Cities, Energy and Climate Change Mitigation: An Introduction

Christopher Dent, Catherine Bale, Zia Wadud, Hinrich Voss
(University of Leeds)

1. Why Cities, Energy and Climate Change Mitigation?

Understanding cities is vital to understanding the nature of energy and climate change challenges facing humanity in the 21st century, as well as how these twin challenges are addressed. Fossil fuel combustion is the biggest contributor to carbon emissions and other greenhouse gas (GHG) emissions, and thus the principal cause of climate change. Cites are where the human and industrial activity that produces GHG emissions is most concentrated, and account for up to 75 percent of total emissions (UNEP 2015). Cities are also adversely affected by the effects of climate change given that over 80 percent of cities are located on coasts and rivers, making them susceptible to sea level rise, floods and extreme weather events (IPCC 2014, UN 2014, WHO 2014). Energy systems also play a vital role in urban infrastructures, and thus sustaining the material welfare and prosperity of societies worldwide. However, recent research suggests that we cannot burn the fossil fuels we have if we are to limit significant climate change. A third of oil reserves, half of gas reserves and over 80 per cent of current coal reserves should remain unused from 2010 to 2050 in order to meet the target of 2 °C (McGlade and Ekins 2015). As a result cities are facing a growing need to move to energy independence. This adds another dimension to sustainable energy strategy-making in cities, where renewables and other low-carbon technologies can offer attractive options for city-based power generation and supply, bringing economic, social and environmental incentives in addition to helping tackle climate change (The Global Commission on the Economy and Climate, 2014).

An increasing number of municipal authorities around the world are formulating climate change and energy strategies, in support of the vision for sustainable 'green' cities (REN21 2015). Studies in this area have thus far generally focused on developed country cities (Bulkeley and Betsill 2013, Bulkeley *et al* 2014) but developing country cities – and especially those in Asia – are expanding at a burgeoning rate and having a profound impact on climate change and global energy security. As papers in this special edition examine and global reports indicate, the impact of Asian cities is expected to become more significant over forthcoming decades (IEA 2013, WRI 2014). Most of the world's largest cities are now located in East Asia and South Asia, and current estimates suggest they will absorb another billion people by the late 2030s (Puppim de Oliveira *et al* 2013). This expansion of the world's urban population alone will create intensifying energy and environmental pressures that will be felt both locally and globally.

In the context of these urban energy and climate change mitigation challenges, eco-city development has become a global trend. In the developing world, Asia is again very relevant here (Fook and Gang 2010), yet according to the IPCC (2014) many cities in the developing and emerging countries lack the institutional and financial capacities

as well as the political will to establish viable low carbon strategies and plans. Issues of governance are critical to how cities address energy and climate change mitigation challenges generally. Municipal authorities can of course undertake this task with varying degrees of autonomy, depending upon the political and legislative environment of the countries in which they are located. Yet as papers in this special issue explore, effective urban planning on energy and climate change requires multi-level interactions across local, provincial, national, regional and global scales because optimal actions on this front necessitate co-ordinated responses and different co-operation mechanisms. Thus, city plans are often set within the legislative framework set by national policies on low carbon development, that in turn arise from international agreements (Adelle and Russell, 2013, Franzén, 2013, Gouldson *et al* 2014). At the regional level, Håvard Haarstad notes in this issue how the European Union has mobilized several initiatives directed at climate change and low-carbon transitions in cities and in cooperation with city authorities.

Notwithstanding this 'nesting' of urban planning on energy and climate change mitigation within the parameters of national policies and international treaties, many researchers contend that municipal authorities are frequently better positioned, able to act with greater flexibility and generally more effective than their relevant counterpart agencies in central government in dealing with energy and climate change risks. In addition to vertical governance relationships and structures, cities are also engaged in horizontal forms of co-operation and alliance formation on this front (Hodson and Marvin 2012). City networks such as C40 Large Cities Climate Group, Local Agenda 21, ICLEI-Local Governments for Sustainability and the EU-sponsored Covenant of Mayors are now powerful lobbies for positive action on tackling climate change, and have sought strategic role in harnessing finance for low carbon energy and related infrastructure to secure the prosperity of member cities (Hodson *et al* 2013).

This special edition is a collection of revised papers first presented at the *Cities, Energy and Climate Change Mitigation* at the University of Leeds in July 2014. The event was the third conference of the Asia-Europe Energy Policy Research Network (AEEPRN) that was founded in 2012 by a group of specialists from both regions committed to conducting objective, cutting edge research that contributes to financially viable and environmentally sustainable energy use within and between Asia and Europe in both the short and long run. Professor Christopher Dent (Leeds) first conceived the idea for the Network, and it is now hosted organisationally at the Energy Studies Institute (ESI) at the National University of Singapore. The fourth AEEPRN conference was convened in July 2015 at Korea University, Seoul, further continuing the work of our group. The papers assembled here represent different perspectives from Europe and Asia on how cities are tackling the twin challenges of energy and climate change mitigation. Key themes comprise urban planning, city governance, transport, business models, built infrastructure and distributed generation.

