



The political underpinnings of cities' accumulated resilience to climate change

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ABSTRACT The impacts of climate change in any city are obviously influenced by the quality of its housing and other buildings, its infrastructure and services. These were not built with climate change risks in mind, although they were influenced by environmental health risks that were present when they were constructed (including those from extreme weather) and often by responses to past disasters. Well-governed cities that have greatly reduced these risks have accumulated resilience to the climate change impacts that exacerbate (or will exacerbate) these risks. In so doing, they have also developed the social, political, financial and institutional structures that provide the basis for addressing these and other risks. These structures were developed through social, environmental and political reforms, driven by such factors as democracy, decentralization and strong social movements representing the needs of those with limited incomes, or other factors associated with vulnerability. These “bottom-up” pressures from citizens and civil society on national and city governments are critical for developing the institutions and measures to reduce climate change-related risks (especially for those most at risk) and to support resilience.

KEYWORDS cities / climate change / disaster risk / local government / political change / resilience / vulnerability

I. INTRODUCTION: HOW DO WE USE THE TERM RESILIENCE?

The idea of resilience is attractive to many sectors in that it implies a capacity to resist or cope with stress or threats (even if unanticipated) and remain unharmed. So within discussions of development, disaster risk and climate change, resilience has come to be applied to a great range of contexts – for instance to individuals, households and communities (and their knowledge, assets and livelihoods), to cities (or specific sectors within city economies) and to national economies. Resilience in the context of climate change and cities is usually taken to mean the capacity of a city to absorb climate change-related disturbances/shocks while retaining the same basic structure and ways of functioning. So it includes a capacity to resist these shocks and to recover. It may also include the capacity to recover in ways that reduce risks from future shocks.

There is much abstract discussion about what creates or contributes to resilience and the institutional or governance structures that underpin it. But when considering a specific city, the task becomes more immediate and real and more focused on who or what is resilient. Will the storm and

surface water drains cope with the next storm (a particularly pressing issue for cities that have heavy rainfall concentrated in particular seasons)? Will the building stock be undamaged by storms? Will measures to help those most at risk from high temperatures be effective during heat waves and reach all high-risk groups? These are also issues that require attention in each district of a city, especially where there are large differentials between districts in the quality of the housing, the safety of the site, and what might be termed “risk-reducing” infrastructure (piped water, sewers, drains, all-weather roads, electricity...).

The interest in processes that build resilience in cities, or in particular groups in cities, can draw from their social histories. For instance, in London much of the innovation in environmental and public health, housing, infrastructure, social services and governance over the last 180 years has increased the resilience of Londoners – not only to extreme weather but also to disease, many physical hazards (including fires) and economic change. William Solecki’s 2012 paper on urban environmental challenges and climate change action in New York⁽¹⁾ included a discussion of how different environmental crises over the last 220 years (lack of stable supply of drinking water, lack of open space, waste accumulation on streets, congestion, pollution...) stimulated responses. The case study of the city of Rosario in Argentina in this issue of the Journal⁽²⁾ shows how the city has become more resilient to climate change impacts as a result of government measures to reduce long-standing risks from flooding, improve housing conditions, increase public space and improve health care (and who has access to it); these measures were not in response to climate change, but they build both the physical and the institutional underpinnings of resilience to such change. Of relevance to this discussion is how the term resilience has come to be used. Is it used in ways that focus on natural systems that leave out human systems with their complex power relations and the ways in which risk and vulnerability are so often socially constructed?⁽³⁾

Resilience includes the ability to withstand shocks and stresses (and so avoid their impact); the ability to recover from their impact (what is sometimes termed “bouncing back”); and the ability to bounce back in ways that reduce future risks. Here, resilience is not so much a property of buildings and infrastructure but the capacities of households, communities and local governments to act (even as this includes making buildings and infrastructure more resilient). Thus, it is built by a supporting institutional structure that responds as risks and circumstances change, as new information is received and as learning takes place.⁽⁴⁾ This is evident in the UN–ISDR Making Cities Resilient campaign, as it focuses on the role of local governments and civil society in building resilience to disasters.⁽⁵⁾ Of course, there are impacts for which there is no bounce back – as in the case of deaths and serious injuries from disasters. This, in part, is recognized by the UN Framework Convention on Climate Change in the “loss and damage” that results from outcomes of climate change that cannot be adapted to.

