

## CHAPTER 6:

### CITIES AND ENERGY<sup>1</sup>

*by Nigel Jollands*

*International Energy Agency*

Washing lines are causing a stir in North America. Rather than use their clothes dryers, some residents have taken to trying to save energy and reduce CO<sub>2</sub> emissions by hanging their laundry to dry in the backyard. Unfortunately, often local ordinances prohibit outdoor clothes lines as eyesores. The washing line ban is just a small example of how local planning rules and city governments can and do influence their city's energy use. From washing lines to the way that city energy and transport infrastructure is laid out, city governments can play a significant role in influencing the energy use of city residents. This paper explores the rationale for why cities, their governments and their energy use patterns should be the focus of considerable attention. In doing so, the paper addresses three critical questions:

What is the potential for cities to mitigate energy-related CO<sub>2</sub> emissions?

What are the obstacles to greater action by city governments?

What action is needed, by whom?

### **Introduction**

Washing lines have been causing a stir in North America (Carpenter, 2007; Lofholm, 2007; Rosenthal 2008). Rather than use their clothes dryers, some residents have taken to trying to save energy and reduce CO<sub>2</sub> emissions by hanging their laundry to dry in the backyard. Unfortunately, often the local ordinances prohibit outdoor clothes lines as eyesores. As a result, some people are trying to get these clothes-line bans declared an illegal barrier to conservation under provincial law (Rosenthal, 2008).

The washing line ban is just a small example of how local planning rules and city governments can influence their city's energy use. From washing lines to the way that city energy and transport infrastructure is laid out, city governments can play a significant role in influencing the energy use of city residents. The purpose of this paper is to:

- Outline the rationale for focusing on city energy use;
- Outline the potential for cities to mitigate energy-related CO<sub>2</sub> emissions;
- Investigate the obstacles to greater action by city governments in energy management;
- Identify actions that cities and other actors can take to address climate change.

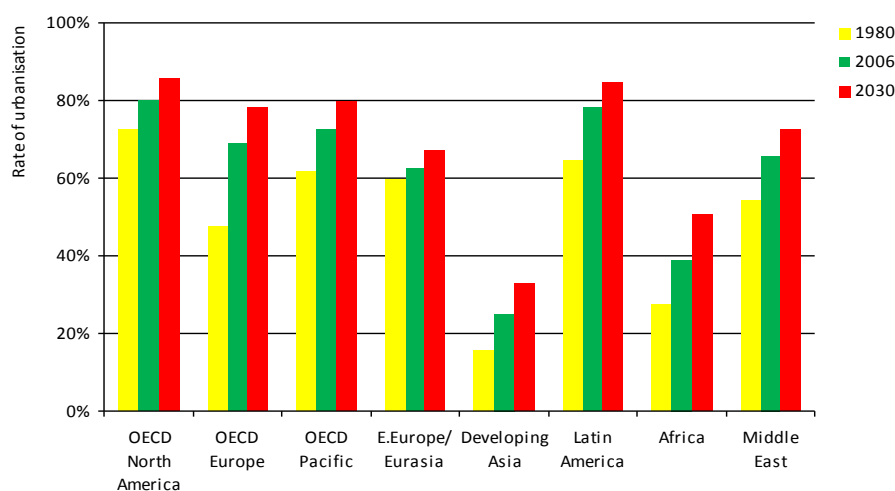
## Why focus on cities and energy?

There are several compelling reasons why cities and their energy-use patterns should be the focus of considerable attention.

First, cities use a significant proportion of the world's energy. In today's world, cities are a dynamic and vital part of global culture and are the main engines of social, economic and technological development. But to provide their populations with services, cities need energy – lots of it – and much of it is fossil-fuel based. The Tokyo metropolitan area, for example, with a population exceeding 12 million people, consumed approximately 20 Mtoe – equivalent to the total annual energy supply of Bulgaria (International Energy Agency, 2007). Globally, cities today are estimated to consume between 60% to 80% commercial energy.

