

water and environmental degradation. The source and target areas of human migration should receive particular attention. Such agreements might highlight groundwater quantity and quality in urban regions; riverside or floodplain protection; and development and irrigation in areas needed to protect water supplies for cities. Immigration policies should encourage development and growth in environmentally suitable regions.

National governments must put teeth into policies mandating urban region plans. Funding for planning, implementation and measuring progress should be allocated by the different levels of government and beneficiaries.

Urban region planning requires a new mix of expertise. Essential are experts in: ecosystem and landscape ecology, water quantity and quality, agricultural soil quality and productivity, economics, transportation infrastructure engineering and community development. International agencies, non-governmental organizations, academics and professionals should step forward with case studies, examples, models and new projects. Major universities should establish multisector urban region planning units to develop models and initiatives.

Society must think globally, plan regionally, then act locally. ■

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1. United Nations Department of Economic and Social Affairs. *World Urbanization Prospects: The 2014 Revision* (United Nations, 2014).
2. Brinkmann, K., Schumacher, J., Dittrich, A., Kadore, I. & Buerkert, A. *Landsc. Urban Plan.* **105**, 94–105 (2012).
3. Forman, R. T. T. *Urban Regions: Ecology and Planning Beyond the City* (Cambridge Univ. Press, 2008).
4. Forman, R. T. T. *Urban Ecology: Science of Cities* (Cambridge Univ. Press, 2014).
5. Intergovernmental Panel on Climate Change. *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (eds Stocker, T. F. et al.) (Cambridge Univ. Press, 2013).
6. Tilman, D., Balzer, C., Hill, J. & Befort, B. L. *Proc. Natl Acad. Sci. USA* **108**, 20260–20264 (2011).
7. Hoekstra, J. M. et al. *The Atlas of Global Conservation: Changes, Challenges, and Opportunities to Make a Difference* (Univ. California Press, 2010).
8. Wu, J. *Landsc. Urban Plan.* **125**, 209–221 (2014).



The Mayor of Paris, Anne Hidalgo, at a meeting of the C40 and Compact of Mayors city networks.

Give cities a seat at the top table

Building more strategic links between urban innovation and global governance will help to tackle today's grand challenges, argues **Michele Acuto**.

In October, the United Nations will launch its New Urban Agenda at the Habitat III conference on housing and sustainable urban development in Quito, Ecuador. This declaration aims to harness the power of cities as engines of sustainable development. Yet the road to Quito is uphill: cities are integrated poorly into multilateral diplomacy, and limits to their powers and budgets threaten their effectiveness as global change-makers.

Cities already account for 70% of global greenhouse-gas emissions and house more than half of humanity. Most are expanding: by the end of 2016, more than 70 million people will have moved to urban areas¹. By 2030, there will be 41 megacities of 10 million inhabitants or more, from today's 28, and city dwellers will generate more than 2 billion tonnes of waste per year².

Yet, as politically organized entities, cities are also catalysing sustainability

solutions. By 2017, for example, nearly 2.5 million daily subway commuters in Santiago, Chile, will be transported by a system run on solar and wind energy. Singapore has pioneered efficient traffic management through congestion charging since 1975. Cape Town in South Africa has some of the continent's most ambitious water-conservation targets. And San Francisco in California and Montreal in Canada have exceeded their federal governments' standards for policies on gender balance and human rights. The global importance of cities for grand challenges has been recognized in the Paris agreement on climate change, the UN Sustainable Development Goals (SDGs) and the UN Sendai Framework for Disaster Risk Reduction.

Cities are more networked than ever. They enhance their capabilities by working together, sharing experiences and forging public-private partnerships across health, governance, democracy, infrastructure ▶

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► and security. Formal networks include United Cities and Local Governments (UCLG), the Rockefeller Foundation's 100 Resilient Cities, the World Health Organization's (WHO) Healthy Cities and ICLEI Local Governments for Sustainability. In 1985, there were 55 such networks; now there are more than 200, spanning issues from climate to gender, health, security and democratic accountability³.

The C40 Cities Climate Leadership Group, a network focused on environmental action, includes 86 of the world's most influential human settlements from Sydney and Rio de Janeiro to Hong Kong, Johannesburg and London. Its 9,831 climate and sustainability initiatives since 2011 affect 1 in 12 people worldwide, and the economies of C40 cities account for 25% of global gross domestic product. C40 efforts will reduce carbon dioxide emissions by 645 megatonnes by 2020, with financing of more than US\$2.8 billion⁴.