When resilience to climate change is considered for urban areas, it means taking into account each possible climate change impact (for instance, resilience to freshwater constraints is not the same as resilience to extreme winds or heat waves) and whether the urban area or district in question can absorb each impact while retaining its structure and ways of functioning. This obviously requires a focus on the physical

1. Solecki, William (2012), “Urban environmental challenges and climate change action in New York City”, *Environment and Urbanization* Vol 24, No 2, October, pages 557–573.
2. Hardoy, Jorgelina and Regina Ruete (2013), “Incorporating climate change adaptation into planning for a liveable city in Rosario, Argentina”, *Environment and Urbanization* Vol 25, No 2, October, pages 339–360.
3. Cannon, Terry and Detlef Muller-Mahn (2010), “Vulnerability, resilience and development discourses in the context of climate change”, *Nat. Hazards* Vol 55, No 3, pages 621–635; also Brown, Amanda (2011), “Policy discourses of resilience”, in Mark Pelling, David Manuel-Navarrete and Michael Redcliff (editors), *Climate Change and the Crisis of Capitalism: A Chance to Reclaim Self, Society and Nature*, Routledge, London, pages 37–50.
4. Dodman, David, Jessica Ayers and Saleemul Huq (2009), “Building resilience”, Chapter 5 of Worldwatch Institute, *State of the World 2009: Into a Warming World*, Routledge, London, pages 151–169; also Reed, Sarah Orleans, Richard Friend, Vu Canh Toan, Pakamas Thinphanga, Ratri Sutarto and Dilip Singh (2013), “‘Shared learning’ for building urban climate resilience – experiences from Asian cities”, *Environment and Urbanization* Vol 25, No 2, October, pages 393–412.
5. Johnson, Cassidy and Sophie Blackburn (forthcoming), “Advocacy for urban resilience: UNISDR’s Resilient Cities campaign”, *Environment and Urbanization*.

6. Tyler, Stephen, Sarah Orleans Reed, Karen MacClune and Shashikant Chopde (2010), *Planning for Urban Climate Resilience; Framework and Examples from the Asian Cities Climate Change Resilience Network*, Climate Resilience in Concept and Practice ISET Working Paper III, ACCCRN and ISET; also see reference 4, Reed et al. (2013); and da Silva, Jo (2012), "Shifting agendas: response to resilience. The role of the engineer in disaster risk reduction", 9th Brunel International Lecture Series, The Institution of Civil Engineers, London, 43 pages.

7. See Bhat, G K, Anup Karanth, Lalit Dashora and Umamaheshwaran Rajasekar (2013), "Addressing flooding in the city of Surat beyond its boundaries", *Environment and Urbanization* Vol 25, No 2, October, pages 429–441; also see reference 4, Reed et al. (2013).

8. United Nations (2009), *Global Assessment Report on Disaster Risk Reduction: Risk and Poverty in a Changing Climate*, ISDR, United Nations, Geneva, 207 pages.

9. Adelekan, Ibidun O (2012), "Vulnerability to wind hazards in the traditional city of Ibadan, Nigeria", *Environment and Urbanization* Vol 24, No 2, October, pages 597–618.

aspects – buildings and infrastructure. It also requires a focus on resilience at different scales (individuals, households, neighbourhoods, urban centres) and for different groups within the city (enterprises, civil society, government and other institutions). It also requires a concern for all the multiple interconnections that exist between these in cities. A concern for resilience applied to cities helps to get attention to cities as complex systems⁽⁶⁾ and to the larger (economic, political and ecological) systems of which they are part. So a focus on resilience for urban centres requires a focus on resource availability beyond the urban boundaries that are essential for populations and/or enterprises. It may require coordinated actions by institutions from other jurisdictions (for instance, the management of watersheds to reduce flood risks that are outside city boundaries and jurisdictions⁽⁷⁾).

