Environment&Urbanization Brief – 28

Towards resilience and transformation for cities within a finite planet

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SUMMARY: Development, disaster risk management and climate change adaptation and mitigation all have a common concern with reducing risk and protecting vulnerable populations – although they may focus on different risks and time scales. All cities need to become resilient to climate change's direct and indirect impacts and to build this into infrastructure investments, development plans and disaster risk management. But most city governments lack the capacity to do so. No city can be resilient if it has large deficits in risk-reducing infrastructure, little or no public investment capacity and little possibility of managing land use, new construction and urban expansion in ways that support resilience. Meanwhile, achieving the needed global reduction in greenhouse gas emissions seems impossible if private capital can seek the highest monetary returns and prosperous individuals can have high-consumption lifestyles, whatever their ecological consequences (including those related to climate change). We know that cities can be places where development needs are met (including a high quality of life) and resilience to climate change (and other disaster catalysts) built while keeping down greenhouse gas emissions. But we do not know how to get movement on these at the needed scale and speed.

I. WHAT HAS TO BE RESILIENT?

There are disagreements with regard to what resilience is and what it includes. But there are three obvious points in relation to climate change:

- The populations and economies of cities, towns and rural settlements have to become resilient to the many direct and indirect impacts of climate change.
- A large part of the world's population lives in settlements that at present cannot develop resilience because they lack the institutions, technical competence and finance to do so and because most have very large deficits in risk-reducing infrastructure and services.
- The global impact that consumption patterns and the production systems that meet (and encourage) them have on climate change has to be reduced dramatically; this requires a transformation in the choices made by middle- and high-income groups. It also means a transformation of cities both as centres of production and as concentrations of consumers.

For climate change adaptation, we need to understand who or what needs to become more resilient, and resilient to what. This means identifying the characteristics of resilience that are required for settlements if they are to support economies and societies that enable residents to lead meaningful and satisfying lives even in the face of climate change impacts. These characteristics are mutually dependent and mutually reinforcing rather than existing in a clear hierarchy. Individuals and households need to be resilient – able to respond to current risks and to reduce the consequences of future risks. For cities, this means resilient systems, both built and natural – including networked infrastructure (piped water, sanitation, drains, roads, electricity), services (public transport, health care, emergency services) and protected and managed ecosystems that deliver a sustained supply of ecosystem services. For infrastructure networks, resilience means the capacity to withstand external shocks and to have alternative paths of provision, while also being designed to recover quickly and cheaply.[1] For cities and their reliance on interconnected systems, this requires redundancy (so that failures in one system do not lead to cascading failures in others) and safe failure (so that the failure of a particular system does not in itself generate new risks).[2]

In turn, local governments need to be flexible, responsive and adequately resourced, with both financial and technical capacities to ensure that these systems operate. There is also a political dimension to resilience – a resilient city is one where city authorities are genuinely responsive to the priorities and needs of all residents. In most cities in Africa, Asia and Latin America, this includes residents of informal settlements, who require political representation and rights, including the possibility of settling on land that is not exposed to hazards and of having networked infrastructure and services as key components of their own resilience.

1. Vugrin, Eric D and Mark A Turnquist (2012), "Design for resilience in infrastructure distribution networks", Sandia Report No SAND2012-6050, Sandia National Laboratories, Albuquerque, 39 pages.

2. Tyler, Stephen and Marcus Moench (2012), "A framework for urban climate resilience", *Climate and Development* Vol 4, No 4, pages 311–326.

II. CITIES AND CHANGE

Cities need to change to stay successful. No city can be prosperous if the enterprises it concentrates produce what is no longer in demand – whether this is goods or services or its cultural heritage. Within an ever more integrated global market, this means that every prosperous city has to have and keep some comparative advantage over the competition – indeed, the need for cities to be "entrepreneurial" has been recognized for several decades.[3] At base, cities that prosper are mostly those where private capital chooses to concentrate, and this brings obvious pressures. For instance, in many Asian cities, there is pressure on the city government to be entrepreneurial, focusing on attracting or retaining private investment rather than on the land use management needed to stop urban expansion onto land exposed to climate-related hazards and to protect critical flood buffers.[4] Many city governments in sub-Saharan Africa have ambitious and expensive plans to construct city centres or satellite cities to attract foreign investment and high-income groups, while much of their population lives in informal settlements lacking piped water, sewers, drains and paved roads.[5] The private sector can be sensitive to city risk although it often requires a disaster to get their attention; in Surat, one of India's wealthiest and most successful cities, the private sector in the city recognized the need for public investment to improve conditions after two crises occurred – the plague epidemic that hit the city in 1994 and the massive flood that disrupted the city in 2006. Both had major indirect impacts on businesses, including serious disruptions to production.[6]

