LUND UNIVERSITY

Advancing Sustainable Urban Transformation

McCormick, Kes; Anderberg, Stefan; Coenen, Lars; Neij, Lena

Published in:
Journal of Cleaner Production

DOI:
10.1016/j.jclepro.2013.01.003

2013

Document Version:
Publisher's PDF, also known as Version of record

Link to publication

Citation for published version (APA):
McCormick, K., Anderberg, S., Coenen, L., & Neij, L. (2013). Advancing Sustainable Urban Transformation. *Journal of Cleaner Production*, *50*, 1-11. https://doi.org/10.1016/j.jclepro.2013.01.003

Total number of authors:
4

General rights
Unless other specific re-use rights are stated the following general rights apply:
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.
• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: https://creativecommons.org/licenses/

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Advancing Sustainable Urban Transformation

Kes McCormick[1]
Stefan Anderberg[2]
Lars Coenen[3]
Lena Neij[1]

[1] International Institute for Industrial Environmental Economics (IIIEE) at Lund University, Sweden
[2] Lund University Centre for Sustainability Studies (LUCSUS), Sweden
[3] Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE) at Lund University, Sweden and the Nordic Institute for Studies in Innovation, Research and Education (NIFU), Norway

Abstract: Despite increased awareness of the urgency to respond to climate change and to promote sustainable development, there are few powerful initiatives that are decisively shifting urban development in a sustainable, resilient and low-carbon direction. This Special Volume of the Journal of Cleaner Production explores sustainable urban transformation focusing on structural transformation processes – multi-dimensional and radical change – that can effectively direct urban development towards ambitious sustainability goals. The 20 articles are based on 35 cases and over 130 surveyed examples of urban initiatives on sustainability in many countries. While cities in Europe dominate, there are also examples from North America, South America, Africa, Asia and Oceania. The combined articles in this Special Volume contribute to knowledge and understanding on sustainable urban transformation across a range of areas, including governance and planning, innovation and competitiveness, lifestyle and consumption, resource management and climate mitigation and adaptation, transport and accessibility, buildings, and the spatial environment and public space. Overall, this Special Volume documents and analyses real-life action in cities and communities around the world to respond to sustainability challenges and it provides critical insights into how to catalyse, intensify and accelerate sustainable urban transformation globally. A main finding of the articles is that governance and planning are the key leverage points for transformative change.

Keywords: sustainable urban transformation, sustainable urban development, climate change, sustainable development, governance, planning, transformative change

1. Introduction

The relationship between urban areas and sustainability has attracted increasing attention on the international political and economic agenda over the last few decades. However, the role of cities in global economic development as well as social and environmental conditions has gained more attention recently (WWF, 2010; UN-Habitat, 2008). Sustainable urban transformation refers to structural transformation processes – multi-dimensional and radical change – that can effectively direct urban development towards ambitious sustainability goals. This Special Volume called for contributions to advance knowledge and understanding on sustainable urban transformation across a range of areas, including governance and planning, innovation and competitiveness, lifestyle and consumption, resource management and climate mitigation and adaptation, transport and accessibility, buildings, and the spatial environment and public space. Contributions have addressed these topics as well as issues, which are creatively beyond and across them (see Appendix 1). In particular, governance and planning were identified as critical to transformative change towards urban sustainability.

Together, the 20 articles in this Special Volume highlight and explore 35 cases and over 130 surveyed examples of city initiatives on sustainability in a diversity of countries in the developing and industrialised world (see Table 1). Cities in Europe dominate, but there are also examples from North America, South America, Africa, Asia and Oceania. In this introduction and overview of the Special Volume, section two addresses the challenges that are shaping urban areas "from above" and the expectations "from below" on urban life. A review of the history and background on the strategic role of cities in responding to pressures, particularly climate change and economic decline, is presented. A framework is outlined in section three to assist in approaching the complexity of sustainable urban transformation. Cross-cutting themes emanating from the articles in this Special Volume are briefly identified and discussed in section four. And finally, section five provides reflections on this Special Volume and the field of sustainable urban transformation.

Table 1: Cases from the Articles in this Special Volume

Continents	Cases and Countries
Europe	Stockholm, Gothenburg, Växjö, Hofors, Kalmar, Karlstad, Malmö (Sweden) London, Aberdeen, Woking, Birmingham, Manchester (UK) Amsterdam, Hoofddrop, Culemborg, Rotterdam (Netherlands) Gent, Kortrijk (Belgium) Montreuil (France) Ludwigsburg (Germany) Basel (Switzerland) Egedal (Denmark)
North America	New York, San Francisco, Utica (USA)
South America	Lima (Peru) Bogota (Colombia) Quito (Ecuador) Curitiba (Brazil)
Africa	Cape Town (South Africa)
Asia	Hong Kong (China) Rajkot, Coimbatore (India)
Oceania	Melbourne, Adelaide (Australia)

This table highlights the 35 cases discussed and analysed in the articles that appear in this Special Volume.

2. Global Context for Sustainable Urban Transformation

National governments and international agencies have struggled to respond to climate change, and it is clear that the reduction in emissions of greenhouse gases necessary to keep global warming within a safe trajectory is not being targeted or achieved (IEA, 2011). Essentially the same can be stated for sustainable development, which has been the focus of numerous international conferences and reports, but little has been accomplished in achieving the ambitions of systemic change in development paths (Rockström et al., 2009; Baumgartner, 2011). Furthermore, recent, major global events, such as the Climate Change Conference in Copenhagen, Denmark in 2009 and the Earth Summit in Rio de Janeiro, Brazil in 2012, have exposed the limited agreements and actions at the international and national levels on climate change and sustainable development. At the same time, these events have raised the profile of programs and activities within cities, involving formal institutional agents, particularly local governments, and multi-actor collaborations.

The majority of people currently live in cities and urban areas, and over 70% of the global population are expected to live in urban areas by 2050 (UN-Habitat, 2008). The importance of cities is also expected to increase due to the role of metropolitan areas as growth centres of the emerging global service economy. Furthermore, cities play a dominant role in global consumption, production and pollution (Sukhdev, 2009). For this reason, policies formulated by international bodies and national governments need to be implemented at the community, city and regional levels. In particular, cities have been identified as a key for sustainable development and climate change, and there is a general agreement that effective and integrated solutions can only be found and efficiently implemented through cities and urban areas (UN-Habitat, 2010; ICLEI, 2011; Wheeler, & Beatley, 2010; Roseland, 1997).

The shifting focus towards cities and urban areas is the result of both frustrations at the slow pace of national and global action on climate change and sustainable development as well as the ability of municipalities and local collaborations to form visions and strategies in accordance with scientific knowledge, and just as importantly, initiate actions “on the ground”. Innovation theory and research on socio-technical transitions highlight the critical role of “niche” developments in transforming established, unsustainable regimes (Geels, 2002; Beck, 2010). The increasing quantity and intensity of activities at the city level around urban development and sustainability can have the potential for disruptive socio-technical change diffusing into wider society. Many articles in this Special Volume explicitly utilise theory and literature from the field of sustainability transitions and innovation theory (Khan, 2013; Quitzau et al., 2013; Nevens et al., 2013; Block et al., 2013). There is considerable “room” and opportunity for further investigations and analyses of sustainable urban transformation in these fields (Coenen et al., 2012; Coenen & Truffer, 2012; Doloreux & Parto, 2005; Naess & Vogel, in press).