As urban population, economic activity and wealth increase, urban energy use is projected to grow rapidly. In 2008, half of the world's population lives in cities (see Figure 1). By 2030, cities will house 60% of the world's population – equivalent to the total global population in 1987. At the same time, the geographic distribution of urban population is changing: while global urbanisation in the first half of the 20th century was dominated by European cities, currently most urban population resides in the Asian continent, and some of the fastest-growing cities are found in the African continent. As cities grow, so too does city energy use.

**Figure 1. Trends in global urbanisation**



Source: United Nations Population Division (2007), *World Population Prospects: The 2006 Revision*, United Nations, New York and United Nations Population Division (2007), *World Urbanization Prospects: The 2007 Revision*, United Nations, New York.

Cities are likely to account for an increasingly large proportion of global energy use and CO<sub>2</sub> emissions. This is mainly driven by the rapid changes in cities in emerging and developing countries – both because of their urban population growth (the bulk of the world's population growth by 2030 is forecast to be in cities of developing and emerging countries) and because cities in these countries are a source of increasing economic activity. This increased economic activity requires growing energy use. In addition, as developing countries urbanise, they tend to shift from CO<sub>2</sub>-neutral energy sources

(biomass and waste) to CO<sub>2</sub>-intensive energy sources. As a result, there is potential for a trend towards an increasing global proportion of CO<sub>2</sub> emissions from cities.

Characteristics of city authorities (CAs) themselves provide a second rationale for engaging cities in energy management and climate change mitigation. Through their direct energy use, regulatory powers, capital works programmes and property management, community services and experience with translating national and international policy into action, CAs are actively involved directly and indirectly in energy management and climate change mitigation. CAs are significant energy users in their own right. For example, Sydney's local government spent around AUD 53 million on energy in 2006 to provide urban services for its population of 4.3 million people (ICLEI, 2007). CAs are significant owners and managers of energy-related capital infrastructure, including buildings, recreation facilities, transport fleets and energy distribution networks.

Through their regulatory functions, CAs also have a profound indirect influence over a city's overall energy use. This influence is principally through urban planning functions and their consequent impact on urban form and transport infrastructure. Many city governments can also levy rates and charges and to some extent provide incentives and disincentives for energy use through pricing policies.

Finally, CAs have had considerable experience in engaging with issues of sustainable development and attempting to translate global and national targets into local practice. For example, CAs are generally responsible for implementing national energy efficiency requirements in building codes. This experience means that many CAs are well placed to assist with sustainable energy and climate change mitigation strategies.

### **What is the potential for cities to mitigate energy-related CO<sub>2</sub> emissions?**

Cities have significant energy and CO<sub>2</sub> savings potential. If one considers the range of policies and measures available to a country to reduce emissions, around two-thirds of the total global energy savings could occur in cities. Moreover, cities could go further than these national savings because many policy options to reduce energy consumption and decrease CO<sub>2</sub> emissions are under the authority of local governments.

City governments can also influence city energy use, both directly and indirectly. Through its provision of services (sanitation, water provision, public transport, etc.), local government consumes energy directly. Estimates of the proportion of city energy consumed by local government range from between 1% to 5% (for example, in New Zealand and France) to 16% (in countries like Austria) of total city energy use (International Energy Agency, 2008). Local government also has a significant indirect impact on energy use in cities. For example, local governments are typically responsible for enforcing energy-efficiency requirements in building codes. They also set land use and planning rules that have a profound influence on city layout and, among other things, transport energy use. Little information is available on the actual scale of local governments' indirect influence on city energy use. However, Lumb (1994) suggests that local governments can influence up to a quarter of city energy use.

Energy-saving potential varies between cities, reflecting their particular geographic setting and biophysical resource and infrastructure endowment (including industrial structure) and their social environment in terms of policy and institutional framing conditions. Of equal importance is the availability of a skilled workforce, public/private partnerships and networks with other cities. Despite the different contexts, policy challenges and the many demands on local government resources, there

are numerous examples around the world of local governments using policies to save energy (see Table 1).