There is certainly some continuity; most of the world's largest cities have long been important, and India and China have long had a high proportion of the world's largest cities.[7] Yet there is constant change, both in those cities that prosper and those that do not. And some very successful cities only have short histories – for instance, Shenzhen (with more than 10 million inhabitants) was a village in 1970, and Las Vegas (with two million inhabitants) was a small town in 1950.

The need to reduce global greenhouse gas concentrations (and other forcers of climate change) is obvious – and this means reducing emissions from cities and from their inhabitants' consumption. But it has to be in the context of retaining and attracting successful enterprises. City governments are influenced by the priorities of enterprises and potential investors, which are usually at odds with climate change mitigation and often with adaptation. They are often at odds with public measures to raise funding or implement policies or regulations for mitigation. We are stuck with a fundamental disjuncture – the freedom of private capital to seek the highest monetary returns and the freedom of prosperous individuals to have high-consumption lifestyles, and the environmental and social consequences of these freedoms. Cities might be celebrated for their capacity to change, but in reality each city has a huge inertia to change because of the powerful vested interests it concentrates and existing patterns of building, infrastructure and land use.[8]

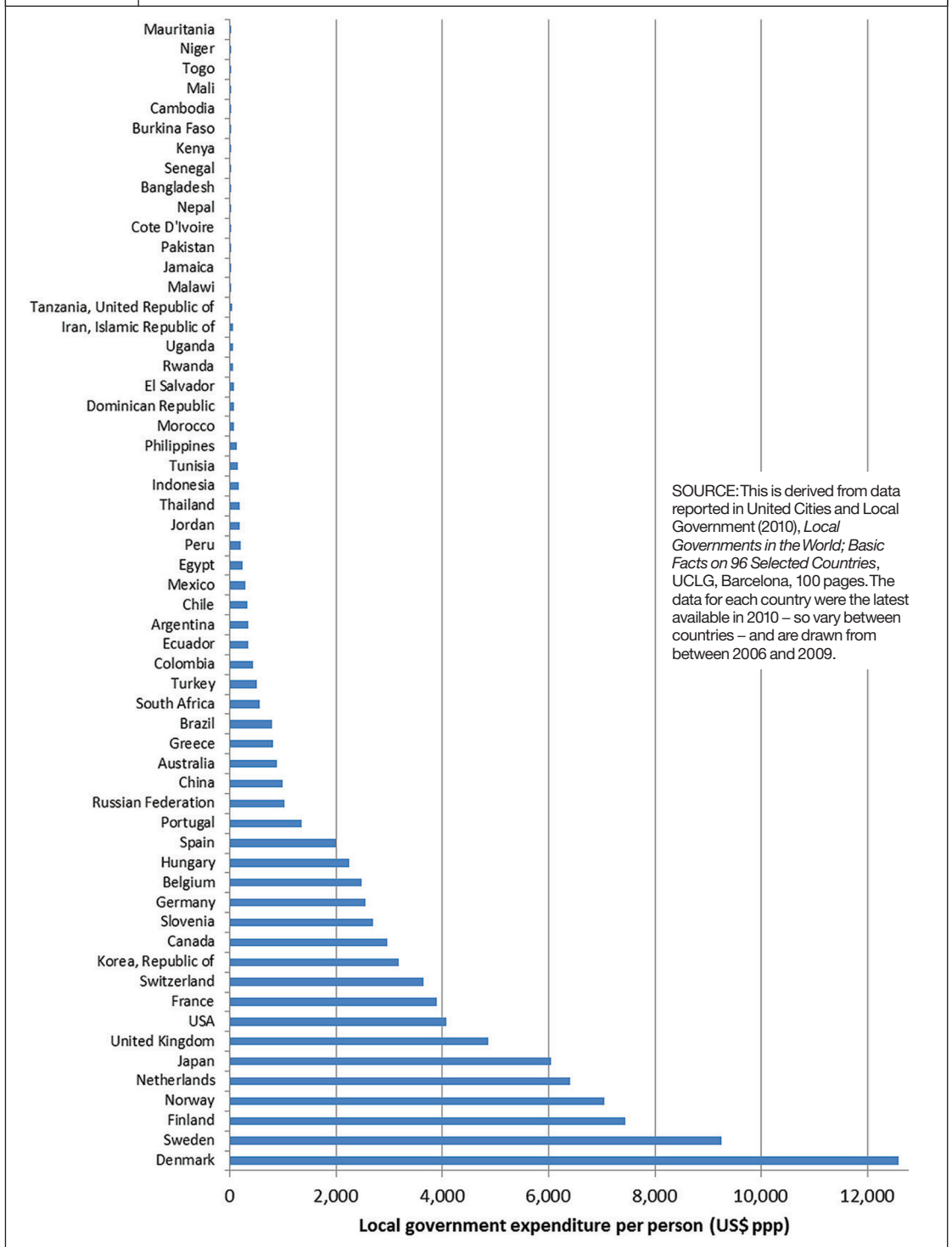## III. RISK, RESILIENCE AND TRANSFORMATION