2. Overview of the Special Issue Papers

In the first paper of this special issue, Håvard Haarstad considers at what levels are urban low-carbon transitions are governed, and how we can conceptualise the complex governance arrangements for mobility and urban form in Europe. He generally contends that urban governance on energy and climate change mitigation exists at various scales, and that existing debates in the literature tend to emphasise both

vertical processes – primarily through multi-level governance perspectives – and horizontal processes, focused on network and policy mobility perspectives. Haarstad argues that these perspectives however tend to overlook the material nature of cities, and how low-carbon energy transitions and climate change responses are mediated by existing urban infrastructures. His paper attempts to reconcile these approaches and, with reference to the European context and the Norwegian city of Stavanger, outlines a framework for conceptualizing how different types of governance processes around urban low-carbon energy transitions are interrelated.

Following on in the urban planning theme, the paper by Andrew Gouldson *et al* starts with the premise that while cities are central to tackling energy and climate change risks, those in the developing world invariably lack the institutional, financial and technical capacities needed to switch to low carbon development paths. Based on three detailed case studies of Asian cities (Kolkata in India, Palembang in Indonesia and Johor Bahru in Malaysia), the authors contend that the opportunities to switch to economically attractive low carbon development strategies at the urban level are significant. However, they also argues that without a co-ordinated multi-level, cross-sectoral governance framework these opportunities for low carbon urban development are likely to be left unexploited. As such governance conditions are often non-existent, it seems likely that these case study cities and many others are likely to become increasingly locked in to higher cost, higher carbon development paths. The paper concludes by suggesting that these urban development decisions – or in the case of ungoverned urban development these non-decisions – will have global implications for climate change.

Jae-Seung Lee and Jeon-wong Kim's paper also focuses on Asia, and specifically on the policy frameworks and local responses concerning South Korea's green city strategies. They note that the environmental and energy problems confronting this highly urbanised, carbon-intensive country, where industry still dominates the economy, have required paradigm shifts in urban development toward low-carbon green cities, especially after the inauguration of the national government's Green Growth Strategy (GGS) in 2008. Consequently, both national and local governments have set targets for increasing urban energy self-sufficiency through renewable energy generation and implemented various urban 'Green City' energy policies and projects. However, these have achieved varying degrees of success. Lee and Kim argue that while the top-down approach of the national government's GGS made it possible to spread the Green City concept and strategies in a short time period, some key problems arose in implementing the policy. These included disputed divisions of governance responsibility between national government and municipal authorities, and failures to take sufficiently into account local conditions and community involvement. The authors thus make a case for stronger citizen and civil society engagement, as well as greater city government autonomy in South Korea, to form a more effective 'bottom-up' approach to fostering green city development in the country.

Moving back to Europe, the next paper by Janette Webb *et al* examines the governance challenges of re-orienting urban resources for sustainable energy systems. It first broadly maps the current governance of local energy and carbon reduction strategies in British cities, and explores reasons for the incremental progress seen so far, rather that the realisation of ambitious change in this area. The authors report data on levels of engagement in sustainable energy development across all Britain's local authorities, and thereafter present three examples of leading cities – London, Birmingham and

Aberdeen. These cities are distinctive by virtue of the strategic orientation and breadth of activity, each seeking impact beyond immediate responsibilities, and engaging with the energy system in multiple ways. Webb *et al* contrast different models of governance, comparing private-public partnerships for energy investment with community-owned non-profit enterprise. In conclusion, they argue that urban governance of innovation in sustainable energy is constrained by current energy markets, and limited resources and capacities of city authorities, and make recommendations for future changes in governance approach.

Jo-Ting Huang and Jon Lovett also discuss energy and climate change challenges in a city governance context but specifically focusing on public-private sector relationships. Their paper examines how institutional frameworks motivate public and private sectors to take pre-emptive action to adapt to climate change at the city level. Case studies on Hamburg and Rotterdam are used for this purpose. The authors suggest that a well-designed institutional framework can enhance innovation and increase environmental and business performance. Whereas Hamburg city government has developed formal institutions and rule, Rotterdam city government adopts a balance between formal and informal modes of governance. Huang and Lovett discuss the relative merits of both approaches, and make recommendations on governing public-private sector relationships concerning energy and climate change risks.