Cities and urban areas are facing complex pressures, originating “from above” as well as expectations “from below” on the attributes and opportunities of “urban life”. Put simply, urban areas need to be attractive and inclusive, sustainable and resilient, and prosperous and innovative from local, national and international viewpoints (Kautto, 2012; UN-Habitat, 2008). It is therefore important to address sustainable urban transformation in the context of scale and the linkages across levels. Cash et al. (2006) argue: *“In a world increasingly recognised as being multilevel, solutions must be as well. The opposite poles of top-down approaches, which are too blunt and insensitive to local constraints and opportunities, and bottom-up approaches, which are too insensitive to the contribution of local actions to larger problems and the resulting potential for tragedies of the commons, are clearly inadequate in providing both socially robust information and viable management solutions.”* In this respect, sustainable urban transformation

is not just about local action, but how it “fits” into multiple scales and levels, and the dynamic relationships that exist (García-Sánchez & Prado-Lorenzo, 2009).

Importantly, cities and municipalities are not isolated entities. Instead, they are interconnected in complex ways through the global economy (and society) and they can be catalysts for change at wider scales (Theaker & Cole, 2001). Local governments around the world have formed various networks to join forces to reduce greenhouse gas emissions, use water, energy and resources more efficiently, and improve resilience and sustainability (Kautto, 2012). The UN Settlements Program (called UN-Habitat) and ICLEI – Local Governments for Sustainability are two such global alliances. ICLEI is an association of more than 1200 local governments working with sustainable development (Bhagavatula et al., 2013), while UN-Habitat covers stakeholders working with sustainability and development in urban and rural areas in industrialised and developing countries (Shaalan, 2013). This Special Volume highlights the value of these types of global networks, not least for learning, benchmarking and collaborating.

Cities are often associated with social and economic problems such as poverty and segregation, tensions between different groups, and economic vulnerability, as well as ecological problems related to pollution, resource use, congestion and spatial competition (Legner & Lilja, 2010). They are also connected with economic and cultural wealth, and a dynamic development that can provide opportunities for technological, organisational and social innovation (Sukhdev, 2009). The concentration of population, activities and resource use in cities brings potentials for important efficiency increases as well as for multi-purpose solutions by combining different sustainability goals (Bettencourt & West, 2011). New urban technology and infrastructure may also be replicable or useful in urban areas in different regions, such as historically has been the case with district heating, wastewater treatment, and public transport systems (Wheeler, & Beatley, 2010). Larger cities often have particular weight through their consumption, head office functions, or cultural influence. In particular, the populations in major cities can play an important role for developing new consumer cultures and attitudes.

Cities, around the world, have very different starting points and conditions for sustainable development, which is evident in this Special Volume (Yang, 2010; Tuts & Altinger, 2011). Widespread poverty, over-population, unhealthy housing conditions, inadequate infrastructure, hygienic problems, poor water quality and uncontrolled pollution are examples of problems that still dominate cities in the developing world, particularly Africa (UN-Habitat, 2010). However, many of these problems have decreased in cities in industrialised countries in Europe, North America and Oceania during the 20th century. This has been primarily due to stable and more equally distributed economic growth, improved organisation, town planning, and investment in infrastructure, construction and urban renewal. A similar development has taken place in parts of South America and Asia. In Europe, the urban sustainability problems today primarily consist of segregation and growing social tensions, local traffic problems, continuous growth of solid waste generation, and the large and often inefficient consumption of energy and material with linkages to climate change and the global environmental and resource problematique.

UN-Habitat (2010) highlights the “urban divide” between and in many cities. There are divisions between cities in the developing and industrialised world, where cities have very different pressures and priorities. But there are also divisions within cities between “rich” and “poor”, and this can have devastating effects on how cities develop, particularly in terms creating gated communities and neglecting basic human rights for some sections of urban populations. Another divide is between large and small cities with megacities and large metropolises often attracting considerable investment, attention and support at the expense of smaller and regional centres. Local governments in suburban and rural areas should not be overlooked, as the complex interactions resulting from the flows of people, information, resources and wastes through the

so-called “rural-urban interface” impact social, environmental and economic conditions (UN-Habitat, 2008; Kautto, 2012). In this Special Volume, the articles draw attention to a diversity of cities in terms of size, importance, location and history, as well as the experiences and lessons from sustainable development initiatives in these cities.

Importantly, urban sustainability problems are not necessary characteristics of urbanisation but can rather be considered as results of poor governance and planning (Rode & Burdett, 2011). The design of cities plays a significant role in relation to the (positive and negative) impacts of urban development as well as how urban citizens interact and live together. An important theme in this regard is the “battle” against urban sprawl and the development of higher density living (Block et al, 2012). Development opportunities for individual cities can also vary over time. Diverse processes of transformation constantly influence cities, including a changing structure of population, economy, culture, lifestyles and national policies, which can lead to altered urban functions and new local needs and opportunities (UN-Habitat, 2010). Interpreting these different development processes, responding to related demands, and identifying and realising opportunities are constant challenges for urban governance and planning. Cities are influenced in diverse ways by large-scale transformation processes, but the vulnerability and opportunities for cities may also differ due to internal factors, such as the local economic structure as well as external relations and geographic location.

There are, at least, two major “breaks” in the development of cities that are especially important when looking at urban transformation (Lehmann, 2010). The first is the introduction of the automobile at the beginning of the 20th century, which created a city model that is dedicated to meeting the function of vehicles. This resulted in expanding cities and urban sprawl, not to mention a host of other impacts on how we live in and experience urban areas. A few articles in this Special Volume explore the interlinkages between transportation, urban design and sustainability (Mejia-Dugand et al., 2013). However, this is an enormous topic with many dimensions that could fill an entire Special Volume. The second concerns the growing awareness of the impacts of climate change and the influence on urban planning and design, particularly in relation to adaptation and resilience, but also in making deep cuts in greenhouse gas emissions. All of which is shaping how districts and city-infrastructures are being designed, developed and evaluated (Bulkeley et al., 2010). Multiple articles in this Special Volume point to this dynamic as a catalyst for sustainable urban transformation (Wamsler et al., 2013; Ryan, 2013).

Economic transformation often provides opportunities that can be innovatively used for furthering sustainable development. After a long stagnation, due to an often dramatic industrial restructuring, many major cities in Europe and North America have experienced renewed growth related to development of a profitable service economy, and related revitalisation of inner city and harbour areas. Revitalisation of older housing or former harbour and industrial areas can be used for creating attractive city areas, realising the enormous potential for energy savings within cities, and developing distributed energy systems. The revitalisation of buildings and districts also opens up opportunities for the development of public space and social inclusion. In recent years, approaches to economic development in various cities have attracted interest and cities are being highlighted as successful growth engines (Wheeler & Beatley, 2010). Furthermore, the political leaderships in many cities are now actively working with strategies to increase their attractiveness and competitiveness in the context of sustainable development (Bhagavatula et al., 2013).

