

Reducing risks to cities from climate change; an environmental or a development agenda?

SUMMARY: Discussions of how to address climate change have focused far more on mitigation (reducing greenhouse gas emissions) than adaptation (coping with the storms, floods, sea-level rise and other impacts that climate change will bring). The limited discussions on adaptation have also given little attention to cities. But many cities in Africa, Asia and Latin America and the Caribbean are at high risk from climate change – even as they (or the nation in which they are located) have contributed very little to greenhouse gas emissions. Many such cities are national capitals, or otherwise central to their nation's economies and cultures. There is a profound unfairness globally between the people who cause climate change and those most at risk from its effects. So cities with very low average greenhouse gas emissions per capita still need to add climate change adaptation to their public works programmes and land use plans. Most face very large backlogs in the infrastructure needed to protect the city – with, for instance, one-third to one-half of the population lacking roads and drains. In many cities, there is the added problem of local governments that refuse to work with the population living in informal or illegal settlements – often the groups most at risk. While mitigation may be a national agenda driven by international agreement, adaptation is intensely local. It requires competent, capable local governments with a commitment to working with all the low-income groups that live in informal settlements. This is not present in most urban centres and not easily achieved; and current international funding mechanisms show little capacity to address this.

I. INTRODUCTION

THE LIVES AND livelihoods of hundreds of millions of people will be affected by what is done (or not done) in cities with regard to climate change over the next 5–10 years. Cities are key players both in the generation of greenhouse gases and in strategies to reduce this generation, especially in reducing our dependence on carbon-based fuels.⁽¹⁾ Cities also concentrate a large proportion of those most at risk from the effects of climate change – as lives, property, environmental quality and future prosperity are threatened by "...increasing risk of storms, flooding, landslides, heat waves and drought, and by overloading water, drainage and energy supply systems."⁽²⁾ The need for city governments to reduce emissions is well established – and many city governments in Europe and North America are already acting on this. But the need to adapt to climate change and to reduce the associated risks receives comparatively little attention.

Most of the cities (and nations) that face the highest risks from climate change make small contributions to greenhouse gases. For instance, in Cotonou, the economic capital of Benin, as in many cities on the coast of West Africa, many residential neighbourhoods, commercial interests and much infrastructure are at risk from sea-level rise and storm surges.⁽³⁾ Yet average emissions per person of carbon dioxide in Benin are around one-fiftieth that in high-income nations – or one-eightieth that in the USA.⁽⁴⁾ Half of Africa's large cities are on the coast or very close to it. Banjul, Lagos, Abidjan and Alexandria are among those most at risk.⁽⁵⁾

Many of the world's largest cities are in the floodplains of major rivers in Asia (e.g. the Ganges–Brahmaputra, the Mekong and the Yangtze) and in cyclone-prone coastal areas. The Intergovernmental Panel on Climate Change has emphasized that river deltas are among the world's most valuable, heavily populated and vulnerable coastal systems.⁽⁶⁾ Dhaka, the capital of Bangladesh is particularly at risk. This city of 10 million inhabitants faced devastation and heavy economic losses from floods in 1988, 1998 and 2004. The combination of rising sea level and more frequent and intense storms is likely to greatly increase these risks.⁽⁷⁾ Yet in 2004, the average contribution of each Bangladeshi to carbon dioxide emissions was around one-eightieth that of USA citizens. Mumbai and Shanghai are also very vulnerable to storms and sea-level rise, with large sections of the city only one to five metres above sea level.⁽⁸⁾

1. See the paper by Patricia Romero Lankao listed on the back page.

2. Wilbanks, Tom and Patricia Romero Lankao with Manzhou Bao, Frans Berkhout, Sandy Cairncross, Jean-Paul Ceron, Manmohan Kapshe, Robert Muir-Wood, Ricardo Zapata-Marti et al. (2007), *Industry, Settlement and Society*, IPCC WGII Fourth Assessment Report, Chapter 7, page 40.

3. See the paper by Krystel Dossou and Bernadette Gléhouenou-Dossou listed on the back page.

4. In this Brief, figures for per capita carbon dioxide emissions are drawn from the World Bank's *World Development Indicators On-line*, accessible at <http://www.worldbank.org/reference/>.

5. IPCC Special Report on the Regional Impacts of Climate Change; An Assessment of Vulnerability, accessible at <http://www.grida.no/climate/ipcc/regional/index.htm>.

