. *Environment and Urbanization* 20(1): 165-176. ■ ⁷ Roberts, D. 2008. Thinking globally, acting locally – institutionalizing climate change at the local government level in Durban, South Africa. *Environment and Urbanization* 20(2): 521-538.

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