But sustainable urban transformation is about more than creating technically sustainable urban areas and stimulating economic development. It must engage, attract and excite people about opportunities and lifestyles today and into the future. Ryan (2011) states: *“A thriving community*

is a place that you recognise from its energetic engagement with the essential human project of re-inventing and re-constructing the possibilities for social existence. You would know a community that is thriving if you visited it, for it would leave you refreshed, invigorated and empowered." These ideas stress the importance of embedding well-being and happiness in visions, plans and actions on sustainability in urban areas (Dempsey, et al., 2011). Leyden et al. (2011) have investigated the happiness of residents in ten international cities, which suggest that the design and conditions of urban areas are contributing significantly to the level of well-being and feelings of connectedness of inhabitants. Essentially, cities are, and will increasingly be, a key determinant of how people feel, interact and live. This is an area that demands more attention.

A related topic attracting growing interest is how to measure the sustainability of cities and urban environments. This covers principles, indicators and ranking systems, which are often linked to awards and the profile of cities. Principles can form the basis of indicators and ranking systems (Lehmann, 2010). Furthermore, the use of ranking systems can be an effective instrument to identify strengths and weaknesses of cities, which can further be used to improve competitiveness and sustainability (Giffinger & Haindlmaier, 2010). City rankings can also affect public emotions and actions, draw media attention, attract investors, and stir political discussions. However, ranking systems often take into account, simplified indicators and tend to neglect intricate city interactions. There are mixed views about the contribution of ranking cities in achieving sustainability, reducing greenhouse gas emissions, and enhancing cooperation. However, it is clearly very important to track progress towards sustainable development in urban contexts (Walton et al., 2005). This is taken up in the articles in this Special Volume but deserves greater investigation and analysis.

Overall, the increased awareness of climate change and sustainable development has not created powerful initiatives that are decisively shifting urban development in a sustainable, resilient and low-carbon direction. Many factors are responsible for this situation, including a lack of urgency for undertaking the "radical" changes that are needed and therefore, inadequate political, business or broader social support, fragmentation in research activities as well as in urban practice and planning, limited coordination between international, national and local levels, and a significant separation between science and practice. So, while there are many experiences with sustainable city initiatives and urban transformation, there are only a few examples where transformative change has been adequately connected to sustainability goals to realise strategic potentials. A key contribution of this Special Volume on advancing sustainable urban transformation is to provide a structural focus for action and research on urban sustainability.

3. A Framework for Sustainable Urban Transformation

Sustainable development is an elusive concept with a diversity of definitions (Baumgartner, 2011; Koglin, 2008). However, it has captured the attention and "imagination" of the world. In a straightforward way, it means that current development should not harm the interests of future generations. It has been commonly depicted as an integration of economic, social and environmental spheres. Briefly summarised, sustainable development implies that society must strive to attain a balanced approach to socio-economic development that is based on a strong understanding and respect for ecological systems (Raworth, 2012). Institutional and time dimensions have become more prominent in sustainability discussions, which highlight the importance of governance and democracy as well as processes and actions over time (Waas et al., 2011). Urban development has emerged as a key topic within debates on sustainability, particularly as a source of problems, when urban areas are not intelligently planned and

developed (UN-Habitat, 2010; Koglin, 2008). This area of research and action has been called sustainable urban development.

It is important to differentiate between sustainable urban development and sustainable urban transformation. This is not simply a matter of semantics. Camagni (1998) provided a constructive definition of sustainable urban development as follows: *"A process of synergistic integration and co-evolution among great subsystems making up a city (economic, social, physical and environmental), which guarantees the local population a non-decreasing level of well-being in the long term, without compromising the possibilities of development of surrounding areas and contributing by this towards reducing the harmful effects of development on the biosphere."* Sustainable urban transformation places a stronger emphasis on structural transformation processes, both multi-dimensional and radical change, which can effectively direct urban development towards sustainability. Put simply, sustainable urban development is primarily about development in urban areas while sustainable urban transformation is about development or change of urban areas.

Sustainable urban transformation involves understanding cities as a source of possibilities for sustainability, promoting active collaboration among diverse stakeholders, integrating different perspectives and bodies of knowledge and expertise, and stimulating experimentation with different solutions and approaches. Sustainable urban transformation can be defined in two dimensions – drivers of "radical" change and "multi-dimensional" sustainable urban structures. The main drivers of change encompass governance and planning, innovation and competitiveness, and lifestyle and consumption. These can be considered as the processes that combine to bring about change in urban contexts. For sustainable urban structures, these include resource management and climate mitigation and adaptation, transport and accessibility, buildings, and the spatial environment and public space. It is the interactions across the different elements of this framework that are particularly important, and that changes in physical structures are intimately connected with economic flows, social aspects and environmental impacts. However, the distinction between processes and structures can serve as a guide through the complexity of sustainable urban transformation.

Governance and planning: For achieving ambitious targets for sustainable cities, there is a need to analyse and practice different approaches including effective strategic planning, integration of policy instruments, and "real" engagement of key stakeholders. Such efforts should be interconnected across sectors and be adapted for specific urban and national policy conditions to ensure empowerment, engagement and collaboration of relevant stakeholders. Bugliarello (2010) identifies three key policy challenges, including policies must be ambitious but politically and economically realistic in deciding on appropriate balances, policies must be developed quickly and with flexibility for rapidly changing urban conditions, and it is imperative to eliminate contradictory policies.

Innovation and competitiveness: Cities and local municipalities are facing "tough" decisions with regard to reconciling economic growth and maintaining or restoring the local and global environment (Wheeler & Beatley, 2010). Innovation and clean technology are considered as necessary for sustainable development, but also as keys to fostering urban competitiveness in a global economy. Sustainable urban economic development is an important area of research where a focus is needed on how to encourage symbiotic relationships between industries, governments, and universities to ensure sustainable management of human, ecological and economic capital, and turn density and urban systems into eco-efficiency (Bhagavatula et al., 2013; Prado-Lorenzo et al., 2012).

Lifestyle and consumption: Research related to socio-economic and cultural development in the urban setting is important and needs to be further developed to effectively support the planning and implementation of sustainable urban governance strategies. The negative implications of over-consumption are particularly evident in cities and urban areas (Rode, 2009). UN-Habitat (2008) suggests: *"Harmony within cities hinges not only on prosperity and its attendant benefits, but also on two pillars that make harmony possible: equity and sustainability"*. Defining an improved quality of life and creating visions of sustainable lifestyles is imperative to the design and governance of more sustainable cities.

Resource management and climate mitigation and adaptation: Sound resource management and design of urban structures that mitigate and adapt to climate change are critical challenges for cities. Urban systems must be multi-functional and be able to integrate ecological, economic, recreational and aesthetic values (WWF, 2010). Key areas include shifting urban energy systems towards renewable sources, increasing energy and material efficiency, ensuring sustainable management of the quality and sufficiency of water supply, and transforming waste management into sustainable material and energy usage (Hawkey et al., 2013).

Transport and accessibility: The transportation sector accounts for significant environmental and social impacts. Sustainable urban transport research and practice has focused on specific problems such as pollution, road safety and on various measures and their effects. However, in order to create sustainable transportation in the urban context, a more integrated approach is needed, which simultaneously addresses energy security, environmental and social impacts, accessibility issues, urban conditions, and equitable economic development (Sukhdev, 2009; Mejia-Dugand et al., 2013).