If the data were available to construct an indicator of an urban area's resilience to climate change, it would need to take into account where and how risks change (including an exacerbation or change of existing risks, and new risks); where vulnerable populations, enterprises and institutions are already concentrated (or not); where these have a capacity to cope with changing risks; and where there is capacity to adapt so that this adaptation also reduces future risk. In some aspects, resilience can be seen as the opposite of vulnerability, but it also pushes us to see and act on risk and vulnerability or their underpinnings within the larger systems in which they are embedded. In addition, vulnerability is more often discussed in relation to particular groups of people within the population, whereas resilience is more often discussed in relation to urban centres. Discussions on vulnerability may also focus on particular risks, when resilience focuses on conditions that reduce a range of risks.

II. ACCUMULATED RESILIENCE

Most cities in high-income nations are resilient to many of the direct and indirect impacts of climate change. This resilience is independent of any climate change adaptation measures because it was built to risks that are (or were) present independent of climate change but that climate change will exacerbate. An urban centre's resilience to climate change, in other words, is much influenced by its resilience to the kinds of stresses and shocks that have been experienced in the past. If these include stresses that are similar to those that climate change is bringing, then it may already have developed (or accumulated) considerable resilience to them.

Thus, the first aspect of any analysis of an urban centre's resilience to climate change is an analysis of its resilience to those familiar stresses or shocks that climate change is likely to exacerbate – for instance, an increase in the intensity of extreme weather events. Here, in reviewing different cities, we are faced with very large differences in how resilient they are to extreme weather. Note, for instance, the 20-fold difference in mortality between the Philippines and Japan when hit by a typhoon of the same intensity – the result of differences in the resilience of the building stock and infrastructure and in the effectiveness of government in developing resilience.⁽⁸⁾ In Ibadan (Nigeria), a relatively small increase in the intensity of windstorms caused very considerable damage to the building stock in the traditional core of the city;⁽⁹⁾ windstorms of similar intensity in cities in high-income nations would be unlikely to cause

much damage. More importantly, it is not the absolute wind speed but, rather, the fact that it has increased that means that buildings that were “resilient” to the established climatic regime may cease to be so in the context of changes in climate.

Cities in high-income nations and many in middle-income nations have become far more resilient to extreme weather (and most other potential catalysts for disasters) through a great range of measures that have been taken in response to local risks and to the political processes that demanded responses. What is already built and the financial and institutional underpinnings that influence this result in considerable accumulated resilience. The factors that strongly influence this resilience to extreme weather include the following:

Quality of buildings: homes and workplaces – this is in great part reliant on building standards that ensure that buildings are unaffected by extreme weather; also standards for the health and comfort of occupants, including sufficient space, provision for heating or cooling, and ventilation.

Provision for infrastructure to which residents have access independent of income – including storm and surface drainage systems, all-weather paved roads and paths, and street lighting. (The proportion of the population served by these features varies from 100 per cent to only a few per cent in different urban centres.)

Provision for services that are paid for – including public transport, piped treated water, sanitation, solid waste collection, electricity (and the larger infrastructure networks on which these depend).

Provision for services available independent of income – including health care, education, street cleaning, emergency services (for fire, acute illness/injury, crime), policing/rule of law, being able to vote for city politicians, access to these politicians, civil servants or ombudsmen, and recourse to the courts if need be. The costs are generally covered by taxation, although in some cities people pay for some of these services.

Early warning systems for extreme weather; public response measures to extreme risks (e.g. plans and capacity to implement evacuation); expectation of provision for needs of residents if they are impacted by a disaster.

Whether residents’ incomes are sufficient to invest in resilience – allowing them to afford healthy and safe homes, life insurance, insurance for homes and possessions, savings, pensions, the ownership of relevant assets. (It should be acknowledged, too, that insurance may have the effect of reducing people’s efforts towards resilience.)

What safety nets are available if income is insufficient – including social security, cash transfers and pensions.

The regulatory framework for ensuring that measures for resilience are applied – for instance, through building and infrastructure standards; controls on developments in high-risk areas (and more generally risk-reducing land use planning and management that includes a recognition of the role in this of ecosystem services); standards for working conditions; and provision for consumer protection.