What unites climate change adaptation and mitigation, development and disaster risk management is that all are concerned with reducing risk – even if they focus on different risks and time frames. Development is meant to reduce everyday risks – for instance, from contaminated water, inadequate sanitation and drainage, accidental fires, traffic accidents, air pollution and a range of diseases. For much of the urban population in low-income nations, risks from a range of diseases that often include HIV/AIDS, malaria, acute respiratory infections and diarrhoeal diseases are likely to be far higher than those from disasters and from climate change. But the scale of deaths, injuries and damage to assets from disasters is probably under-reported[9] – and much of what reduces risk from everyday hazards also does so for disasters. If it was possible to identify the additional risk that climate change has brought in terms of additional deaths, injuries and loss of assets, it would probably be quite small. But it is likely to be growing, with large and ever-growing risk levels into the future that may be beyond what adaptation can cope with unless global agreements are reached that rapidly reduce global greenhouse gas emissions. Work needs to start now, given how slow and difficult it is to build and reshape cities so that they contribute to risk reduction from everyday hazards, disasters, local climate change impacts and global climate change.

The issues of resilience and transformation[10] are relevant to all urban settings: how the capacities to withstand or recover from all direct and indirect impacts of climate change (resilience) can be developed while also contributing to the so much-needed transformation to a low carbon (local and global) economy where everyone's needs are met – and to achieve this quickly enough to avoid dangerous climate change. This involves, as a central component, delinking consumption patterns from high greenhouse gas emissions – and cities' contribution to this.

Resilience is also important with regard to cities facing disaster risks that are independent of climate change.[11] Far more attention is needed to disaster risk reduction and to working with low-income communities to identify how best it can be planned and implemented. Acting on disaster risk reduction can also help build local awareness and capacity to address climate change adaptation.

Cities can be assessed with regard to each of the three basic issues outlined above: resilience, capacity

3. Harvey, David (1989), "From managerialism to entrepreneurialism: the transformation in urban governance in late capitalism", *Geografiska Annaler Series B, Human Geography* Vol 71, No 1, pages 3–17.

4. See the paper by Sarah Orleans Reed, Richard Friend, Vu Canh Toan, Pakamas Thinphanga, Ratri Sutarto and Dilip Singh listed on the back page, which includes an example of this taking place in the city of Da Nang in Vietnam.

5. See the paper by Vanessa Watson on "African urban fantasies: dreams or nightmares?" to be published in the April 2014 issue, but that will be available online at http://www.eau.sagepub.com/ in December 2013.

6. See the paper by G K Bhat, Anup Karanth, Lalit Dashora and Umamaheshwaran Rajasekar listed on the back page.

7. This is discussed in more detail in Satterthwaite, David (2007), *The Transition to a Predominantly Urban World and its Underpinnings,* Human Settlements Discussion Paper, Urban Change 4, IIED, London, 86 pages; this can be downloaded from http://www.pubs.iied.org/10550IIED.html.

8. Handmer, John and Stephen Dovers (2007), *The Handbook of Disaster and Emergency Policies and Institutions,* Routledge, London, 192 pages.

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

10. This discussion draws on Pelling, Mark (2011), *Adaptation to Climate Change; From Resilience to Transformation,* Routledge, London, 203 pages.