Buildings: The challenge for the building and construction sector is to create affordable, attractive, efficient, comfortable and sustainable buildings, which help their occupants to mitigate contributions to climate change, utilise renewable energy, reduce excessive material consumption as well as incorporate principles of reuse, whilst adapting to changing environmental realities (Rode et al., 2011). The efficiency of the proposed strategies also require an understanding of human behaviour and consumption in the context of the built environment as well as working not just with single buildings but across precincts or districts that integrate buildings, transportation and infrastructure.

Spatial environment and public space*:* Urban development planning increasingly focuses upon the spatial environment in terms of the revitalisation of districts and city centres, urban public spaces and the interconnection of fragmented urban landscapes in order to develop a continuous and welcoming web of humane liveability within the urban experience (UN-Habitat, 2008; Roseland 1997). This encompasses preserving existing "green" spaces (such as parks and gardens) and "blue" features (such as ponds and canals) and integrating new "green" and "blue" structures into cities in innovative ways that create healthy environments and stimulate social interactions. In fact, the role of public space and social interactions in sustainable urban transformation deserves more attention (Radywyl & Biggs, 2013).

4. Key Themes for Sustainable Urban Transformation

A sectoral or disciplinary approach to the challenges of sustainable development and climate change facing cities will fail. Instead, research and practice with a capability of shaping urban policies and practices in a sustainable direction will take place at the intersection of different disciplines, sectors and methodologies. An integrated approach is required where research and innovation are combined to explore, experiment, and evaluate creative solutions in complex and

real-life contexts. From a research perspective, as different disciplines build on established research traditions and they have developed specific scientific approaches and languages, such cooperation remains very difficult. And the obstacles are just as great in practice for the integration of different sectors and infrastructures in urban environments. However, this Special Volume highlights many innovative approaches to interdisciplinary research and action for sustainable urban transformation, which engage key stakeholders in design, implementation and evaluation processes.

Interestingly, while technology is often considered the "solution" to make cities and urban areas smarter and more sustainable, the authors of this Special Volume suggest that sustainable urban transformation is far more a social, organisational, economic, cultural and political challenge, than a technological. In fact, sustainable urban transformation can be thought of as a multi-dimensional design problem. We need to produce intelligently designed cities that can respond to the challenges of climate change and sustainable development. This process needs to be closely related to how to govern, plan and engage a diversity of key stakeholders in creating urban areas that are attractive and inclusive, sustainable and resilient, and prosperous and innovative. This Special Volume illustrates that achieving these goals demands a structural transformation of urban "systems", which can be understood as a significant shift in current development paths.

There are four main cross-cutting and over-lapping themes to emerge from this Special Volume on advancing sustainable urban transformation. These can be grouped as governance and planning, collaboration and learning, infrastructure and resilience, and buildings and precincts. These areas are the focal points for analyses and discussions across the articles. In particular, governance and planning were identified as critical to bringing about sustainable urban transformation. The themes of governance and planning as well as collaboration and learning can be predominantly described as "processes", based on the drivers of change discussed earlier, while infrastructure and resilience as well as buildings and precincts are mainly "structures", based on sustainable urban structures. Looking at the key themes from these distinctions serves to illustrate how they "fit" together and form an integrated perspective on sustainable urban transformation. With 35 cases of urban sustainability projects and over 130 surveyed examples in the articles in this Special Volume, there is ample empirical evidence to support the theoretical and analytical discussions on sustainable urban transformation.

Governance and Planning: As suggested, governance is a key theme that comes through in virtually all of the articles in this Special Volume. The role of governance is closely connected to planning as well as to innovation, collaboration and socio-technical transitions (Nevens et al., 2013; Quitzau et al., 2013). Planning is recognised as a key method for governing and implementing sustainable urban transformation (Wamsler et al., 2013). The planning process and the concept of governance highlight the critical roles of collaboration and engagement of stakeholders, particularly residents in urban areas (Radywyl & Biggs, 2013). Many of the articles explore the challenges and lessons learned from partnerships and collaborative approaches in the context of governance (Khan, 2013; Hamann, 2013; Block & Paredis, 2013). The overarching theme of "unsustainability" of cities and urban areas, and the political and business challenges associated with embarking on radical shifts in urban development trajectories is present in the Special Volume (Higgins, 2013; Ryan, 2013). Overall, this Special Volume underlines that sustainable urban transformation demands "new" modes of governance connected to strategic planning that creates "spaces" for visionary plans (Ryan, 2013), transition management (Nevens et al., 2013), disruptive activities (Radywyl & Biggs, 2013) and entrepreneurial change agents (Woolthuis et al., 2013).

Collaboration and Learning: Collaboration and partnerships is a prominent theme in this Special Volume. It permeates through discussions on governance and planning, and many of the articles identify it as a foundation for sustainable urban transformation. In other words, it is only through collaborative action that urban sustainability projects can be effective, particularly when there are ambitious goals. The roles and effectiveness of different types of collaborative set-ups in respect to innovation and governance are evident in many of the articles, such as collaborative intermediary organisations (Hamann, 2013), local energy and governance models (Hawkey et al., 2013), co-creation though university partnerships (Trencher et al., 2013), network governance (Khan, 2013), the constructive dialogue process (Smedby & Neij, 2013) and urban transition labs (Nevens et al., 2013). Coupled to the discussions on collaboration and innovation is the importance of learning processes (Dieleman, 2013). Nevens et al. (2013) suggest: *"Whenever cities engage in this innovative, ambitious and responsible task of change for integrated sustainability, an undoubtedly major amount of learning emerges"*. It appears that sustainable urban transformation requires collaborations that can harness and integrate different knowledge and viewpoints, and engage key players in a learning process that opens up "new" thinking and drives forwards innovation in urban contexts (Campbell, 2009; Zilahy & Huisingh, 2009). Learning between cities is also addressed in this Special Volume.

Infrastructure and Resilience: Integrating infrastructure, particularly, water, waste and energy, is another key theme in this Special Volume. There are some insightful discussions related to infrastructure, resilience, construction and sustainability, including climate change impacts on urban areas and adaptation planning of urban infrastructure and systems (Wamsler et al., 2013), coupling adaptation and mitigation strategies to enhance urban resilience (Dieleman et al., 2013), the dangers of locking-in and locking-out "new" or more sustainable technologies or systems (Corvellec et al., 2013), linking waste management and energy infrastructure (Uyarra & Gee, 2013), and enhancing resource efficiency and moving towards zero waste (Zaman & Steffen, 2013). Urban infrastructure is also explored from the viewpoint of mobility and transportation (Mejia-Dugand et al., 2013). The importance of building up resilience, rapidly, in urban areas in preparation for the expected impacts associated with climate change is a persistent topic in this Special Volume. This is articulated through the many examples of urban projects and activities in the articles where municipalities and collaborations of local stakeholders are working to enhance resilience, and coupling these efforts with sustainability aspirations. While climate change is in focus, it is often presented in the context of sustainable development.