All these factors contribute to resilience that serves individuals, households, neighbourhoods and enterprises and that has accumulated over time, much of it driven by national and local governments responding to citizen and civil society demands over the last two

centuries. The origins of this accumulated resilience may be seen in measures taken to improve provision for water and then sanitation at a city scale and to introduce building regulations to reduce fire risks. High levels of accumulated resilience are obviously associated with cities in high-income nations, although there are considerable differences in the extent of their resilience, which relates to differences in the orientations and frameworks of national and local governments (and to past disasters). There are also cities in middle-income nations that have considerable accumulated resilience. Serious extreme weather disasters can shake professional attitudes and political systems and result in more attention to this issue.

In urban centres with accumulated resilience, it is usually local governments that were responsible for most of the factors contributing to the resilience – although within very different systems in terms of the roles taken by local government (in planning, provision and financing) and the nature of local government relationships with higher levels of government. Many of the innovations and initiatives by local government also depended on changes at the national level – for instance, in legislation and in financial support for local government investments (although political change at the national level was also in part driven by political pressure from urban dwellers and innovation by city governments). Private companies or non-profit institutions may provide some of the key services, and private companies may have key roles in the provision and, often, maintenance of infrastructure, but the framework for provision and quality control is provided by local government. The quality, capacity and accountability of a city government, which also includes attention to risks to low-income groups, is an important part of resilience – as it is more likely than higher levels of government to understand and act on local circumstances and has a more immediate link with citizens, including those facing higher risks.

A city's accumulated resilience can be assessed for the extent to which it has reduced hazards,⁽¹⁰⁾ risk and exposure, with particular attention to how this serves or protects vulnerable groups (those who are most sensitive to the risks and those lacking the capacity to cope and adapt). One of the tests of the effectiveness of all the above is whether it provides resilience for those with limited incomes, chronic illnesses and disabilities. Such an assessment can then move to assessing the system components and interactions that underpin this resilience and to considering how well this "accumulated resilience" is serving or will serve climate change adaptation.

III. RESILIENCE TO CLIMATE CHANGE

Although the provisions outlined above were seldom or never made in response to risks from climate change, the web of institutions, finances and regulations that made these provisions possible also provides a base for climate change adaptation (and more broadly for resilience). The fact that building and infrastructure standards are applied means that these can be adjusted if necessary to accommodate new risks or risk levels. For instance, storm and surface water drainage systems can be upgraded. Future resilience requires measures (and standards) that are affordable to low-income groups – for instance, the support in Cuba for incrementally

10. Of course not all hazards can be reduced.

constructed houses that include at least one core “safe” room that can withstand hurricanes. Existing service provision can also be adjusted for new risks or risk levels (for instance, with measures to reach populations vulnerable to heat stress during heat waves and within heat islands). City planning and land use management can be adjusted to any new or heightened risk, for instance by keeping new development and city expansion away from areas facing high levels of risk at present and in the near future, and can build on long experiences of town planners in modifying urban micro climates.⁽¹¹⁾ This can be supported by changes in private sector investments (over time shifting from high-risk areas) and changes in insurance premiums and cover.

Thus the web of local institutions and the buildings, infrastructure and services that have developed in response to non-climate change risks provide a foundation for developing resilience to climate change. They provide the capacity to absorb climate change-related disturbances, direct and indirect, while retaining the same basic structure and ways of functioning. Whether these systems will be able to respond effectively depends on whether this is promoted by the demands of inhabitants and their capacity to organize, whether city and municipal governments respond, and on the learning capacity of the institutions and their complex interrelationships. Obviously, the extent to which resilience can be effective also depends on global agreements reached on climate change mitigation that slow and stop global warming. It also depends on the scale of the shocks; New York is a wealthy city with much accumulated resilience and a city government that has innovated in disaster risk reduction and climate change adaptation,⁽¹²⁾ yet it was devastated by Hurricane Sandy.