This Brief for the April 2007 issue of the journal *Environment&Urbanization* is based on the editorial by Saleemul Huq, Sari Kovats, Hannah Reid and David Satterthwaite and draws on the papers in this issue. (The papers are listed on the back page, with details of how to obtain electronic copies of individual papers or the whole issue). This summary, produced with the support of the Royal Danish Ministry of Foreign Affairs (DANIDA) and the Swedish International Development Cooperation Agency (Sida) allows the journal's main findings to reach a wider audience.

6. IPCC (2001), *Climate Change 2001: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, 1,032 pages.

7. See the paper by Mozaharul Alam and MD Golam Rabbani listed on the back page.

8. See the paper by Alex de Sherbinin, Andrew Schiller and Alex Pulsipher listed on the back page.

9. See *World Development Indicators On-line*. Some sources suggest that by 2006, the average per capita carbon dioxide emission for China was around one-quarter that of the United States and around one-half that of the UK. But all such comparisons are misleading because they take no account of what a nation exports or imports. All carbon dioxide emissions generated in the fabrication of goods in China that are sold in the UK or the USA are assigned to China's national total.

10. EM-DAT: the OFDA/CRED International Disaster Database, accessible at www.em-dat.net, Université Catholique de Louvain, Brussels, Belgium.

11. Revi, Aromar (2005), "Lessons from the deluge: priorities for multi-hazard risk mitigation", *Economic and Political Weekly* Vol 40, No 36, pages 3911–3916.

12. The October 2007 issue of *Environment&Urbanization* will include a case study of flood risks in unplanned settlements in Lusaka, Zambia, by Wilma S Nchito.

13. ActionAid International (2006), *Unjust Waters; Climate Change, Flooding and the Protection of Poor African Communities: Experiences from Six African Cities*, 23 pages. This can be downloaded from <http://www.actionaid.org/main.aspx?PageID=576>. The April 2008 issue of *Environment&Urbanization* will include a paper drawn on this by Ian Douglass, Kurshid Alam, MaryAnne Maghenda, Yasmin McDonnell, Louise McLean and Jack Campbell.

14. See the paper by Mike Muller listed on the back page, which focuses on how water management must change in sub-Saharan Africa.

15. UN-Habitat (2003), *Water and Sanitation in the World's Cities; Local Action for Global Goals*, Earthscan Publications, London, 274 pages.

16. WHO (1992), *Our Planet, Our Health*, World Health Organization, Geneva.

Although China and India are major contributors to global greenhouse gas emissions, per capita emissions of carbon dioxide are still relatively small – for India less than one-tenth that in high-income nations; for China about one-fifth.⁽⁹⁾ In addition, their contribution to greenhouse gases released to date is much smaller. If every person were to be allocated a "carbon budget" to reduce greenhouse gas emissions enough to avert potentially damaging levels of global warming, both China and India would still be well below their allocation.

II. WHAT ARE THE RISKS FROM CLIMATE CHANGE?

FOR CITIES, PERHAPS the most obvious increased risk comes from the increased number and intensity of such extreme weather events as heavy rainstorms, cyclones and hurricanes. The cities most at risk are those where these events are already common – although there is some evidence that the geographic range of some extreme weather events is expanding. For any city, the scale of the risk is much influenced by the quality of housing and infrastructure and the level of preparation of the city's population and key emergency services. The risks in cities in high-income nations have been much reduced by decades of investment in housing and infrastructure but even here, damage to such systems as water supply, transport and electricity leave people very vulnerable. The devastation of New Orleans by Hurricane Katrina in 2005 shows that even in high-income nations, flood defences and emergency services can be overwhelmed – and that the low-income citizens are those most affected.

It is worth noting the scale of the devastation from some recent extreme weather events. These events are not "proof of climate change", which is difficult to ascertain, but are proof of the vulnerability of cities and smaller settlements to extreme weather events. In Central America, in 1998, Hurricane Mitch resulted in devastation (thousands killed, millions homeless, billions of dollars worth of damage to already fragile economies).⁽¹⁰⁾ In 1999, flooding in and around Caracas, Venezuela, resulted in around 30,000 people dead and some 600,000 others seriously affected. Floods in Mumbai in 2005 left more than 1,000 dead and caused massive damage to people's homes, livelihoods and asset bases.⁽¹¹⁾ Jakarta (and other areas in Indonesia) suffered from very serious floods in February 2007, and Karachi (and other areas in Pakistan) in June 2007. In 2000, floods in Mozambique killed at least 700 people and displaced more than 650,000, as well as devastating many urban centres. In 2001, floods in Algiers killed 900 people and displaced 45,000. There were also very serious floods in Port Harcourt and in Addis Ababa in 2006. And for every flood that is large enough to get noticed internationally, there are hundreds that do not get counted as "disasters", yet they kill and seriously injure many people and destroy or damage many people's homes and assets.⁽¹²⁾ Discussions with residents in informal settlements in various African cities indicate that flooding has become more frequent and intense, and often occurs in locations that previously were not at risk. According to these residents, local government is doing little to address these issues.⁽¹³⁾