Buildings and Precincts: Broadly speaking, there are three scales for urban projects on sustainability, including new buildings or the renovation of existing buildings (Smedby & Neij, 2013), districts or precincts within cities (Ryan, 2013), and city-wide activities (Corvellec et al., 2013). Interestingly, a noticeable focus in the articles in this Special Volume is on examples of projects to drive forwards sustainability in parts of cities or precincts. There are at least three key reasons for the focus on districts. First, this scale allows more options and creative solutions for sustainable urban transformation than working only with buildings (Ryan, 2013). Second, districts encompass buildings, infrastructure, transport systems and public space, but at a manageable size as opposed to a whole city. Additionally, working with districts supports the usage of integrated approaches to infrastructure, which is critical to improving resilience as well as adaptation and mitigation (Uyarra & Gee, 2013). Third, urban sustainability projects that cover districts can be better suited to engaging communities (Radywyl & Biggs, 2013). This includes residents as well as key local stakeholders, like universities, business and community groups. Overall, the authors of this Special Volume suggest that generating change at the scale of precincts plays an important role in catalysing and learning about sustainable urban transformation.

5. Reflections

In the context of sustainable urban transformation, conventional approaches to governance are inadequate, and many municipalities and cities are testing and developing governance innovations. This is particularly the case for how to effectively collaborate with key stakeholders. Governance and planning are strong themes in this Special Volume, which are essentially integrated with collaboration and learning. Furthermore, the many cases and examples in the articles, suggest that sustainable urban transformation needs to be more than creating a technically sustainable city. Urban social sustainability and economic prosperity in the context of thriving communities are critical areas of attention. This brings together environmental, social and economic dimensions, the importance of collaborative efforts and links in closely with the roles of governance and planning as the key leverage points for transformative change.

Experimentation with different solutions and approaches is a key to generate sufficient variety in problem-solving capacities. An important aspect to induce further evolution is that leaders of different experiments can learn from each other globally, something which this Special Volume aims to accomplish through the compilation and analysis of cases and examples. Beyond this, platforms for documenting processes, key decisions, mistakes and unexpected results in urban sustainability projects are needed. There is also an urgent need for research with in case and cross case analyses, and developing insights that are both context-specific and more general. These perspectives link directly to the integral roles of learning, teaching and training as foundations for local and global change. But researchers and practitioners on sustainable urban transformation must remain alert to the challenges and risks of generalisation and how best to utilise lessons learned in different contexts.

Much greater interaction between researchers and universities with practitioners and municipalities is required to stimulate co-creation, disseminate research findings and knowledge as well as shape research and innovation activities towards relevant and useful results. Improved interactions between research and practice can lead to better results in both sustainable urban practice and research. In reality however both research and practice communities, more often than not, operate in isolation. But there are increasing examples of universities working in their local urban areas through joint projects or initiatives, action and participatory research, and learning activities and knowledge transfer, in both directions. Collaboration between universities and municipalities needs to be greatly diversified and expanded to meet the challenges of sustainable urban transformation.

Effectively expanding from local sustainable city development projects toward up scaling and influencing standard practices, addressing citywide structural issues is a key focus area for researchers and practitioners. These are really major steps towards sustainable urban transformation, for addressing multiple structures and frames in relation to processes and urban systems, encompassing governance, collaboration, infrastructures and building-refurbishing activities in an integrative fashion. Cities are “natural” sites where the multiplicity of different dimensions concerning sustainable development comes together. This requires a programmatic rather than a single project-based approach. Moreover, cities have the potential to act as hubs or nodes in global networks. This allows them to skip scales and up-scale their practices beyond their direct regional or national contexts.

Research on sustainable urban transformation demands inputs from and interactions between different disciplines, fields and approaches. Many of the articles in this Special Volume utilised innovation theory as a framework to explore sustainable urban transformation and pointed to the usefulness of approaches from the field of sustainability transitions. There is

clearly a research “gap” for greater efforts on socio-technical transitions that put cities in focus rather than countries. Importantly, the basis of this Special Volume is about the possibilities at the urban scale for transformation and how cumulative local actions can catalyse national or global change. The interactions between different scales and levels demand more attention and analysis from a diversity of perspectives.

Establishing key principles and evaluations for sustainable urban transformation and tracking progress towards goals is a foundation for effective strategies and actions. Indicators for sustainable urban transformation, as well as assessment frameworks and ranking systems have not been key topics in this Special Volume. However, how to measure and evaluate progress is a major aspect of bringing about sustainability in urban contexts. Additionally, constructive competition between cities and municipalities on sustainable development and climate change can potentially stimulate innovation and stronger political commitments. This also links to how cities can share experiences and improve global learning on sustainable urban transformation.

Overall, this Special Volume of the Journal of Cleaner Production aims to provide a foundation for expanding and advancing research and action in the field of sustainable urban transformation. Unfortunately, there are few powerful initiatives that are decisively shifting urban development in a sustainable, resilient and low-carbon direction. However, this Special Volume shows that there are a diversity of activities and visionary plans in cities and communities around the world on urban sustainability and that governance and planning are the key leverage points for bringing about transformative change. An enormous challenge for the 21st century is to catalyse, intensify and accelerate structural transformation processes – multi-dimensional and radical change – that can effectively direct urban development towards ambitious sustainability goals.

References

Baumgartner, R. (2011) Critical Perspectives on Sustainable Development Research and Practice. Journal of Cleaner Production 19(8), 783-786.

Bhagavatula, L., Garzillo, C. & Simpson, R. Bridging the gap between science and practice: An ICLEI Perspective. (In this volume)

Beck, U. (2010). Climate for Change, or How to Create a Green Modernity? Theory, Culture and Society, 27(2-3), 254-266.

Bettencourt, L. M. A., & West, G. B. (2011) Bigger Cities Do More with Less. Scientific American, 305(3), 38–39.

Block, T., Dovolder, S., Paredis, E. & Vandevyvere, H. (2012) Green and Just Projects: To a Comparative Assessment Framework. Paper for the International Conference on Sustainable Transitions, 29-31 August 2012, Copenhagen, Denmark.

Block, T. & Paredis, E. Urban development projects and sustainable urban transformations: The need for entrepreneurial political leadership. (In this volume)

Bugliarello, G. (2010) The Future of Sustainability: Some Urgent Sociotechnological Challenges. Sustainability, 3(6), 351-358.

Bulkeley, H., Broto, V., Hodson, M. & Marvin, S. (2010) Cities and Low Carbon Transitions. New York: Routledge.

Camagni, R. (1998) Sustainable Urban Development: Definition and Reasons for a Research Programme. International Journal of Environment and Pollution, 10(1), 6-26.

Campbell, T. (2009) Learning Cities: Knowledge, Capacity and Competitiveness. Habitat International, 33, 195-201.

Cash, D., Adger, W., Berkes, F., Garden, P., Lebel, L., Olsson, P., Pritchard, L. & Young, O. (2006) Scale and Cross-scale Dynamics: Governance and Information in a Multilevel World. Ecology and Society, 11(2), 8-19.

Coenen, L., Benneworth, P. & Truffer, B. (2012) Toward a spatial perspective on sustainability transitions. Research Policy, 41, 968-979.