**Table 1. City energy and CO<sub>2</sub> savings examples**

City	Sector	Description of Programme	Savings
Jakarta, Indonesia, and Bogotá, Colombia	Transport	Introduction of bus rapid transport system	120 000 tonnes CO <sub>2</sub> (Jakarta) and 287 000 tonnes CO <sub>2</sub> (Bogotá) annually
Barcelona, Spain, and Paris, France	Transport	Bicycle hire scheme	960 tonnes CO <sub>2</sub> in the first six months in Barcelona
Seoul, Korea, and London, England	Transport	Congestion fees	Between 10%-20% CO <sub>2</sub> emissions
Oslo, Norway, and Vaxjö, Sweden	Transport	LEDs for traffic signals and public lighting	Between 50%-70% of street lighting CO <sub>2</sub> emissions
Mexico City, Mexico	Transport	Replacement of old taxis with more efficient ones	665 000 of CO <sub>2</sub> annually
Kotka, Finland	Buildings	Combined Heat and Power (CHP) plant for district heating	390 000 tonnes of CO <sub>2</sub> , or 30% of total city emissions
The Hague, Netherlands	Buildings	Seawater central supply unit	4 000 tonnes CO <sub>2</sub> annually
Sao Paulo, Brazil	Buildings	Landfill methane gas thermal plant	730 000 tonnes of GHG annually
Tokyo, Japan	Buildings	Energy Conservation Specifications – more stringent building specifications	30% of building CO <sub>2</sub> emissions annually
Berkeley, US	Buildings	Buildings standards exceeding state level	13% energy consumption annually
Alameda, US	Transport/renewables	Alternative-fuel public transport vehicles	5 654 tonnes CO <sub>2</sub> annually
Calgary, Canada	Transport/renewables	Light rail public transport system powered by wind-generated electricity	26 000 tons of CO <sub>2</sub> emissions annually
Copenhagen, Denmark	District heating	Using waste heat from incineration plants and CHP plants	665 000 tonnes of CO <sub>2</sub> annually
Rizhao, China	Renewables	Solar water heaters for households, traffic and street lights powered by solar cells	18 000 tonnes of CO <sub>2</sub> annually

Source: C40 website ([www.c40cities.org](http://www.c40cities.org)), and other sources.

### **What are the obstacles to greater action by city governments?**

Despite the initiatives that many cities have undertaken, there are several critical observations that can be made. First, only a relatively small proportion of all cities are active in pursuing CO<sub>2</sub> mitigation policies. Second, it appears there is still scope to fully mainstream climate change into day-to-day action. A large number of single actions are taken without being fully embedded in broader government operations. Finally, several policy areas have not been fully exploited. The use of urban and land use planning to address climate change is one example where local governments could make further progress.

There appear to be a range of obstacles to more widespread city-based energy initiatives. These obstacles include those external to the local government, such as the lack of acknowledgment,

encouragement and clear national-level guidance on climate change for local governments, as well as the lack of energy and climate change policy competence delegated to local governments.

There are also significant internal obstacles, including the presence of many competing demands for the local government's limited resources (both financial and staffing); the tension between short re-election periods and long-term infrastructure challenges; institutional barriers such as inflexible budgetary structures and lack of cross-departmental collaboration; the lack of co-operation beyond city borders; and the difficulty in measuring achievements. The lack of resources is often regarded as one of the most critical internal obstacles. This problem is exacerbated when, in some situations, local governments are expected to contribute to achieving the national CO<sub>2</sub> abatement target without being provided the necessary additional resources.

These barriers are diverse and complex. The next section outlines a series of critical next steps for cities to capture the significant CO<sub>2</sub> mitigation potential.

## **What is needed?**

### ***General actions***

In general, cities can do three things immediately to achieve CO<sub>2</sub> savings and to tap into the co-benefits of energy security and environmental policies. Cities and their governments can:

- Implement measures that are both local priorities and that mitigate CO<sub>2</sub> emissions without imposing additional costs (such as energy efficiency, district heating or cooling, etc).
- Enable the implementation of those CO<sub>2</sub>-mitigating measures that are of lower priority due to resource constraints by making use of international financial mechanisms and, Kyoto mechanisms and international carbon markets.
- Discourage measures that are high local priorities but are detrimental to CO<sub>2</sub> emission levels, for example, the construction of expressways and highways without restraining cars or improving public mass transport systems.