So one of the key issues is whether all levels of government use their “accumulated” resilience (both in the built environment and in institutional/governance capacities) as the foundation to address the new or increased hazards and risks that climate change is bringing or will bring. Many cities that have accumulated resilience may not act on these changes. The political pressures that resulted in accumulated resilience were mostly citizen and civil society demands that focused primarily on their own immediate needs and priorities. Will these citizen and civil society pressures now also press for the measures needed for greater resilience to climate change? Perhaps so, if they are convinced that climate change clearly impacts (or will impact) their homes, neighbourhoods and cities. But what about citizen and civil society pressure for climate change mitigation? *Here, the issue is whether the institutions and political pressures that built the accumulated resilience will shift to resilience as a process – responding dynamically and effectively to evolving and changing climate change-related risks and to evolving and changing knowledge bases for this.* Not all climate change risks are reduced by the resilience that has accumulated over time – for instance, potential disruptions to resource flows or the risks from sea level rise; or it may be that the actions needed for resilience are outside the jurisdiction of the cities in question.⁽¹³⁾ Some recent disasters have shown what disruption they can cause to enterprises all around the world, as the supply of particular components or services these rely on is disrupted.⁽¹⁴⁾

Cities need system-wide resilience. Jo da Silva gives the example of an automobile factory in Turkey that paid attention to earthquake risk reduction, so that its plant was not damaged by a large earthquake

11. Hebbert, Michael and Vladimir Jankovic (2013), “Cities and climate change: the precedents and why they matter”, *Urban Studies* Vol 50, No 7, pages 1332–1347.

12. See reference 1.

13. See reference 7, Bhat et al. (2013).

14. UNISDR (2013), *From Shared Risk to Shared Value; the Business Case for Disaster Risk Reduction*. Global Assessment Report on Disaster Risk Reduction 2013, United Nations Office for Disaster Risk Reduction (UNISDR), Geneva, 246 pages and annexes.

15. See reference 6, da Silva (2012).

16. UN figures may suggest a lower figure but these are likely to be underestimates; see Mitlin, Diana and David Satterthwaite (2013), *Urban Poverty in the Global South: Scale and Nature*, Routledge, London, 354 pages.

17. Kiunsi, Robert (2013), "The constraints on climate change adaptation in a city with large development deficits: the case of Dar es Salaam city", *Environment and Urbanization* Vol 25, No 2, October, pages 321–337.

18. See reference 16, Mitlin and Satterthwaite (2013).

19. Pryer, Jane (1989), "When breadwinners fall ill: preliminary findings from a case study in Bangladesh", *Vulnerability: How the Poor Cope*, *IDS Bulletin* Vol 20, No 2, April, pages 49–57; also Pryer, Jane (1993), "The impact of adult ill-health on household income and nutrition in Khulna, Bangladesh", *Environment and Urbanization* Vol 5, No 2, October, pages 35–49.

20. Satterthwaite, David (2011), "How can urban centres adapt to climate change with ineffective or unrepresentative local governments?", *WIREs Climate Change* Vol 2, pages 767–776.

21. United Cities and Local Governments (2010), *Local Governments in the World; Basic Facts on 96 Selected Countries*, UCLG, Barcelona, 100 pages.

disaster – but production was disrupted for several weeks because most of the workforce lived in housing that had collapsed or had been badly damaged.⁽¹⁵⁾

What does all of this mean for urban centres in low- and middle-income nations? Many cities have very large backlogs in "risk-reducing" infrastructure and in the institutions that are meant to address this – the very opposite of accumulated resilience. Perhaps it might be termed "accumulated vulnerability". This is especially the case for the high proportion of low-income groups that live in informal settlements, mostly in housing of poor quality and often on sites at high risk from extreme weather. Around one in seven of the world's population lives in informal settlements.⁽¹⁶⁾ In a high percentage of cities in low- and middle-income nations, one-third or more of the population lives in informal settlements; many have much higher proportions, for instance more than 70 per cent in Dar es Salaam.⁽¹⁷⁾ Many large cities and most small cities in sub-Saharan Africa have no sewers or covered storm drains – or if they do, these only serve a small percentage of the population.⁽¹⁸⁾ Large sections of the urban population do not have a household waste collection service or street cleaning – which also explains why existing drains are so often blocked. They also lack access to public services, including health care, emergency services, policing/rule of law, and standard infrastructure – storm and surface drainage systems, paved roads and paths and street lighting. The incomes of these households are usually insufficient to invest in household resilience (healthier homes, life insurance, insurance for homes and possessions, savings, pensions, asset ownership). They rarely have access to government safety nets. In short, they have little resilience to any stress or shock. Simply an increase in the price of food staples, a drop in income when an income earner is injured or the purchase of medicine for a sick family member can upset a fragile equilibrium and quickly result in hunger and other needs being unmet.⁽¹⁹⁾