Coenen, L. & Truffer, B. (2012) Spaces and scales of sustainability transitions: Geographical contributions to an emerging research and policy field. European Planning Studies, 20(3), 367-374.

Corvellec, H., Campos, M. & Zapata, P. Infrastructures, Lock-in and Sustainable Urban Development: The Case of Waste Incineration in a Swedish Metropolitan Area. (In this volume)

Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011) The Social Dimension of Sustainable Development: Defining Urban Social Sustainability. Sustainable Development, 19(5), 289-300.

Dieleman, H. Resilient cities and organisational learning: Stimulating eco-cultural innovations. (In this volume)

Doloreux, D. & Parto, S. (2005) Regional Innovation Systems: Current Discourse and Unresolved Issues. Technology in Society, 27, 133-153.

García-Sánchez, I. & Prado-Lorenzo, J. (2009) Decisive factors in the creation and execution of municipal action plans in the field of sustainable development in the European Union, Journal of Cleaner Production, 17(11), 1039-1051.

Giffinger, R. & Haindlmaier, G. (2010) Smart Cities Ranking: An effective instrument for the positioning of cities? Architecture, City and Environment, 4(12), 7-25.

Geels, F. (2002) Understanding the Dynamics of Technological Transitions. Enschede: Twent University Press.

Hamann, R. On the role and capabilities of collaborative intermediary organisations in urban sustainability transitions. (In this volume)

Hawkey, D., Webb, J. & Winskel, M. Organisation and governance for the transformation of urban energy systems: District heating and cooling in the UK. (In this volume)

Higgins, P. From sustainable development to carbon control: Urban transformation governance in Hong Kong and London. (In this volume)

ICLEI. (2011) Green Urban Economy.
URL: http://www.iclei.org/

IEA. (2011) World Energy Outlook. Paris: IEA.

Kautto, N. (2012) Towards Sustainable Communities. Paper for the Sustainable Communities Forum for Local Government, 30 March 2012, Melbourne, Australia.

Khan, J. What role for network governance in urban low carbon transitions? (In this volume)

Koglin, T. (2008) Sustainable Development in General and Urban Context: Literature Review. Lund: Lund University.

Legner, M. & Lilja, S. (2010) Living Cities: An Anthology in Urban Environmental History. Stockholm: FORMAS.

Lehmann, S. (2010) The Principles of Green Urbanism: Transforming the City for Sustainability. London: Earthscan.

Leyden, K. M., Goldberg, A. & Michelbach, P. (2011) Understanding the Pursuit of Happiness in Ten Major Cities. Urban Affairs Review, 47(6), 861–888.

Mejia-Dugand, S., Hjelm, O., Baas, L. & Rios, R. Lessons from the spread of bus rapid transit in Latin America. (In this volume)

Naess, P. & Vogel, N. (in press) Sustainable Urban Development and the Multi-level Perspective. Environmental Innovations and Societal Transitions.

Nevens, F., Frantzeskaki, N., Gorissen, L. & Loorbach, D. Urban transition labs: Co-creative action research for sustainable cities. (In this volume)

Prado-Lorenzo, J., García-Sánchez, I. & Cuadrado-Ballesteros, B. (2012) Sustainable cities: Do political factors determine the quality of life? Journal of Cleaner Production, 21(1), 34-44.

Quitzau, M., Jensen, J., Elle, M. & Hoffmann, B. Sustainable urban regime adjustments. (In this volume)

Raworth, K. (2012) A Just and Safe Operating Space for Humanity.
URL: http://www.oxfam.org/

Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P. & Foley, J.A. (2009) A Safe Operating Space for Humanity. Nature, 461, 472–475

Rode, P. (2009) City Making as Climate Policy. Proceedings of the Urban Age Conference, 4-6 November 2009, Istanbul, Turkey.

Rode, P. & Burdett, R. (2011) Cities: Investing in Energy and Resource Efficiency. In: UNEP. Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.
URL: http://unep.org/greeneconomy/

Rode, P., Burdett, R. & Goncalves, J. (2011) Buildings: Investing in Energy and Resource Efficiency. In: UNEP. Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.
URL: http://unep.org/greeneconomy/

Roseland, M. (1997) Dimensions of the Eco-city. Cities, 14(4), 197-202.

Ryan, C. Eco-Acupuncture: Designing and facilitating pathways for urban transformation, for a resilient low-carbon future. (In this volume)

Ryan, C. (2011) Characteristics of Thriving and the Importance of Neighbourhoods. Paper for the Thriving Neighbourhoods Conference, 26 October 2011, Melbourne, Australia.

Radywyl, N. & Biggs, C. Building social cohesion through small scale urban space redesign. (In this volume)

Shaalan, I. Sustainable Urban Transformation in Small Cities in Egypt: A UN-Habitat Perspective. (In this volume)

Smedby, N. & Neij, L. Experiences in Urban Governance for Sustainability: The Constructive Dialogue in Swedish Municipalities. (In this volume)

Sukhdev, P. (2009) Green Economy for an Urban Age. Proceedings of the Urban Age Conference, 4-6 November 2009, Istanbul, Turkey.

Theaker, I. G. & Cole, R. C. (2001) The role of local governments in fostering ”green” buildings: a case study. Building Research and Information, 29(5), 394-408.

Trencher, G., Yarime, M. & Kharrazi, A. Co-creating sustainability: Cross-sector university collaborations for driving sustainable urban transformations. (In this volume)

Tuts, R. & Altinger, L. (2011) Towards a Green Economy: Promoting Sustainable Urban Development and Green Infrastructure Investment. Proceedings of the UN Conference for Sustainable Development, 7-8 March 2011, New York, USA.

Uyarra, E. & Gee, S. Transforming urban waste into sustainable material and energy usage: The case of Greater Manchester. (In this volume)

UN- Habitat. (2010) State of the World's Cities 2010/2011: Bridging the Urban Divide. London: Earthscan.

UN- Habitat. (2008) State of the World's Cities 2008/2009: Harmonious Cities. London: Earthscan.

Waas, T., Huge, J., Verbruggen, A. & Wright, T. (2011) Sustainable Development: A Bird's Eye View. Sustainability, 3, 1637-1661.

Walton, J.S., El-Haram M., Castillo, N.H., Horner, R.M.W., Price A.D.F. & Hardcastle C. (2005). Integrated Assessment of Urban Sustainability. Engineering Sustainability, 158(2), 57-65.

Wamsler, C., Brink, E. & Rivera, C. Planning for Climate Change in Urban Areas: A Review of Theoretical and Practical Approaches. (In this volume)

Wheeler, S. & Beatley, T. (2010) Introduction. In: Wheeler, S. & Beatley, T. Sustainable Urban Development Reader. New York: Routledge.

Woolthuis, R., Hooimeijer, F., Bossink, B., Mulder, G. & Brouwer, J. Institutional entrepreneurship in sustainable urban development: Dutch successes as inspiration for transformation. (In this volume)

WWF. (2010) Reinventing the City: Three Prerequisites for Green Urban Infrastructures. URL: http://www.panda.org/

Yang, Y. (2010) Sustainable Urban Transformation: Driving Forces, Indicators and Processes. Zurich: ETH.