But the promise of cities is hampered by patchy collaboration with national governments, limited access to global governance processes such as the SDGs and Habitat III, meagre funding for collaboration, and poor data collection and sharing. Most city collaborations remain ad hoc and lack strategic thinking by mayors and local officers. Branding and business opportunities are the major drivers of city networking, which is often dismissed as "pomp and circumstance" (see *Nature* <http://doi.org/bqrj>; 2015).

If, as Habitat III states, the battle for sustainable development is to be won or lost in cities, they must be given a fighting chance. City networks need to be integrated more seriously into multilateral processes; more directed towards global goals; better equipped to deliver data; and better supported financially and politically.

SCALING UP

Cities see clear benefits in networking (see 'Networking boom'). Two-thirds of climate actions by C40 cities in 2015 were delivered with other C40 cities, and 95% are planned to expand to greater metropolitan scales. Changwon in South Korea, for instance, is applying 'cool roof' techniques (to reflect sunlight and cool buildings) that draw on trials in the C40 cities of Tokyo and New York.

Styles of governance across collaborations and global networks matter. In C40, for instance, cities that own and operate their assets in a top-down manner deliver, on average, fewer pilot climate actions than those with more collaborative approaches⁴. Cities that innovate openly in partnership with business, civil society and other urban areas are three times more likely to extend pilot projects citywide^{4,5}. Nearly two-thirds of city networks have some form of partnership with major multilateral organizations (such as the World Bank) and corporations (such as the

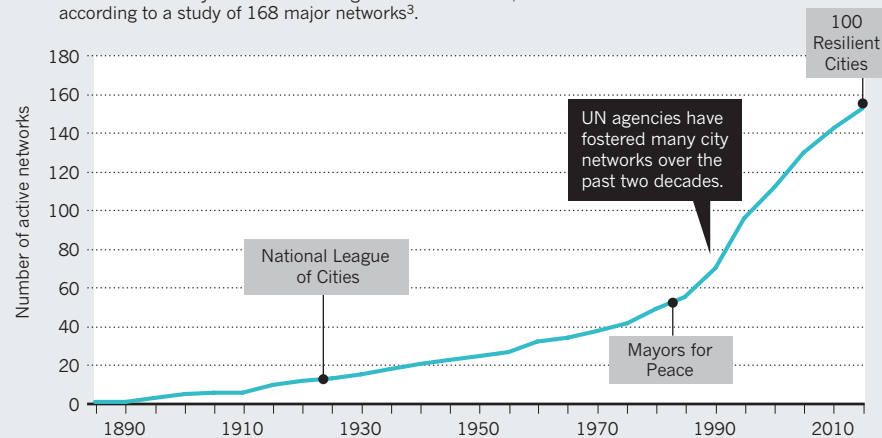
NETWORKING BOOM

Formal networks of cities collaborating on various issues have grown in number (1), geographical scale (2) and scope (3, 4), owing to factors including globalization and heightened environmental concerns.

SOURCE: REF 3

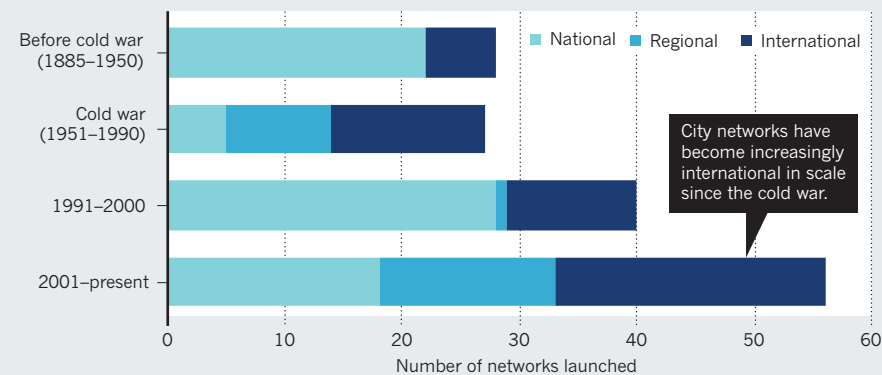
1 Network numbers

The number of city networks has surged since the 1990s, according to a study of 168 major networks³.