A starting point for many local government climate change actions is optimising their own facilities through energy management and strategic investment, campaigns to raise awareness in the private sector and working with citizens and businesses. These are areas of work every local government can tackle, regardless of their specific legal and financial framework.

### ***Actions in four specific areas***

In addition, there are four key areas where local governments can have significant policy influence and achieve energy savings. Cities can encourage the use of integrated energy production technology, such as combined cooling, heat and power (CCHP). Energy demand for space and water heating and cooling often exceeds two-thirds of building energy demand and can be significantly reduced through CCHP technology. The density of demand for energy services in cities provides economies of scale (less infrastructure unit cost *per capita*) as well as additional energy savings due to minimised transmission and distribution losses.

Passenger transport is another sector in which local government can have some influence. In particular, local governments have some influence over transport modes used for short trips. The provision of safe pedestrian and bicycle routes can encourage residents to use these transport modes in

preference to passenger vehicles. Other steps local governments can take include the use of land use and planning, measures such as low-emission zones, congestion charges, and improvements to make public transport more attractive.

Local governments can also influence the efficiency of energy use in buildings. In particular, local governments are instrumental in enforcing the energy components of building codes. In established urban areas, a typical rate of housing stock turnover is 1% to 2%, so the benefit accrues very slowly but over a long period of time. A far greater benefit is available in newly developed urban areas, but the trend toward larger houses has prevented any reduction in total energy use so far.

In the United Kingdom, about 100 local authorities have either fully adopted or at least included in policy drafts the participating in the “Merton rule”, which requires new buildings over a certain size and major refurbishments to achieve at least 10% greenhouse gas reductions through on-site generation of electricity from renewable sources. Electricity production and heat generation in buildings can also be regulated through planning laws: Barcelona is widely recognised for introducing a Solar Thermal Ordinance, a law requiring 60% of hot water supply to be met through solar thermal collectors. This approach was later adopted in a less stringent form in the national building codes of Spain.

### ***Co-ordinated action***

In addition to work on specific sectors, local governments can achieve significant savings through co-ordinated action. Cities can begin by pooling purchasing power. For example, the C40 energy-efficient buildings initiative has led to several agreements for the collective purchase of energy-efficient products. At the second Summit of the C40 cities in 2007, 16 cities signed a USD 5 billion programme to improve the energy efficiency of buildings, starting with public buildings.

Cities can also pool resources and know-how to reduce policy development costs. For example, several city associations have developed methodologies and tools that can assist local governments to develop greenhouse gas reduction strategies (*e.g.*, ICLEI’s milestones approach, and Climate Alliance’s climate compass).

Another realm of action is urban design and spatial planning for an energy-efficient city. Research suggests that changes in urban design can have a profound and long-term effect on energy consumption. Cities need to consider using tools such as mixed-use zoning, “permeable” street patterns, densification, etc., to address energy and climate change issues. In these areas, cities have unique responsibilities and opportunities to tap CO<sub>2</sub> reduction potentials.

### ***At the national level***

There is an urgent need for many national governments to provide guidance to local governments on how to address climate change and related energy issues. This guidance can range from providing clear legal requirements to relatively indirect approaches such as guidebooks, etc.

One option is for national governments to establish a legal framework requiring local governments to take climate change actions. Past experience with such requirements for local energy plans shows these requirements have mixed results, depending on whether local governments have the technical skills to plan for climate protection and the financial means to implement programmes that go beyond business as usual. This makes the need for guidance and technical assistance important.

Some national governments have already started to provide guidelines for local climate policy. Examples include Germany's guidebook on local climate protection (Kern *et al.*, 2005), and Austria's Klima:aktiv programme (Austrian Energy Agency, 2008). In the United Kingdom, urban planning guidelines have been published by the national government, recommending that local governments make provisions to address climate change.

City energy use data collection could also benefit from co-ordinated guidance. Identifying policy options and evaluating their potential impact requires much more comprehensive and systematic data collection on city energy use. Greenhouse gas emissions inventories for cities are a good first step, but they need to be standardised and complemented by protocols for monitoring emissions reductions and gains in energy efficiency.