Zaman, A. & Lehmann, S. The Zero Waste Index: A Performance Measurement Tool for Waste Management Systems in a Zero Waste City. (In this volume)

Zilahy, G. & Huisingh, D. (2009) The roles of academia in Regional Sustainability Initiatives Journal of Cleaner Production, 17(12), 1057-1066.

Appendix 1: Overview of the Articles in this Special Volume

FULL PAPERS			
Title, Authors and Summary	**Themes**	**Cities and Countries**	
		Cases	**Surveys**
On the role and capabilities of collaborative intermediary organisations in urban sustainability transitions *Ralph Hamann* This article discussed opportunities and challenges in the governance of urban sustainability transitions, with an emphasis on the role and necessary capabilities of collaborative intermediary organisations, which were defined as a particular type of intermediary organisation that can create platforms for deliberation and collaboration between diverse stakeholders. This article discusses two examples in Cape Town, South Africa, bringing to bear disparate socio-economic and institutional conditions in a city characterised by high degrees of inequality.	Governance, deliberation, collaboration, inequality	Cape Town, South Africa	
Organisation and governance for the transformation of urban energy systems: District heating and cooling in the UK *David Hawkey, Janette Webb, Mark Winskel* A number of UK urban authorities are developing combined heat and power with district heating and cooling networks as a means to achieve sustainable and affordable energy, and contribute to economic regeneration. This article studied the cities of Aberdeen, Woking and Birmingham to explore the local energy governance and organisation models adopted in the UK context of privatised, centralised energy markets. The authors of this article concluded that a balance between supportive government policy and locally knowledgeable action is necessary to establishing sustainable urban energy for heat and cooling.	Energy, governance, collaboration	Aberdeen, Woking and Birmingham, UK	
Infrastructures, Lock-in and Sustainable Urban Development: The Case of Waste Incineration in a Swedish Metropolitan Area *Hervé Corvellec, María José Zapata Campos, Patrik Zapata* Even infrastructures with a sustainability record may evolve over time into a lock-in that obstructs the emergence of more innovative and sustainable technologies. Therefore, understanding the rationale of urban infrastructure lock-in is significant for the governance of cities towards more sustainability. Focusing on Gothenburg in Sweden, four paired dimensions of urban infrastructure lock-in were identified: legal and institutional; technological and economic; cultural and cognitive; and spatial and material.	Waste, infrastructure lock-in, governance	Gothenburg, Sweden	
Co-creating sustainability: Cross-sector university collaborations for driving sustainable urban transformations *Gregory Trencher, Masaru Yarime, Ali Kharrazi*	Collaboration, universities as drivers for	Basel, Switzerland Utica, USA	Data from 27 cities in Europe, Middle East,

Partnerships between universities, industry, government and the community are potentially a powerful way of driving sustainable urban transformation. Through the analysis of 27 partnerships in Europe, Middle East, Asia and North America, and the cities of Basel and Utica, the authors of this article created a theoretical framework to identify common traits, motivations and roles assumed by universities when pursuing the goal of collaborating with others to advance sustainability in a specific urban location. This was termed as “co-creation for sustainability”.	sustainability		Asia and North America
From sustainable development to carbon control: Urban transformation governance in Hong Kong and London *Paul Higgins* The author of this article explored the prevailing urban transformations of Hong Kong and London in the light of a shift from sustainable development preoccupation to carbon control management by utilising the theorised concepts of “known unsustainability”, “commitment to a blessed way of life”, and “the discourse of opportunity” as key analytical guides. Although it is accepted that both economies have re-orientated their prevailing urban planning trajectories in the direction of sustainable development, and increasingly carbon control, the key question remains whether the proposed measures for mitigation are radical enough to avert the predicted crises.	Philosophy of sustainability, carbon control management	Hong Kong, China London, UK	
Planning for Climate Change in Urban Areas: A Review of Theoretical and Practical Approaches *Christine Wamsler, Ebba Brink, Claudia Rivera* City authorities are increasingly facing the challenge of finding ways to include adaptation strategies into their work, although related knowledge is still scarce and fragmented. With the aim to address this knowledge gap, the objective of the authors of this article was to critically review and compare predominant theoretical and practical approaches to adaptation planning. Gaps and synergies between the theoretical and practical approaches to adaptation planning, and the implications for improving sustainable urban transformation are analysed based on data from around the world.	Climate adaptation, theory and practice		Data from a diversity of cities and countries around the world
Lessons from the spread of bus rapid transit in Latin America *Santiago Mejia-Dugand, Olof Hjelm, Leenard Baas, Ramiro Ríos* The authors of this article examined sustainable urban transformation and the dissemination of mobility concepts throughout Latin America. Transition management and governance theory were used as support for the analysis of the adaptive, aligning nature of the studied transportation systems. By using empirical data gathered from different bus rapid transit projects implemented in 30 locations in Latin America and in four cities in Lima, Bogota, Quito and Curitiba, the propagation pattern and the conditions for the system development was described and analysed.	Transport, transition management	Lima, Peru Bogota, Colombia Quito, Ecuador Curitiba, Brazil	Data from 30 cities in Latin America
Institutional entrepreneurship in sustainable urban development: Dutch successes as inspiration for transformation	Collaboration, institutional	Amsterdam, Hoofddrop and	

Rosalinde Klein Woolthuis, Fransje Hooimeijer, Bart Bossink, Guus Mulder, Jeroen Brouwer The authors of this article framed urban transitions as a strategy for action between multi-disciplinary and multi-perspective stakeholders, and focused on the role of institutional entrepreneurs in realising sustainable urban developments, thereby showing future avenues for urban transitions. Based on examples from Amsterdam, Hoofddrop and Culemborg in the Netherlands, this article documented that institutional entrepreneurs are able to change the perceptions on what urban sustainability is thereby, changing the social cognitive institutions, they proposed and lobbied for changes in rules and regulations thereby, influencing the regulative political institutions and they showed how different business models and professionalisation of new knowledge and business practices can create value thereby, altering the economic normative institutions.	entrepreneurs	Culemborg, Netherlands	
Transforming urban waste into sustainable material and energy usage: The case of Greater Manchester *Elvira Uyarra, Sally Gee* By combining insights from urban studies and research dealing with ”systems innovation” and ”sustainable transitions”, the authors of this article focused on a transformation towards a more sustainable waste management system in the urban setting of Manchester in the UK, which underwent a shift from a relatively simple landfill model to a highly complex, multi-technology waste solution based on intensive recycling and composting, and sustainable energy usage. It showed how a mix of political vision, stakeholder collaboration, economies of scale, planning concerns, transport infrastructure, and the ability of waste disposal managers to gather expertise, resources, political influence and commitment at multiple levels of governance, dramatically influenced the outcome.	Waste, networked infrastructures, collaboration, governance	Manchester, UK	
Urban transition labs: Co-creative action research for sustainable cities *Frank Nevens, Niki Frantzeskaki, Leen Gorissen, Derk Loorbach* In this article, ”urban transition labs” are presented by its authors as settings in which real life trajectories of sustainable development in cities are deployed and at the same time carefully observed in a co-creative collaboration between actors and researchers (”action research”). Thereby, a ”transition management” approach was applied, resulting in a cycle of five distinct phases: process design and system analysis, problem structuring and envisioning, back casting, determining major pathways and agenda setting, experimenting and monitoring and evaluation. Utilising five cases of Aberdeen, Montreuil, Gent, Ludwigsburg and Rotterdam from Europe, this article shared findings about specific barriers and enablers that could determine the effectiveness of the envisaged approach.	Collaboration, transition management	Aberdeen, UK Montreuil, France Gent, Belgium Ludwigsburg, Germany Rotterdam, Netherlands	
The Zero Waste Index: A Performance Measurement Tool for Waste Management Systems in a Zero Waste City *Atiq Zaman, Steffen Lehmann*	Zero waste, management	Adelaide, Australia San Francisco,	