In addition, there is so little institutional capacity – for instance, very small city budgets (with almost no investment capacity) and most buildings and land developments contravening plans and regulations.⁽²⁰⁾ There is also not much point in changing building standards and land use management practices to serve climate change adaptation if these are not applied. Much of the responsibility for building resilience in urban areas and reducing the deficits in risk-reducing infrastructure falls to local governments. Yet annual expenditure per person by local governments in most low-income nations is less than US\$ 20, and sometimes even less than US\$ 5 – compared to local governments in most high-income nations where annual expenditure per person is US\$ 2,000–13,000.⁽²¹⁾ In most high-income countries, 10–40 per cent of government expenditure is spent by local governments. In most low-income nations, it is less than three per cent, and in many less than one per cent.⁽²²⁾ So even though local governments may have comparable responsibilities, there are very large differences in the funding base available to them to fulfil these.

So how can city resilience be built in this context? And far more quickly than in today's high-income nations, while also recognizing the political complexities of doing so? Perhaps the most important lesson from high-income nations is the significance of citizen pressure and civil society organization within each nation and locality in obtaining the political, legislative and institutional changes that provide the basis for city resilience. This can include pressure from businesses that also

want risk-reducing infrastructure and want to avoid the disruptions that extreme weather events can bring – for instance to water, electricity supplies and the goods, services and labour force on which they rely.

In many of the world's cities, local governments may have responsibility for infrastructure and services, but either they lack the capacity or they choose not to meet their responsibility to those living in informal settlements. So here, citizens will have to address their needs for greater resilience themselves, individually or collectively, while also pressing government to provide the larger underpinnings of resilience. Household and community action can increase resilience but its effectiveness often depends on complementary action by government. Community action cannot build trunk infrastructure but it can install the community level improvements that such trunk infrastructure makes possible – local piped water supplies, sewer and drain networks or community toilets and washing facilities.⁽²³⁾

Resilience to climate change is often the result of low-income citizens getting responses to everyday needs. Upgrading programmes, where those who live in informal settlements get infrastructure and services along with the tenure that encourages investment in better quality housing, are often a key to resilience for low-income households despite the fact that such upgrading has rarely been justified as climate change adaptation. The same is true for the extension of health care, emergency services and the rule of law to these settlements and also more transparent and accountable local government – i.e. the very core of good development. Resilience to climate change thus depends in large part on effective political organization and receptive political systems with the capacity both to respond positively to citizen demands and to learn. Future changes in climate that affect hydrological and coastal systems means that these investments in housing and other infrastructure will also need to take into account the changing environmental surroundings, if they are not to be wasted. Because many technological solutions – such as houses built on foundations that can be raised, or that float – will be unaffordable by most city dwellers, there will need to be a better understanding of the costs and benefits of building in different locations and using different building technologies.

But if this is the case, it changes our perspective on how climate change adaptation and resilience are best supported in cities. It ties resilience to the quality of governance, especially local governance and the capacity of government institutions to work with those most at risk. It is useful here to consider two aspects of the experiences of organizations and federations of "slum"/shack dwellers that now exist in more than 30 nations.⁽²⁴⁾ The first is how they self-organize to increase resilience through their own savings groups, which are the foundation of these federations. Most savings groups were set up by low-income women to manage risk and increase their resilience to shocks by having quick and easy access to loans when needed.⁽²⁵⁾ These groups joined together to form federations, and through their collective capacities to build or improve their own homes and basic services. They also organized and undertook citywide surveys, enumerations and mapping that helped to assess who was most at risk.⁽²⁶⁾ The second aspect is how they work to influence government and governance. They use what they do, what they build and what they document to show government their capacities and to seek partnership. When they work together with local government, it means a large increase

22. See reference 21.

23. Hasan, Arif (2006), "Orangi Pilot Project; the expansion of work beyond Orangi and the mapping of informal settlements and infrastructure", *Environment and Urbanization* Vol 18, No 2, October, pages 451–480; also Burra, Sundar, Sheela Patel and Tom Kerr (2003), "Community-designed, built and managed toilet blocks in Indian cities", *Environment and Urbanization* Vol 15, No 2, October, pages 11–32.

