

## Executive Summary

### Cities are major contributors to climate change and also vulnerable to its impacts

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#### *Cities are major contributors to CO<sub>2</sub> emissions.*

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Roughly half of the world's population lives in urban areas, and this share is increasing over time, projected to reach 60% by 2030. Cities consume a great majority – between 60 to 80% – of energy production worldwide and account for a roughly equivalent share of global CO<sub>2</sub> emissions. Greenhouse gas (GHG) emissions in OECD cities are increasingly driven less by industrial activities and more by the energy services required for lighting, heating and cooling, electronics use, and transport mobility. Cities can in principle use energy in a more efficient way than more dispersed areas because of reduced costs and economies of scale, however this depends on urban design and form. Growing urbanisation will lead to a significant increase in energy use and CO<sub>2</sub> emissions, particularly in non-OECD countries in Asia and Africa where urban energy use is shifting from CO<sub>2</sub>-neutral energy sources such as biomass and waste to CO<sub>2</sub>-intensive energy sources.

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#### *Climate change also poses key threats to urban infrastructure and to urban populations.*

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Many of the world's largest cities are located in coastal areas and this increases their vulnerability to rising sea levels and storm surge, presenting unprecedented risk to livelihoods, property, and urban infrastructure. Port cities most at risk for coastal flooding are located in both rapidly developing countries such as India and China (*e.g.* Kolkata, Shanghai, Guangzhou) and in wealthier countries such as the United States (*e.g.* Miami, New York City), the Netherlands (*e.g.* Rotterdam, Amsterdam) and Japan (*e.g.* Tokyo, Osaka). Heat waves will also be more intense in urban areas due to urban heat island effects which are exacerbated by large amounts of concrete and asphalt and excess heat from equipment such as air conditioning; average annual temperatures tend to be 3.5 to 4.5 °C higher in cities than rural areas, and this difference is expected to increase by 1 °C per decade (up to a difference of 10 °C in large cities). Poor populations, often concentrated in cities in both rich and poor nations, are among the most vulnerable to climate change, in part because they tend to settle in sub-standard housing in more vulnerable areas, and because they lack the resources to quickly and effectively protect themselves from extreme weather patterns and shifting climatic conditions.

## **Given their role as predominant consumers of energy, cities should be part of the climate solution: urban form, lifestyles and energy sources are what count**

*How cities grow and operate matters for energy demand and thus for greenhouse gas emissions.*

Energy use and related CO<sub>2</sub> emissions are driven by how much energy is required to light, heat and cool buildings as well as to operate home appliances and office equipment, by how electricity is generated and by the energy used to move around the city and its peripheral areas. Urban density and spatial organisation are key factors that influence energy consumption, especially in the transportation and building sectors. The acceleration of urbanisation since the mid-half of the last century has been accompanied by urban sprawl, with urban land area doubling in the OECD and growing by a factor of five in the rest of the world. The expansion of built-up areas through suburbanisation is still growing in OECD metropolitan areas (66 out of the 78 largest OECD cities experienced a faster growth of their suburban belt than their urban core over 1995-2005). Increasing density could significantly reduce energy use in urban areas and CO<sub>2</sub> emissions. For instance, Japan's urban areas are around five times denser than Canada's, and the use of energy per capita (as measured by total primary energy supply) in Japan is around 40% that of Canada's. If we take countries in the same geographical context with similar heating needs, such as Denmark and Finland, the link is still visible: Denmark's urban areas are denser than Finland's by a factor of four and people in Denmark consume 2.5 times less energy than the Finns.

*Lifestyles, spatial form and public transport availability are also crucial in the generation of CO<sub>2</sub> emissions.*

It is not cities, or urbanisation *per se*, that contribute to greenhouse gas emissions, but rather the way in which people move around the city, sprawling urban development, the amount of energy people use at home and to heat buildings that make cities the great consumers of energy and polluters that they are. As urban areas become denser and rely more on public transport, carbon emissions are reduced. Similarly, not all cities in the same country are home to the same spatial form and lifestyles, nor do they contribute to carbon emissions in the same way. For example, the United States is the OECD country with the highest per capita carbon emissions, however the level of emissions varies greatly within the country, in part due to differences in density. The City of Los Angeles has higher personal vehicle use, much lower density and higher total CO<sub>2</sub> emissions than the city of New York, even though the latter has the largest population concentration in the country (60% higher than Los Angeles).

*Energy sources and technology choices also matter.*

The greenhouse gas emissions impact of energy consumption depends not just on how much is consumed, but also on the energy source, and in the case of electricity it depends on the mode of power production. For example, Cape Town has comparatively lower per capita

electricity consumption than Geneva but its electricity consumption has a higher greenhouse gas emissions factor per unit since South Africa uses coal to generate 92% of its electricity whilst Switzerland relies heavily on hydropower. Technology also matters: urban areas relying on inefficient or wasteful energy technologies contribute more greenhouse gas emissions than those that consume the same amount from more efficient sources.