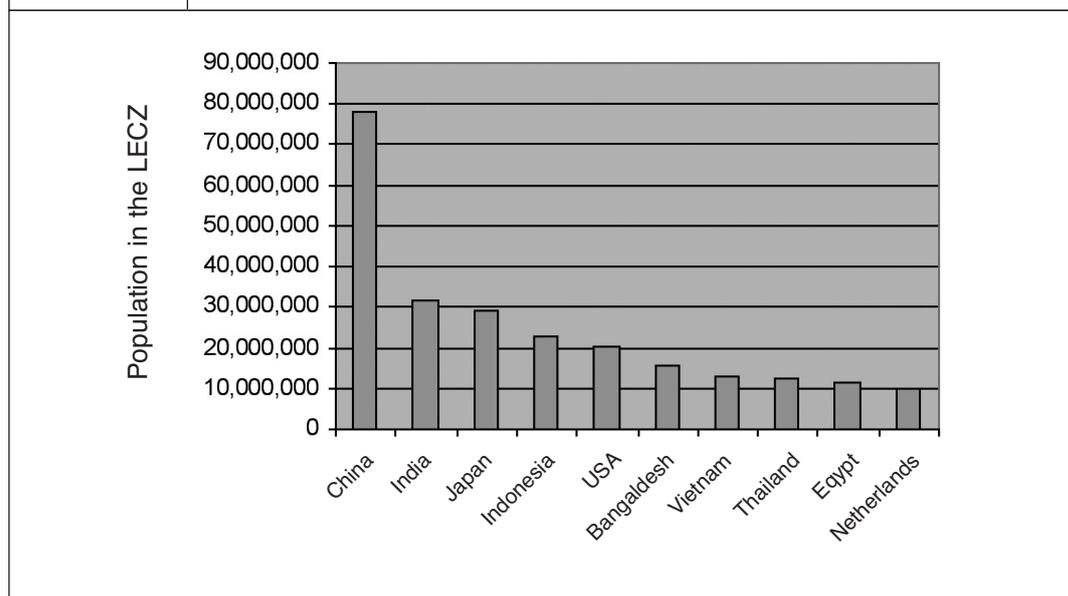
Climate change has the potential to increase flooding risks in a number of ways: from the sea (higher sea levels and storm surges); from glacial lake outburst (a problem in countries such as Nepal); and from rainfall – for instance, heavier rainfall or rainfall that is more prolonged than in the past. For some cities and regions, climate change is likely to reduce annual average rainfall – but this does not necessarily mean less risk of flooding, because the reduced rainfall may be more concentrated. In most cities with increased levels of risk of flooding induced by climate change, this risk comes on top of already serious deficiencies in provision for storm drainage.

Urban areas always face some risk of flooding when rainfall occurs. Buildings, roads, infrastructure and other paved areas prevent rainfall from infiltrating the soil – and thus produce more run-off. In well-governed cities this is rarely a problem; there is provision for storm and surface drainage, along with complementary measures to protect from flooding – for instance, the use of parks and other areas of open space as places to accommodate safely flood waters from unusually serious storms. But in poorly governed cities, drains are not built and it is common for buildings or infrastructure to obstruct natural drainage channels. Heavy or prolonged rainfall rapidly overwhelms drainage systems – especially if drains are insufficient or have not been maintained (for instance, many are full of silt or clogged with garbage).