Another approach to encouraging local initiative is to provide local governments with additional funding targeted directly at climate change mitigation. The most far-reaching funding framework exists in the Netherlands: The *Klimaatcovenant*, a multi-level arrangement involving local government, provinces and several ministries at the national level (Netherlands Ministry of Housing, 2006). Funds will include EUR 37 million of subsidies between 2008 and 2011. Important features require that a city that receives funding has to present a comprehensive action plan based on a common methodology (Climate Menu), and that the funding is not related to projects, but a specific amount per inhabitant or land area that can be used for any part of the costs related to implementing the plan. Other promising funding initiatives for local governments are in the United States (as part of the 2007 Energy Independence and Security Act, Congress established the Energy Efficiency and Conservation Block grant program, a USD 2 billion per year pool of funds for cities and counties) and the various voluntary carbon markets being established around the United States.

### ***Local governments and the UN climate process***

Another potential avenue for enhancing local government action in climate change mitigation is encouraging greater local government participation in international climate change policy processes (Climate Alliance and Energie-Cités, 2002). Such involvement can provide cities/local governments with recognition of the value of their on-the-ground policy experience. In addition, it is important to distinguish between actions relevant to cities in developed and developing countries, and action relevant to all cities. In the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol processes, local governments currently play a minor role, and the visibility of local-government actions is limited.

Except for some governments that invite selected cities in their delegations, the role of local and regional governments is restricted to observers. Within the large group of non-governmental organisations, local governments have their own constituency, Local Government and Municipal Authorities (LGMA), providing them with opportunities for certain interventions and consultations. There has been lobbying for a stronger role of local government in the UNFCCC process, arguing that city networks are not non-governmental, but rather local government organisations. As such, their members, as elected bodies, have strong legitimacy and the powers to provide substantial contributions to the objectives of the Convention and the Kyoto Protocol.]

Local governments and their activities could be given greater visibility and recognition in the UN process. This can be achieved in at least three ways. As a first step, national governments could invite local and regional representatives in their national delegations. This would provide delegations the opportunity to draw on the on-the-ground experience of local governments in climate change mitigation action. Second, a range of topics ranging from local climate policy, options for national governments to promote local action, and models of multi-level arrangements could be considered at

thematic workshops on mitigation and adaptation in the UN process. However, a word of caution is needed. If participation in the UN climate process is to be extended to local governments, it needs to be done in a way that does not hinder an already complex process involving 198 parties.

A third approach is to include local and regional activities in national communications. The Guidelines both for Annex I and Non-Annex I National Communications under the Convention allow for the reporting on subnational policies and measures. While some countries already do this, local actions are not presented in a structured way. Since it is not practical to mention every policy and measure undertaken by subnational governments, it would be helpful to define a standard format and agree on guidelines for reporting on subnational action, and for allocating funding for developing countries to report on regional and local action. Furthermore, the UNFCCC Secretariat could place more emphasis on this level of action in their assessments of national reports, *e.g.*, within their in-depth reviews of national communications of Annex I countries, and include a section on local and regional actions in their Compilation and Synthesis Reports. A reporting template could include the number and role of local and regional governments within the state, a survey and an assessment of local climate policy (*e.g.*, main areas of work, percentage of active local governments in relation to defined activity levels, measurable results), national actions to promote, support and guide local climate change policies and programmes, and multi-level arrangements, if they are in place.

In some situations, local governments can participate in the Kyoto mechanisms, which have established a global carbon market, and related regional schemes such as the EU Emission Trading Scheme (ETS). For example, European local governments that directly or indirectly own power stations above the threshold level (through owning or holding shares of local utilities) can participate in the ETS.

Also, local governments can take part in other aspects of the carbon market. For the moment, they can invest in Joint Implementation and Clean Development Mechanism (CDM) or host JI projects (if they are in an Annex I country) or host CDM projects (if in a Non-Annex I country). For example, the ICLEI network is encouraging its members to participate, and is promoting some CDM projects (*e.g.*, in Indian cities). Furthermore, in some European countries, there are efforts to involve local governments in the carbon market (such as Italy and France) and to this end, allow for domestic projects. However, project-based mechanisms provide incentives only for individual projects, thereby failing to stimulate a process of mainstreaming of climate policy into the local policy (although programmatic CDM could, in the future, go some way to addressing this problem).