11. As the papers on Surat and Bursa listed on the back page make clear.

FIGURE 1:	The range in local government expenditure per person per year

Mauritania
Niger
Togo
Mali
Cambodia
Burkina Faso
Kenya
Senegal
Bangladesh
Nepal
Cote D'Ivoire
Pakistan
Jamaica
Malawi
Tanzania, United Republic of
Iran, Islamic Republic of
Uganda
Rwanda
El Salvador
Dominican Republic
Morocco
Philippines
Tunisia
Indonesia
Thailand
Jordan
Peru
Egypt
Mexico
Chile
Argentina
Ecuador
Colombia
Turkey
South Africa
Brazil
Greece
Australia
China
Russian Federation
Portugal
Spain
Hungary
Belgium
Germany
Slovenia
Canada
Korea, Republic of
Switzerland
France
USA
United Kingdom
Japan
Netherlands
Norway
Finland
Sweden
Denmark

Local government expenditure per person (US$ ppp)

0   2,000   4,000   6,000   8,000   10,000   12,000

SOURCE: This is derived from data reported in United Cities and Local Government (2010), *Local Governments in the World; Basic Facts on 96 Selected Countries*, UCLG, Barcelona, 100 pages. The data for each country were the latest available in 2010 – so vary between countries – and are drawn from between 2006 and 2009.

to act and transformation. Cities in low-income nations and many in lower-middle income nations have very little possibility of addressing these. For instance, Dar es Salaam with more than three million inhabitants is a city with little resilience and very limited capacity to act. It has relatively low levels of greenhouse gas emissions per person, mainly because of the lack of industry and the low consumption levels of most of the population – although the city's sprawl is helping to create an urban pattern that is difficult to serve with public transport and infrastructure. How does a city like Dar es Salaam begin to build resilience to storms, floods, sea level rise, storm surges and extreme temperatures when it cannot even provide much of its population with piped water and provision for sanitation, drainage and all-weather roads?[12]

12. See the paper by Robert Kiunsi listed on the back page.

13. These are US dollars at purchasing power parity (ppp). The statistics are drawn from United Cities and Local Government (2010), *Local Governments in the World; Basic Facts on 96 Selected Countries*, UCLG, Barcelona, 100 pages. Some of the variation relates to how local governments are defined – for instance, provincial or state governments are included as local government in some countries but not in others.

Figure 1 highlights the astonishing differences in annual expenditure per person by local governments. This ranges from US$ 2,000–13,000 for most high-income nations to less than US$ 20 for most low-income nations and less than US$ 5 for many.[13] It also highlights how far the resources available to local governments in many nations are from what is needed to meet their responsibilities. If there were figures for capital available for investment per person – for instance, in risk-reducing infrastructure – they would be much lower than these figures, as most local government expenditure goes to pay staff and other recurrent costs. You cannot build resilient cities when there are large deficits in risk-reducing infrastructure, little or no public investment capacity – and little possibility of managing land use, new construction and urban expansion in ways that support resilience.

In cities in high-income nations, it is much simpler to set targets for mitigation than for adaptation. The success of mitigation initiatives can be assessed by a single metric (the reduction in greenhouse gas emissions) and there are established frameworks for Monitoring, Reporting and Verification (MRV) (a key component of global climate negotiations). Conversely, in cities in low- and middle-income countries it is easier to foresee progress on adaptation than on mitigation. Even the most progressive and climate change-aware city government will have difficulty discouraging new enterprises or high-consumption residents if this simply means they go elsewhere. It must also be recognized that most urban residents in Africa and Asia contribute little to climate change through emissions arising from their consumption, although in urban centres where the middle classes, and their consumption, expand this will change. Although some cities and local governments around the world have shown a remarkable commitment to reducing their own emissions, these efforts need to be supported by global agreements on low carbon production and consumption – to which all national governments commit and contribute.

IV. LEARNING FROM CITIES

14. Previous papers on Durban's climate change policies in this Journal are included in Vol 25, No 1 (April 2013), Vol 24, No 1 (April 2012), Vol 22, No 2 (October 2010) and Vol 20, No 2 (October 2008).