Other risks from climate change are less dramatic but nonetheless serious, especially for low-income groups. Many cities will get less precipitation, and may need to adapt water supply systems.⁽¹⁴⁾ At least 14 African nations are already facing water stress or water scarcity, and many more are likely to join this list in the next 10–20 years. Around half of Africa's urban population lack adequate provision for water and sanitation, although this is far more to do with inadequate governance than with water shortages.⁽¹⁵⁾

Most cities will experience more heat waves and more problems with certain air pollutants; for larger, denser cities, the temperatures in central "heat islands" can be several degrees higher than in surrounding areas. The "tourist assets" of many coastal cities will be damaged because of flood damage to coastal reefs and the loss of beaches. Warmer average temperatures will expand the area where many "tropical" diseases occur – for instance, where mosquitoes that spread malaria, dengue fever and filariasis can survive and breed.⁽¹⁶⁾

FIGURE 1: Nations with the largest urban populations in the low elevation coastal zone (LECZ)



III. THE URBAN POPULATION AT RISK IN COASTAL ZONES

THE LOW ELEVATION coastal zone – the continuous area along the coast that is less than 10 metres above sea level – represents 2 per cent of the world’s land area but contains 10 per cent of its total population (i.e. over 600 million people) and 13 per cent of its urban population (around 360 million people). Almost two-thirds of the world’s cities with more than 5 million inhabitants fall at least partly within this zone. Population concentrations in this zone also appear to be increasing in most nations. Low-income and lower-middle income nations have a higher proportion of their urban population in this zone than high-income nations. The least-developed nations, on average, have nearly twice the proportion of their urban population in this zone as high-income nations.⁽¹⁷⁾ Figure 1 shows the nations with the largest urban populations within this zone.

Only a proportion of those in this zone will be at risk but as yet, the detailed local assessments to establish who is at risk have not been undertaken. Estimates for sea-level rise vary between 18 and 59 centimetres by the end of the twenty-first century; this will certainly multiply the number of people flooded by storm surges. One estimate suggests that some 10 million people are currently affected each year by coastal flooding and that this number will increase under all the climate change scenarios.⁽¹⁸⁾ The problems with coastal flooding would obviously be much more serious if certain potentially catastrophic events, whose probability is uncertain, were to occur – for instance, the accelerated melting of Greenland’s ice sheet or the collapse of the West Antarctic ice sheet.

IV. WHO IS MOST AT RISK?

THE PEOPLE MOST at risk in affected areas are those who are:

- least able to avoid the direct or indirect impacts (e.g. by having good quality homes and drainage systems that prevent flooding; by moving to places with less risk; or by changing jobs if climate change threatens their livelihoods);
- likely to be most affected by them (for instance, infants and older groups less able to cope with heat waves); and
- least able to cope with the illness, injury, premature death, or loss of income, livelihood or property caused by the impacts.

Generally, wealthy individuals and households can reduce these risks by having safer housing, choosing safer jobs or locations to live in, protecting assets through insurance, and having assets that help with recovery. Low-income groups have far less scope for managing the risks. In most cities in Africa, Asia, Latin America and the Caribbean, they live in settlements with the worst quality housing and least provision for drainage, and in the districts most at risk from floods and landslides. The more dangerous sites are often the only places lower-income groups can get land to build or find cheap rental accommodation.⁽¹⁹⁾

The quality of government at both national and local (district or municipal) level strongly influences the level of risk faced by those with limited incomes or assets. Government influences the quality of

17. See the paper by Gordon McGranahan, Deborah Balk and Bridget Anderson listed on the back page.

18. Nicholls R J (2004), “Coastal flooding and wetland loss in the 21st century: changes under the SRES climate and socioeconomic scenarios”, *Global Environmental Change* Vol 14, No 1, pages 69–86.

19. Hardoy, Jorge E, Diana Mitlin and David Satterthwaite (2001), *Environmental Problems in an Urbanizing World: Finding Solutions for Cities in Africa, Asia and Latin America*, Earthscan Publications, London, 448 pages.

provision for *infrastructure* (for instance, drainage that limits risks of flooding for the whole city, not just for the wealthier areas), for *disaster preparedness* (including warnings, measures taken to limit damage and, if needed, provision to help people move to safer areas quickly) and for *disaster response* (for example, rescue services and appropriate emergency and health care services and programmes, to help those who lose their homes and livelihoods to rebuild these). The potential “co-benefits” from investments to improve living conditions and to reduce risks from climate change are obvious. However, there is frequently a failure to prevent new development in areas at risk of flooding; to provide alternative, safer sites for low-income groups; and to protect areas that should be left undeveloped because they help buffer flooding risks (for example, wetlands). Urban growth needs to be managed to take account of climate change risks, as well as addressing the needs of low-income groups. This will not be done by the market, and can only be done by governments working with, and accountable to, those who are most at risk.