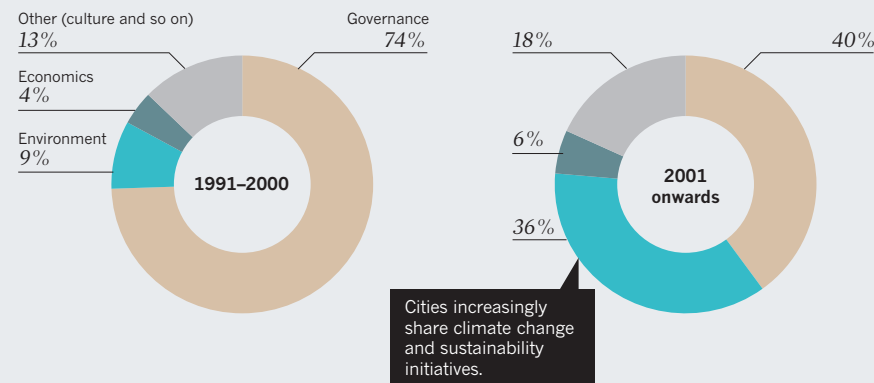
2 Global reach

Most early city networks had a national focus; today they reflect the march of globalization.



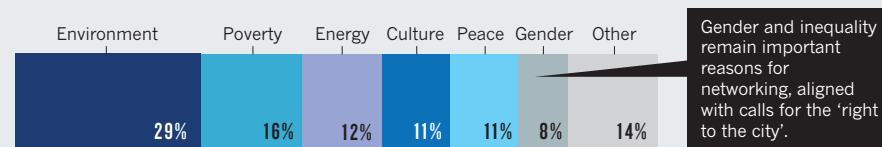
3 Focus of networking

City collaborations have become more environmentally oriented in the 2000s.



4 Broad themes

City networks address a wide range of social and environmental issues, from energy to health.



engineering firm Arup, based in London).

Cities in the developing world are involved: Rio chaired the C40 group in 2013–16, Istanbul chairs UCLG and Bogotá heads the UN Global Network on Safer Cities. Small cities have also been active; for instance, Kuopio in Finland and Udine in Italy are WHO Healthy Cities. And in South Africa, Tshwane (a medium-sized city that includes Pretoria) is expanding its biogas power plants. It is investing \$5 million to save 2 million tonnes of CO₂ between 2015 and 2035 in collaboration with international development funders and other C40 cities' energy working groups.

City halls are keen to do more. Nearly 90% of the C40 actions reported in 2015 in adaptation, water, energy supply, private transport and community development are scheduled to be extended. These include Melbourne's target of planting 3,000 trees a year to double its urban canopy by 2040, and Philadelphia's donation of 8,000 free trees by 2015. But there are limits to what cities can achieve within current networks.

LIMITS TO NETWORKING

Funding is short. Even in the relatively well-backed C40 group, almost two-thirds (64%) of climate actions are funded solely from individual cities' budgets or savings. This is unsustainable in the long run. Small and poor cities cannot shoulder the high costs. The wider investment landscape is brittle and splintered; it includes global development organizations such as the World Bank, philanthropies such as the Rockefeller Foundation, companies such as Siemens and some national governments such as Germany. Budget-stretched cities and the market-driven private sector face too many demands to coordinate responses to global challenges.

Data generation and sharing are inadequate, despite being a requirement of the SDGs, the Sendai Framework and the New Urban Agenda. Although 45% of city networks publish reports listing their actions, fewer connect to their members using newsletters (37%) or through collaboration platforms, blogs and social media (24%). Efforts are needed to gather, store, share and connect information at the local level⁶, and to offer more sophisticated urban measurements that are both granular and globally relevant⁷.

Cities and city networks are poorly linked to national and international policy frameworks. Urban issues receive some UN attention (such as through WHO Healthy Cities, the UN Educational, Scientific and Cultural Organization (UNESCO) and the UN-Habitat network on urban safety and security) and from other international bodies (such as the World Economic Forum's council on urbanization). But there are no formal mechanisms to ensure that cities and networks have places at global decision-making tables.

Central governments underestimate the

potential of city networking locally and internationally. The New Urban Agenda remains a largely national effort, despite extensive consultation with assemblies of cities, universities and the private sector in the run up to the Habitat III conference⁸. National city networks — which make up almost half the global tally — are sidelined. Cities need to be considered as active partners in global governance, not just as places for markets.