Waste is the symbol of inefficiency of any modern society and a representation of misallocated resources. The authors of this article conceptualised the “zero waste city” and proposed a new tool to measure the performance of waste management systems called the “zero waste index”. This index forecasts the amount of virgin materials, energy, water and greenhouse gas emissions substituted by the resources that are recovered from waste streams. The zero waste index was applied to the three high consuming cities of Adelaide, San Francisco and Stockholm. It is evident that the zero waste index is an innovative tool to assess waste management performance and materials substitution by waste management systems in different cities.		USA Stockholm, Sweden	
What role for network governance in urban low carbon transitions? *Jamil Khan* Cities act in a world of multi-level governance where local decision-makers are dependent on both higher political levels and other actors in society. In this situation network governance has emerged as a promising ”new mode of governance” where cities can increase both the legitimacy and implementation capacity of an ambitious climate agenda. In network governance, the municipality is a facilitator rather than commander and implementer. The aim of the authors of this article was to critically analyse the role of network governance in urban low carbon transitions. Building on original empirical research from Växjö in Sweden, this paper drew from, and merged, two different theoretical perspectives on governance: network governance and transition governance.	Governance, legitimacy	Växjö, Sweden	Data from Europe, North America and Australia
Sustainable urban regime adjustments *Maj-Britt Quitzau, Jens Jensen, Morten Elle, Birgitte Hoffmann* The authors of this article raised the issue of how to more effectively address socio-technical transitions in strategic processes concerning sustainable urban transformations. More specifically, this article unfolded the strategic alignment work that is necessary to enable a sustainable transition, and pointed towards the need to recognise that ”horizontal” transition dynamics are fruitful, although these were somewhat downplayed in the socio-technical transition studies compared with ”vertical” dynamics. Through an in-depth study, Egedal in Denmark, which is a frontrunner in sustainable urban transformation, the authors showed how a more transitional form of planning was adopted in order to develop an energy efficient, new urban area.	Governance, strategic planning, socio-technical transitions	Egedal, Denmark	
Experiences in Urban Governance for Sustainability: The Constructive Dialogue in Swedish Municipalities *Nora Smedby, Lena Neij* The objective of the authors for this article was to assess experiences from Sweden of a collaborative approach to urban environmental governance called the ”Constructive Dialogue”. These dialogue processes, implemented in six cities, including Hofors, Kalmar, Karlstad, Malmö, Stockholm and Gothenburg, involved players from different actor groups and various platforms for interaction that were formed in the participating cities. The goal	Governance collaboration, planning	Hofors, Kalmar, Karlstad, Malmö, Stockholm and Gothenburg, Sweden	

was to develop planning processes for a sustainable and more holistic urban development. Designed as a meta assessment, based on existing evaluations and complementing interviews, this article evaluated the experiences in capacity building in terms of relation building, knowledge advancement and mobilisation as well as in the achieved environmental outcomes.			
Building social cohesion through small scale urban space redesign *Natalia Radywyl, Che Biggs* The authors of this article argued for urban transformation strategies to embrace instability and foster radical change as an emergent process. Drawing on resilience theory and disruptive innovations, the authors emphasised that strategies to re-activate existing urban commons, co-opt urban space and catalyse shifts in the public imaginary about ownership and use of public space are critical levers for radical urban change. Examples of innovative practices from New York in the USA highlighted the need for sustainable urban transformation to be community-led but facilitated through the distribution of agency locked within existing institutions. In this context, the urban change professional must play a fine line between activating the public imaginary, buffering bottom-up innovations and even knowing when to support initiatives by tacitly allowing illegal activities that undermine dominant conceptions of the commons.	Disruptive innovations, public space	New York, USA	
Resilient cities and organisational learning: Stimulating eco-cultural innovations *Hans Dieleman* In the context of climate change, the author presented the two dominant strategies of mitigation and adaptation, and then presented a systems view of the city in which resilience is the key response to climate change. The author argued that resilience depends on three elements, dimensions or areas: infrastructure and technology, people and particularly the levels of human connectedness and communal self-reliance, and the innovative capacity within the local economy. Teaching and training were considered as an important element in strengthening resilience. The author presented a number of examples from around the world, which underscored the relevance of learning processes as key conditions to work successfully in urban networks.	Climate change, resilience, organisational learning		Data from 25 cities around the world
Urban development projects and sustainable urban transformations: The need for entrepreneurial political leadership *Thomas Block, Erik Paredis* By providing a more precise understanding of urban political leadership and power configurations in decision-making processes of urban development projects in Belgium, the authors emphasised that lessons can be learned for sustainable urban transformation. While urban governance networks and distributed forms of governing may be typical of contemporary urban political configurations, the results from three urban projects in the city of Kortrijk showed the necessity of entrepreneurial political leadership in developing an agenda for sustainable urban transformation, in connecting policy streams and	Governance, political leadership	Kortrijk, Belgium	

engaging stakeholders, and in aligning and deliberating between different interests. To map the role, impact and strategic behaviour of the dominant actors, especially the mayor, decision-making processes were reconstructed.			
Eco-Acupuncture: Designing and facilitating pathways for urban transformation, for a resilient low-carbon future *Chris Ryan* This author reviewed a program of engagement with urban communities in the city of Melbourne in Australia, known as eco-acupuncture. The critical question addressed by this program that is considered in this article is how to effectively initiate and support rapid structural and cultural change within existing urban environments and communities, and to reconfigure urban form and life in anticipation of the projected impacts of climate change and peak oil. This is not a theoretical question. On the contrary, the policy challenges for governments in dealing with the rapid transition from a fossil carbon-based economy are significant. For local and city governments, where the connection with the concerns and fears of urban citizens can be most direct, where land-use planning decisions often intersect with projected climatic changes, and where vulnerability to energy pricing is already part of some community strategies, developing a coherent set of policies and programs for this transition has become a new priority.	Transitions, resilience, engagement, governance	Melbourne, Australia	
SHORT PAPERS			
Sustainable Urban Transformation in Small Cities in Egypt: A UN-Habitat Perspective *Ihab Mohamed Shaalan*	Environmental management, small cities		Data from 50 cities in Egypt
Bridging the gap between science and practice: An ICLEI Perspective *Laasya Bhagavatula, Cristina Garzillo, Richard Simpson*	Collaboration, governance	Rajkot and Coimbatore, India	Data from Europe

This appendix provides an overview of the articles that appear in this Special Volume highlighting key themes and findings.