But how is this possible when most local governments are weak and ineffective – and often refuse to allow any public services or investments in informal settlements, even when these house more than one-third of the entire city’s population and workforce? Research in “disaster-prone” settlements in El Salvador shows the difficulties. Low-income residents recognized that flooding and landslides were the most serious threats to their lives and livelihoods (although earthquakes and windstorms and other factors were also highlighted). These households invested in risk reduction – but with limited success given the lack of representative community organizations through which to design and implement settlement-wide measures and the lack of support from government agencies. Most residents viewed local and national governments as unhelpful or even a hindrance to their efforts. Meanwhile, most of the institutions that supported housing and housing finance initiatives – local and international NGOs, government agencies – did not engage in risk reduction.⁽²⁰⁾

20. See the paper by Christine Wamsler listed on the back page.

V. WHY CITIES DEVELOP ON RISKY SITES

MANY CITIES ARE located on sites at risk from storms and floods. There are four main reasons for this:

- these locations were attractive to those who originally founded and developed the city – because of a good river or sea harbour, a strategic location with regard to trade or territorial control, a ready supply of fresh water, or a fertile delta;
- the city has outgrown a site that was originally safe and has expanded onto land that is at risk – for example, onto floodplains or onto unstable hillsides or mountains;
- once a city has developed, it rarely disappears, even if it experiences some disastrous flood or earthquake – because too many individuals, enterprises and institutions have an interest in that city’s economy; and
- in most cities at risk from floods, the wealthier groups and most formal enterprises do not face serious risks.

There is also the issue of how the political economy of any city influences what is done. Cities can invest in protection against floods and sea-level rise in ways that have strong “co-benefits” with development, as this also improves the homes and neighbourhoods of low-income households. They can greatly reduce risks by ensuring that low-income households can find and afford housing or land on which to build on sites less at risk from flooding. Or the city can ensure that its investments do exactly the opposite, as informal settlements at risk of flooding are bulldozed and no measures are taken to provide their inhabitants with alternative housing. If some provision is made for re-housing, this may further impoverish those who are forced to move, as they are often dumped in distant locations, far from their sources of livelihood and social networks. As the risks facing so many coastal cities in Africa, Asia and Latin America and the Caribbean become evident, one of the greatest worries is that this will draw attention and investment away from unfulfilled development needs. So if city and national governments and international agencies do begin to factor climate change-related risk reduction into their urban policies, how can this avoid further disadvantaging the urban poor? How can those who live in the informal settlements and work in the informal economy become a sufficiently potent political force to ensure that risk reduction investments benefit them?

VI. THE UNFAIRNESS WITH REGARD TO WHO CAUSES THE PROBLEMS AND WHO IS MOST AFFECTED

IT IS PROFOUNDLY unfair that those who are most at risk from climate change globally are not those who are most responsible for causing it. This can be seen in three aspects:

- with regard to individuals and households, it is the high-consumption lifestyles of the wealthy (and the production systems that profit from their consumption) that drive climate change.⁽²¹⁾ It is mostly low-income groups in low- and middle-income nations who make negligible contributions to climate change that are most at risk from its impacts. The differentials in greenhouse gas emis-

21. This statement might be considered to understate the role of industry or particular sectors such as fossil fuel-powered electricity generation, but their production (and concomitant climate change implications) are underpinned by consumer demand, much of it from those with high-consumption lifestyles. It might also be considered to understate the contributions of middle-income groups in high-income nations, but these are among the wealthy if the whole planet’s population is considered.

22. See reference 19 for a discussion of the Trump Index for assessing the differentials in individual's contribution to ecological unsustainability.

sions between high-income and low-income groups is dramatic: the greenhouse gases generated as a result of the high-consumption lifestyle of someone like Donald Trump are hundreds of thousands or even millions of times greater than those generated by low-income rural and urban households in low-income nations;⁽²²⁾

- with regard to nations, it is within the wealthiest nations that most greenhouse gases have been emitted, but it is mostly low- and middle-income nations that are bearing and will bear most of the costs; and
- with regard to cities, larger companies and corporations can easily adjust to new patterns of risk induced by climate change, and can move their offices and production facilities away from cities at risk, with little effect on their operations. These corporations have long been adept at shifting production to locations where profits are maximized, and it is easy for them to factor in risks from climate change. But much of the population cannot easily move because their homes, assets and livelihoods are tied to the city. It is also difficult to conceive of how many of the largest and most successful coastal cities will manage. Cities also concentrate so much of the world's cultural assets and historic heritage. Alexandria – like Venice – cannot be “moved”.