A crucial question is whether it is appropriate to allocate quantitative emission targets to local governments (the same issue concerns other sectors with devolved targets). This may not be effective or practical, since relatively small changes at the country level – like a plant's closure or opening – can have disproportionate impacts on a local government's reported emissions. Such targets may also be too limiting for a city's development in terms of population and economy. Moreover, there is a problem of quantification, since for smaller geographical units, the effect of transborder activities (*e.g.*, traffic crossing the city borders and "imported" electricity) can be substantial. One way around these problems could be to only allocate local government emission targets for infrastructure under their control – for example, targets for local-government-owned electricity generation.

There is a similarity between cities as part of the national system and developing countries as part of the global system. Thus, it might be possible to learn from, adapt, or even in some cases, apply the schemes that have been proposed at the international level to involve developing countries to cities in these countries.

One option could be to directly involve large cities in developing countries into the sustainable development policies and measures (SD-PAMs) approach. As for cities in developing countries, there could be arrangements between national and local governments, possibly within an international framework. A local governments' SD-PAMs scheme would rely on a discrete list of policy measures that countries could commit to, some of which would be implemented at the local level. The discrete set of SD-PAMs would need to emphasise actions where local governments have a unique role (fields of action that can exclusively be covered by local governments), such as urban planning, local transport, district heating, siting of renewable energy installations, etc., and actions which are complementary to national action, such as implementing standards and ensuring compliance. They could also include adaptation measures at the local level, in particular measures to improve resilience.

Based on such a set of actions, individual local governments could then put together their climate action programmes and pledge to implement the actions, with the possibility for cities in developing countries to seek international assistance and funding, as envisaged under Article 1.b.ii of the Bali Action Plan.

## **Conclusion**

Cities and their governments can play a crucial role in helping to address the climate change challenge and achieve a sustainable energy future. Many cities have already risen to the challenge and have demonstrated that they can deliver impressive CO<sub>2</sub> reductions on the ground. However, internal and external barriers exist that prevent more widespread adoption of such actions. Despite these obstacles, there are some actions all cities can pursue, such as implementing fiscally neutral emission reduction projects. Cities can also focus on four priority areas: CCHP, public transport, energy efficiency in buildings and improved land use planning and urban design. Co-ordinated action between cities, as well as improved national guidance, can also play an important role.

Together, these sets of actions can assist cities in continuing to provide the high level of services to their growing populations, while contributing to much-needed climate change mitigation action.

### ***Questions for discussion:***

- How can city leaders encourage energy conservation efforts among local businesses, individual households and municipal institutions?
- What are the priority sectors that city governments should focus on to achieve cost-effective CO<sub>2</sub> mitigation?
- What policies are required to promote energy-efficient buildings in the commercial, residential and municipal building sectors?
- What other measures have proven to be effective for cities to promote energy conservation and efficiency (*e.g.*, in traffic and street lighting, less energy-intensive water supply and treatment systems, heat and energy co-generation systems, waste-to-energy systems)?
- How can city leaders promote broader use of renewable energy sources for meeting urban energy demand?
- What is the potential for improved urban design/land use planning to achieve CO<sub>2</sub> mitigation? What urban design/in land use planning tools should cities consider using?

## NOTES

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<sup>1</sup>. Acknowledgements: This paper draws on research conducted by the Cities Energy Modelling International Expert Group (CEMIEG) convened by the International Energy Agency for preparing material for the World Energy Outlook 2008. Members of CEMIEG include Nigel Jollands, Paul Dowling (IEA), Gotelind Alber (Sustainable Energy and Climate Policy), Claudio Baffioni (Comune di Roma), Shobhakar Dhakal (National Institute for Environmental Studies), Steve Hammer (Columbia University), Stephen Kenihan (ICLEI), Lilly Parshall (Columbia University), Matthias Ruth (University of Maryland), Niels Schulz (Imperial College, London and IIASA), Wayne Wescott (ICLEI), and Tom Kerr (IEA).

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