24. Satterthwaite, David and Diana Mitlin (2014), *Reducing Urban Poverty in the Global South*, Routledge, London, 306 pages. For details of all the federations, see <http://www.sdinet.org/>. Note: The term "slum" usually has derogatory connotations and can suggest that a settlement needs replacement or can legitimate the eviction of its residents. However, it is a difficult term to avoid for at least three reasons. First, some networks or federations of neighbourhood organizations choose to identify themselves with a positive use of the term, partly to neutralize these negative connotations; one of the most successful is the National Slum Dwellers Federation in India. Second, the only global estimates for housing deficiencies, collected by the United Nations, are for what they term "slums". And third, in some nations, there are advantages for residents of informal settlements if their settlement is recognized officially as a "slum"; indeed, the residents may lobby to get their settlement classified as a "notified slum". Where the term is used in this journal, it refers to settlements characterized by at least some of the following features: a lack of formal recognition on the part of local government of the settlement and its residents; the absence of secure tenure for residents; inadequacies in provision for infrastructure and services; overcrowded and sub-standard dwellings; and location on land less than suitable for occupation. For a discussion of more precise ways to classify the

range of housing sub-markets through which those with limited incomes buy, rent or build accommodation, see *Environment and Urbanization* Vol 1, No 2, October (1989), available at <http://eau.sagepub.com/content/1/2.toc>.

25. Joel Bolnick, quoted in Satterthwaite, David (2013), "8 points on financing climate change adaptation in urban areas", IIED blog, available at <http://www.iied.org/8-points-financing-climate-change-adaptation-in-urban-areas>.

26. The April 2012 issue of *Environment and Urbanization* is on the theme of "Mapping, enumerating and surveying informal settlements and cities" and has case studies of community-driven documentation in Ghana, Kenya, India, Namibia, South Africa, Tanzania, Thailand, Uganda and Zimbabwe. See also Appadurai, Arjun (2012), "Why enumeration counts", *Environment and Urbanization* Vol 24, No 2, October, pages 639–641.

27. Rayos Co, Jason Christopher (2010), *Community-driven Disaster Intervention: Experiences of the Homeless Peoples Federation Philippines*, IIED/ACHR/SDI Working Paper, IIED, London, 54 pages; also Mitlin, Diana, David Satterthwaite and Sheridan Bartlett (2011), *Capital, Capacities and Collaboration; the Multiple Roles of Community Savings in Addressing Urban Poverty*, Human Settlements Working Paper No 34, IIED, London, 56 pages; see also the initiatives of the different federations documented at <http://www.sdi.net.org>.

28. Lyons, Michal (2009), "Building back better: the large-scale impact of small-scale approaches to reconstruction", *World Development* Vol 37, Issue 2, pages 385–398.

29. This would also be part of the shift from resilience to transformation as bouncing forward also incorporated a need for much less carbon-intensive development – see Pelling, Mark (2011), *Adaptation to Climate Change; From Resilience to Transformation*,

in the scale and scope of what they can accomplish.⁽²⁷⁾ These federations know the limits of their own self-organization in addressing their needs. Because they cannot build much-needed citywide trunk infrastructure, they have to demonstrate to government agencies their capacities as potential partners.