In our special issue's final paper, Alison Tomlin *et al* look at city-level options for the distributed generation of wind and solar energy. They note that city and other local government actors across Europe and Asia are increasingly recognising the contribution that decentralised renewable electricity production can bring towards reducing emissions whilst also generating a revenue stream for the city. However, these actors are often subject to significant financial pressures, meaning a reliable and compelling business case is needed to justify upfront investment. The paper shows how recent advances in city-scale wind and solar resource assessment can provide evidence for such a business case. The authors' research is based on collected data from 6,794 city government sites in Leeds, Britain's fourth largest city and England's second largest local government district. The results suggest significant potential for small-scale wind and solar power generation across Leeds City Council assets, with a number of sites creating a persuasive business case for investment. The methodological framework developed by Tomlin *et al* enables large city-level asset holders to make strategic investment decisions based on financial assessment of wind and solar generation across their entire portfolio.

3. Conclusion

We believe that this collection of papers will advance understanding of the complex and critically important relationships that exist between cities, energy and climate change. How city governments and other urban authorities deal with both current actual and future anticipated energy challenges has become increasingly inter-linked with their approaches to climate change mitigation and adaptation. Moreover, given the burgeoning growth of cities globally – and especially in Asia – their position in the energy–climate nexus is predicted to become increasingly significant in years and decades ahead. At the time of writing, the world is just a days away from the vitally

important United Nations Climate Change Conference (COP21) talks Paris. By the time of this special issue's publication it will be known if cities made a notable contribution to the event, whether collectively or otherwise. Whatever the case, cities need to play a growing strong role in helping address the climate change challenges facing all humanity in the 21st century and beyond.

References

Adelle, C. and Russell, D. (2013) 'Climate Policy Integration: a Case of Déjà Vu?', *Environmental Policy and Governance*, 23: 1-12.

Bulkeley, H. and Betsill, M. (2013) Revisiting the Urban Politics of Climate Change', *Environmental Politics*, 22: 136-154.

Bulkeley, H., Castan Broto, V. and Maassen, A. (2014) 'Low Carbon Transitions and the Reconfiguration of Urban Infrastructure', *Urban Studies*, 51: 1471-1486

Fook, L.L. and Gang, C. (2010) *Towards a Liveable and Sustainable Urban Environment: Eco-Cities in East Asia*, Singapore: World Scientific Publishing.

Franzén, M. (2013) 'Local Governments as Nodes for Greenhouse Gas Abatement: Climate Change Governance in Multi-Level Frameworks', *European Journal of Sustainable Development*, 2: 361-372.

Gouldson, A., Colenbrander, S., McAnulla, F., Sudmant, A., Kerr, N., Hall, S., Papargyropoulou E., and Kuylenstierna, J. (2014) *The Economic Case for Climate Action in Cities,* Stockholm: New Climate Economy and Stockholm Environment Institute.

The Global Commission on the Economy and Climate (2014) *Better Growth, Better Climate: The New Climate Economy Report*, London: The New Climate Economy, available at: http://newclimateeconomy.report

Hodson, M. and Marvin, S. (2012) 'Mediating Low-Carbon Urban Transitions? Forms of Organization, Knowledge and Action', *European Planning Studies,* 20(3): 421-439.

Hodson, M., Marvin, S. and Bulkeley, H. (2013) 'The Intermediary Organisation of Low Carbon Cities: A Comparative Analysis of Transitions in Greater London and Greater Manchester', *Urban Studies*, 50: 1403-1422.

International Energy Agency / IEA (2013) *Southeast Asia Energy Outlook*, Paris: IEA.

Intergovernmental Panel on Climate Change / IPCC (2014) *IPCC Fifth Assessment Synthesis Report*, Geneva: Intergovernmental Panel on Climate Change.

McGlade, C. and Ekins, P. (2015) 'The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2°C', *Nature*, 517: 187-190.

Puppim de Oliveira, J.A., Doll, C.N.H., Kurniawan, T.A., Geng, Y., Kapshe, M., and Huisingh, D. (2013) 'Promoting Win-Win Situations in Climate Change Mitigation, Local Environmental Quality and Development in Asian Cities Through Co-Benefits', *Journal of Cleaner Production*, 58(1): 1-6.

REN21 (2015) *Global Status Report on Renewable Energy*, Paris: REN21 Secretariat.

United Nations / UN (2014) *World Urbanization Prospects: 2014 Revision*, New York: United Nations.

United Nations Environmental Programme / UNEP (2015) 'Cites and Climate Change', available at: http://www.unep.org/resourceefficiency/Policy/ResourceEfficientCities/FocusAreas/CitiesandClimateChange/tabid/101665/Default.aspx

World Resources Institute / WRI (2014) *Climate Analysis Indicators*, Washington DC: WRI.

World Health Organisation / WHO (2014) *Global Health Observatory: Urban Population Growth*, Geneva: World Health Organisation.