NETWORK STRATEGICALLY

To improve the impact of city networks, three elements must be boosted: investment, collaboration and research.

Invest more wisely. International organizations and the corporate sector have ploughed generous funds into infrastructure — including \$111.6 billion in private investments in 2015 and \$24.2 billion of World Bank financing in 2014. Governments and states should invest more and encourage experimentation on city streets⁹. Philanthropists are ahead of the curve in this respect. For instance, the 100 Resilient Cities project has financed a \$100-million network — covering 100 cities worldwide, from Dakar and Durban to Da Nang in Vietnam — to create resilience plans and share technologies.

A start came with the launch of the C40 Cities Finance Facility last year. Sums of \$3.7 million from the German Federal Ministry for Economic Cooperation and Development and \$2 million from the Inter-American Development Bank should grow to \$20 million over the next three years, if the funding is connected effectively to spending on sustainable infrastructure in cities across low- and middle-income countries. Projects will include low-carbon transport and sustainable street lighting. But those funds are limited to one city network; similar grants are needed to help cities to address all grand challenges, including gender balance or security.

Bridge governance scales. City networks should be a part of global action, not a parallel track. Johannesburg in South Africa, inspired by its C40 link with Washington DC, is working with the World Bank and national bodies to implement a 'tax increment financing' scheme to enhance its neighbourhood planning efforts. Similarly, WHO Healthy Cities was devised as 'field laboratory'¹⁰ for testing and diffusing knowledge about local WHO efforts. Among many lessons from its 25-year track record is the importance of engaging with scholars to assess the impact and effectiveness of city networking.

Local governments should network more effectively. For instance, 100 Resilient Cities

gives \$1-million grants to appoint officers who coordinate all of a city's resilience efforts — between departments, local and national bodies, and across the 100-city cohort.

Enhance science–policy interactions. Cities need data gathering, sharing and analyses to become more joined up and effective. A solution may lie close to mayoral offices — the average distance between a city hall and the closest major university is just under four kilometres in four of the major networks (C40, WHO Healthy Cities, UNESCO Creative Cities and UCLG). Yet most urban assessments are farmed out to the private sector or overseas universities. Philanthropists and universities are again ahead of governments on this score. For instance, Harvard University and the Laura and John Arnold Foundation are sponsoring a peer network of urban 'chief data officers' to support data visualization and predictive analytics. Developing local research hubs, especially in Africa, Latin America and southeast Asia, would enable local innovation and solutions there.

Cross-network efforts need consolidating and better access to national and international policymaking processes. The Compact of Mayors is one starting point. Set up in 2014 by UN special envoy Michael Bloomberg and UN secretary general Ban Ki-moon, it connects 528 cities (438 million people) by linking C40, ICLEI and UCLG. Arup and other Compact of Mayors partners have begun to catalogue members' voluntary carbon commitments as a first step towards collective accounting. So far, this is on an experimental basis — such links need to be strengthened, span more sectors (including climate, health and security) and support closer ties between science and policy.

Cities are undoubtedly changing the world. If they do so together, with seats at the highest global decision-making tables and with a strategic mindset, it will be for the better. ■

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- McGranahan, G. & Satterthwaite, D. *Urbanisation Concepts and Trends* (IIED, 2014); available at <http://pubs.iied.org/10709IIED>
- Hoornweg, D., Bhada-Tata, P. & Kennedy, C. *Nature* **502**, 615–617 (2013).
- Acuto, M. & Rayner, S. *Int. Aff.* **92**, 1147–1166 (2016).
- Climate Action in Megacities 3.0* (C40, 2015); available at <http://cam3.c40.org/#/main/home>
- Powering Climate Action* (C40/Arup, 2015); available at <http://go.nature.com/2cun3ly>
- Acuto, M. & Parnell, S. *Science* **352**, 873 (2016).
- Wachsmuth, D., Aldana Cohen, D. & Angelo, H. *Nature* **536**, 391–393 (2016).
- Satterthwaite, D. *Environ. Urban.* **28**, 3–12 (2016).
- Castán-Broto, V. & Bulkeley, H. *Glob. Environ. Change* **23**, 92–102 (2013).
- Kickbusch, I. *Am. J. Public Health* **93**, 383–388 (2003).