Much of the land area of some small island nations and low-income nations is at risk from sea-level rise, and their survival is in doubt. Yet their contributions to global greenhouse gas emissions have been very small. With regard to cities: in economic terms, it may be easy to write off those where flood protection costs far outweigh the economic value they currently concentrate, but what will this do to international relations? One wonders what new levels of violence and international terrorism will be generated as increasing numbers of people lose their homes, assets, livelihoods and cultural heritage to global warming – especially when the main causes of this global warming are located in high-income nations that have failed to cut back emissions and curb the high-consumption, high-waste lifestyles of their wealthier citizens? If Washington DC, New York and Los Angeles faced risks comparable to those facing Dhaka, Mumbai and Bangkok today as a result of greenhouse gas emissions from other countries, it is unlikely that the US government would oppose the Kyoto Protocol's modest targets for emission reductions.

VII. THE NEED FOR ACTION

THE INITIAL RESPONSE to climate change by the scientific community was to focus on the need to reduce greenhouse gas emissions. It seemed wrong to focus on adaptation because this would only be necessary if emissions were not reduced. It also seemed an unfair approach, in that most adaptation would have to be undertaken in nations with limited resources and very limited contributions to climate change. They have other pressing developmental needs, and there was a concern that a focus on adaptation to climate change would draw attention and resources away from these.

But the need for adaptation has been much increased by the failure of high-income nations to reduce greenhouse gas emissions. There is also the worrying time lag between the reduction in emissions and the effect on climate change. However unfair this is, action is still needed everywhere to reduce emissions and to adapt to reduce risks. And action is needed in each locality, tailored to the specifics of that locality – which means a need for local government to have the knowledge, capacity and legitimacy to act effectively. The sooner action is taken to reduce greenhouse gas emissions *and* to put in place the planning framework that reduces the vulnerability of settlements to climate change, the lower the costs.

Some still argue that any attention to climate change diverts attention and resources away from more immediate development needs. There is also the worry that any action on climate change will be twisted by local, national and international interests to serve themselves. Over-expensive and often ill-considered flood defences can prove very profitable for those who construct them. The risk of this happening is much enhanced where mechanisms of accountability are weak. If the need to reduce greenhouse gas emissions was less pressing, there would be a strong case for saying that this was entirely the responsibility of the rich world. But one of the key determinants of future greenhouse gas emissions is how cities develop in the more prosperous low- and middle-income nations (which is also where most of the world's population growth is being accommodated). Are the rapidly expanding and successful cities in China, India, Brazil, South Africa..... increasing or decreasing the dependence of middle- and upper-income groups on private car use? Are the houses and apartments favoured by middle- and upper-income groups increasing or decreasing the consumption of carbon-based fuels, or the electricity generated by the combustion of such fuels? Are enterprises in these cities successfully encouraged to invest in measures to reduce their direct and indirect contributions to greenhouse gas emissions? Here too, there are important potential co-benefits, as many measures to reduce carbon emissions can also reduce air pollution. The precedents are there to show how much can be done⁽²³⁾ – but these precedents remain the exceptions. In addition, most discussion in relation to cities has been on reducing emissions, not on adaptation – although a discussion of the development of a Municipal Adaptation Plan (MAP) for climate change for Cape Town covers the necessary steps and methods.⁽²⁴⁾

23. The two issues of *Environment&Urbanization* published in 2006 on ecological urbanization included many case studies showing these possibilities. The issues can be accessed on-line at <http://eau.sagepub.com/>.

24. See the paper by Pierre Mukheibir and Gina Ziervogel listed on the back page.

This discussion also points to the importance of a strong local information base and local governance systems that allow voice and influence to poorer groups.

So there is a clear urban agenda focusing on more competent and accountable city and municipal governments, with adaptation built into development plans. But there is little evidence of national governments and international agencies responding to this. In most nations, national and state/provincial governments still concentrate most of the power and the control over public investments. Most international agencies reinforce the power of central governments, as their funding goes through central governments. In addition, too many climate change experts see urban change as a local issue that they do not need to understand, let alone address. It is within urban centres and urban governments that so much of the battle to prevent climate change from becoming a global catastrophe will be won or lost. Yet when urban governments do try to respond, they receive little support. Hopefully, this will change as the full import of the challenge becomes apparent.

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