The idea of resilience as "bouncing forward" is important here. It also draws on the concept of "building back better", which has influenced the disaster risk reduction community.⁽²⁸⁾ Through successful partnerships between government and these grassroots organizations, homes and neighbourhoods have been built or improved that are far more resilient.⁽²⁹⁾ They can better withstand high winds or heavy rainfall and their residents have the capacity to bounce back. But just as important, these partnerships represent a living and learning institutional capacity for still greater resilience. The ambitious programme of support for grassroots initiatives throughout Asia led by the Asian Coalition for Community Action, for instance, not only supports community-determined initiatives but also helps create demand from those who are most at risk, most vulnerable and to date, most marginalized politically. It has provided small grants to allow more than 1,000 community organizations the possibility of designing and implementing their own priorities. It supports all community initiatives in a city to visit each other, learn from each other and consider their common issues on a citywide basis, drawing the attention of city governments to the possibilities for change, if they work together.⁽³⁰⁾

In high-income nations, the resilience of urban residents to extreme weather is achieved largely through what their governments do or enable to happen; this even extends to most low-income residents. But in low-income nations and most middle-income nations, where low-income citizens are not reliably provided for by government, strengthening, protecting and adapting the assets and capabilities of individuals, households and communities is far more important than in high-income countries. This is partly because of the limits of what urban governments can do, especially in providing the necessary protective infrastructure and services to low-income populations. But it is also because of the unwillingness of many city or municipal governments to work with low-income groups, especially those living in informal settlements who are usually those most at risk from floods and storms. A focus on strengthening the asset base of low-income households can have a key role in helping them to withstand disasters. But it also strengthens their capacity to organize effectively, and so can contribute to building more competent, accountable local governments.

In conclusion, there is a need to consider resilience at three levels:

- **Resilience as it applies to individuals/households:** this includes the capacity and possibility to take action to avoid a climate change impact (live in a safe location, have a safe house, have risk-reducing infrastructure), to take action before it happens in order to reduce its impact, and to cope with the impact and either bounce back to the previous state or forward to a more resilient state. It also requires recognition that power relations within households may mean that decisions taken at the household level may not reflect the best ways to increase resilience for all members (men and women, the very young and the elderly).

- **Resilience as it applies to communities:** community capacity to work collectively to avoid a climate change impact, to take action before it happens to reduce its impact, to cope with it when it occurs, to bounce back.
- **Resilience as it applies to municipalities and cities and their governments:** capacity to take measures to ensure households/communities/enterprises avoid a climate change impact, take action before it happens to reduce its impact, cope with it when it occurs, to bounce back (if key services are disrupted, get them up and running quickly, repair infrastructure...) and to bounce forward (doing all this with an eye to where and when risk levels increase or may increase). This also needs urban governments with the capacities and financial base to meet their responsibilities.

For metropolitan areas and many cities, this also means good coordination and collaboration between the different local governments that make up the city or metropolitan area. Resilience will also have to be built at each level to slow-onset changes (e.g. gradual changes in freshwater availability, gradual rises in temperature) and indirect impacts (stresses on agriculture that raise food prices and reduce availability).

Of course, the above also needs action at higher levels of government to provide a supportive legal, institutional and financial framework. To use another increasingly popular term, to ensure that multi-level governance works at all levels (especially at the local level). Both national governments and international agencies need to recognize how competent, adequately resourced city and municipal governments that can and do work with those most at risk are central to climate change resilience. After decades of development assistance where urban governments have been ignored, there are signs that this is being more widely recognized.⁽³¹⁾ But will it result in the needed structural changes in funding for climate change adaptation that really will serve to build resilience for low-income households, community processes and local governments?⁽³²⁾ If it did not make for such an impossible acronym, the UNFCCC might need to be renamed UNFCCCCCCC – the UN Framework Convention on Climate Change for Countries, Cities, Communities and Citizens – to constantly remind it of the different levels at which resilience must be enhanced and supported.

Routledge, London, 203 pages.
30. See many reports on ACCA available at <http://www.achr.net/> including ACHR (2012), *165 Cities in Asia; Third Yearly Report of the Asian Coalition for Community Action*, Asian Coalition for Housing Rights, Bangkok, 28 pages.

31. For instance, the Report of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda released in May 2013 explicitly recognizes the key role of city governments in development, disaster risk reduction and climate change adaptation – see <http://www.environmentandurbanization.org/assessing-report-high-level-panel-eminent-persons-post-2015-development-agenda>. The Sustainable Development Goals coming out of the Rio+20 Summit also recognize the importance of local governments for sustainable development.

32. See the IIED blog <http://www.iied.org/8-points-financing-climate-change-adaptation-in-urban-areas>.

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