Durban is a city from which we can learn on a number of fronts, namely:[14]
• the political changes that brought more attention to climate change issues, and the policies that were adopted;
• the tools used to do this;
• the identification of different options and their benefits and costs;
• the integration of concern for climate change across the urban, peri-urban and rural areas within the local government boundaries;
• the assessment of the contributions of ecosystem services, and the measures needed to protect and enhance these;
• the attention to possibilities to enhance employment through developing a green economy;
• the demonstration that local innovators, not national policies or international initiatives, are providing knowledge on what needs to be done;
• the success in getting the attention of city government by bringing into climate change policy discussions of the issues of job creation (within the green economy) and improved living conditions;
• the encouragement and recognition of local innovation (the interest in green roofs was started by one enthusiastic student); and
• in the honesty concerning what has not yet been achieved.

15. See the paper by Debra Roberts and Sean O'Donoghue listed on the back page.

The experience in Durban has also produced some surprises, for instance on what focuses best build support for climate change adaptation within local governments, what measures work and where lessons can be drawn from. Durban's government has far more capacity to act than the local government in Dar es Salaam, for instance; but it also has other pressing priorities that can make the needed commitment to adaptation and mitigation difficult.[15]

16. This is described in the paper by Bingqin Li listed on the back page.

17. Solecki, William (2012), "Urban environmental challenges and climate change action in New York City", *Environment and Urbanization* Vol 24, No 2, pages 557–573.

18. See the paper by Jorgelina Hardoy and Regina Ruete listed on the back page.

This process in Durban can be contrasted with the experience in China, where it is central government that has sought responses to climate change, but with very little engagement with local governments or citizens. A considerable range of new national policies and institutional changes on climate change have been developed, with provinces encouraged to develop adaptation programmes. But the incentives for local governments are still much more focused on economic growth – and localized policy-making treats central mandates as guidelines to be manipulated for local interests. Policy-making at the local level does not engage citizens or businesses.[16]

A few city governments are taking steps towards building resilience – for example, New York City, and there is some discussion within city government on transformation,[17] although Hurricane Sandy showed the limitations in the city's resilience to extreme weather. Rosario in Argentina has made progress in making the city more resilient (especially for low-income groups), but in the face of other pressing and competing interests, the city government faces significant challenges in developing climate change adaptation – especially in getting funding – and collecting the data needed to plan and act.[18]

Learning that is generated by and shared across all stakeholder groups is increasingly proposed as a key element of resilience. This can help build an appreciation for complexity and uncertainty among stakeholders and provide a space for discussing vulnerability and resilience in each city's particular context. But there are also challenges faced by shared learning among different interest groups in politi-

19. As discussed in the paper by Sarah Orleans Reed, Richard Friend, Vu Canh Toan, Pakamas Thinphanga, Ratri Sutarto and Dilip Singh on shared learning with regard to 10 cities that are part of the Asian Cities Climate Change Resilience Network (ACCCRN), listed on the back page.

20. See the paper by C L Walsh, D Roberts, R J Dawson, J W Hall, A Nickson and R Hounsome listed on the back page.

21. The paper by C L Walsh, D Roberts, R J Dawson, J W Hall, A Nickson and R Hounsome listed on the back page also has a valuable discussion of what is transferable to other cities and of the importance of interaction between researchers and stakeholders.

22. Lyons, M and T Schilderman with Camillo Boano (editors) (2010), *Building Back Better: Delivering People-centred Housing Reconstruction at Scale*, Practical Action, 375 pages.

23. Dodman, D, J Ayers and S Huq (2009), "Building resilience", in Worldwatch Institute, *Into a Warming World: State of the World 2009*, Worldwatch Institute, New York, pages 75–77.

24. See the paper by G K Bhat, Anup Karanth, Lalit Dashora and Umamaheshwaran Rajasekar listed on the back page.

25. 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.

26. See the paper by David Satterthwaite listed on the back page.

27. See the paper by Jorgelina Hardoy and Regina Ruete listed on the back page.

cized urban environments, where the validity of addressing climate change may be contested.[19]

There is also shared learning on how cities develop the data needed to inform policies and actions. Here, integrated assessment modelling is important and its application in London and Durban shows its value.[20] All cities need to consider options for mitigation and adaptation within contexts of demographic and economic change. But there are difficulties both in getting the detail and resolution needed for action and in getting the necessary understanding and attention within local governments.[21]

V. OF TERMS AND TERMINOLOGY

With regard to climate change, the term "resilience" is a useful complement to the more frequently used concept of adaptation, in that it suggests a capacity not only to withstand shocks or stresses but also to recover (although what supports one may not support the other). These capacities should include an ability to withstand or recover from the unexpected. Another characteristic of resilience may be inserted between these – the capacity to cope. Resilience might also include recovery in ways that increase the capacity to withstand future shocks. Increasingly, resilience draws on ideas from the disaster risk reduction literature on "building back better"[22] – that is, not only supporting a return to the previous state but also actively working to improve it. Building back better can also address risks from slow- and rapid-onset disasters and climate change. These are capacities that are very useful with regard to all disasters (or potential catalysts for disasters), so resilience is a popular word in discussions on disaster risk reduction. But a capacity to withstand shocks or stresses is an important characteristic within so many settings, so that the term "resilience" is also used in settings other than climate change and disasters. For instance, the use of the term in relation to economic change is particularly popular at the moment as city governments strive to cope with economic recession, often with a substantial proportion of their population having difficulty affording basic services and often with large cuts in funding from higher levels of government. There is a real worry that the term "resilience" will follow the term "sustainable development" in being used by so many different groups to justify their particular interests and priorities.

Within discussions of development and climate change, resilience has come to be applied to a great range of contexts – for instance, to individuals, households and communities (and their assets and livelihoods); also to cities (or specific sectors within city economies) and national economies. Discussions of resilience in these contexts also include a range of threats and risks, perhaps especially for cities where there are complex interconnections or interdependencies between a range of systems on which they depend (including transport, communications, electricity, water and wastewater disposal).

There is also an interest in the processes through which resilience is achieved – as measures for resilience have to respond to changes in impacts (for instance, rising sea levels, often increasing water constraints and often increases in intensity or frequency of extreme weather). There is particular interest in how city, municipal or metropolitan governments have addressed this or are considering addressing it. In this case, resilience is seen more as a process than an outcome[23] – an activity that has to be continuously practised if it is to maintain value.

A focus on resilience for cities also encourages more attention to the dependence of residents and businesses on goods, services (including ecological services) and financial flows from outside their boundaries (and thus outside the jurisdiction of their governments) – for instance, water and other natural resources. For many cities, managing flood risk often means good management of upstream water flows and watersheds that are also outside their jurisdiction.[24] Then there is the complex mix of supply chains for natural resources and other goods from outside their boundaries (and often from other nations), on which urban citizens and businesses depend – and the dependence of many enterprises on sales of goods and services to external markets.[25] Indeed, some discussions of city resilience focus almost entirely on the resilience of the economy.

Then there is the resilience to climate change impacts that almost all cities in high-income nations and some in middle-income nations have accumulated that has nothing to do with responses to climate change. Within these cities, resilience to extreme weather risks and some other potential disaster risks (for instance, fires) has been developed over the last 150 years, driven by political pressures from those enterprises and residents who were at risk. This is what ensured provision for piped water supplies, sewers, drains, emergency services, health care and social security for everyone in the city, regardless of their income.[26] This provides an institutional, financial and infrastructural base upon which to build resilience to the exacerbation of these risks and other risks that climate change brings or will bring. To return to the city of Rosario, the measures to make the city much more resilient to external stresses and shocks were not implemented because of climate change, but they still provide a valuable base into which climate change concerns can be (and are being) integrated.[27]

VI. THE LIMITS OF RESILIENCE

A city government may build resilience to likely and possible climate change impacts while doing nothing to contribute to a low carbon economy or to meeting the needs of the population. Mark Pelling made the

28. See reference 10, Pelling (2011).

29. See Rees, William, E (1992), "Ecological footprints and appropriated carrying capacity", *Environment and Urbanization* Vol 4, No 2, pages 121–130; also Wackernagel, Mathis, Justin Kitzes, Dan Moran, Steven Goldfinger and Mary Thomas (2006), "The ecological footprint of cities and regions: comparing resource availability with resource demand", *Environment and Urbanization* Vol 18, No 1, pages 103–112.

useful distinction between cities that move towards resilience and those that move beyond this, to transformation.[28] Moving towards resilience is achieved with an active adaptation policy, identifying current and likely future risks, with institutional structures to encourage and support needed action by all sectors and agencies. To go beyond resilience to transformation means having adaptation policies and investments integrated with development that really meet needs (including those of low-income groups), while also addressing mitigation and, where needed, over-large ecological footprints.[29] This obviously requires fundamental changes in the supporting political and cultural systems. We know that cities can be places where development needs are met (including a high quality of life) and resilience to climate change built while also keeping down greenhouse gas emissions. But we are still so far from understanding how to get there with the needed scale and speed and the necessary supports at local, national and global scales.

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