## Urban policies are economically rational and can contribute to a global climate agenda

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*Urban policy can contribute to least-cost national CO<sub>2</sub> emissions reduction targets and mitigation strategies.*

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Findings from a computerised general equilibrium model (IMACLIM-R) with an urban module demonstrate that urban policies can lead to a reduction of total OECD global energy demand and, consequently, of CO<sub>2</sub> emissions at relatively low cost. Under a policy scenario where national emissions reduction objectives are implemented, the aggregate mitigation costs can be reduced if economy-wide environmental policies are complemented by urban policies, such as congestion charges or increasing spatial density. This is due to complementarities with other policy objectives, such as lower local pollution and health benefits, and the enhancement of city attractiveness and competitiveness through lower local pollution levels.

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*The lower tradeoffs between economic growth and environmental priorities at the urban level may be due to complementarities of policies observed only at the local scale.*

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An example is local pollution, which increasingly impacts city attractiveness and competitiveness. Results from the CGE model shows for instance that by 2030 cities that could become more attractive will do so while also curbing local pollution (e.g. Ankara, Auckland, Barcelona, Krakow, Lille, Melbourne, Montreal, Monterrey and Toronto). It also highlights that some metropolitan regions risk losing economic attractiveness if their current pollution trends continue (e.g. Chicago, Los Angeles, New York, Osaka, Paris, Philadelphia, Seoul and Tokyo).

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*The costs of delaying action on climate change are high.*

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While climate change mitigation and adaptation policies require significant investment, delaying action can increase future costs and limit future options for adapting to climate change impacts or reducing emissions in cities. Direct costs from climate change impacts can be staggeringly high, especially related to natural disasters and sea level rise. For example, shoreline retreat in the United States is projected to cost between USD 270 billion to 475 billion for each metre of sea level rise; analogous costs in some developing nations can amount to one-third of annual GDP. Beyond direct costs of climate change in urban centres – such as from increased intensity of extreme events – the economic impacts of climate change can have rebound effects in the job market and reduce tax revenue. These

stresses on the local economy may limit investment opportunities and deplete funds for infrastructure and innovation, leaving cities more vulnerable to future change. Ripple effects from outside the city can also affect the profitability of many economic sectors in the city and the income of city inhabitants, as well as human security. Changes to the built environment both to adapt to climate change and to limit emissions require long lead times, which heightens the urgency of implementing land-use zoning, spatial, building and transportation policies now.

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*Some urban climate policies may be no-regret policies as they can provide co-benefits that offset their cost.*

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These include public health benefits, cost savings from reduced energy use and increased efficiency, energy security, and improved urban quality of life. These additional non-climate benefits may also help to explain the lower tradeoffs and synergies between economic growth and greenhouse gas emissions reduction at the metropolitan level. For example, if achieved in the transport sector, greenhouse gas emissions reductions are often accompanied by reduced emissions of other air pollutants and thus can benefit human health leading to relatively large economic benefits. Furthermore, policies to reduce greenhouse gas emissions through increasing energy efficiency can result in significant energy cost savings and these can compensate for the initial investment costs in as little as a few years.

## **Cities and regions could play a key role in fostering the green growth agenda**

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*Cities and regions can promote green growth through many levers.*

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Cities can help stimulate growth through the creative use of procurement; better screening of investments in infrastructure, transport, communication networks and utilities; financial and tax incentives; partnerships and regulation of energy suppliers; and consumer awareness and training programmes for green jobs. They also have significant opportunities to lead by example. An effective green growth strategy for cities should search for employment gains in the short-to-medium term through targeted investments, and should pursue systemic changes in the way cities function and grow over the long term through the continuous generation and application of new technologies or other innovations that increase connectivity and reduce resource use. Public-private partnerships, leveraged for example through green infrastructure funds, have great potential for reducing the burden on local finances and increasing the efficiency of green investments.

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*Cities and regions can help create stronger markets for renewable energies and energy-efficient products and services and promote eco-innovation.*

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Feasible options for local public investment that can reduce emissions and sustain employment include improving the energy efficiency of buildings through retrofitting (Freiburg) and selective public purchasing (Berlin, Helsinki); integrating environmental

targets in transportation and planning (Toronto, Chennai, India); and increasing the share of renewable sources in energy supplies, through distributed technologies (e.g. Berkeley's programme for individual photovoltaic installations) or centralised utilities (e.g. wind farms in Samsø, Denmark). Green jobs can result from smarter management of energy at the urban level, through regulatory innovations such as local feed-in tariffs for renewable energy (e.g. several German cities) or strong market support for the deployment of information and communication technologies (ICT) and other energy-saving technologies (e.g. the Gangnam-gu district of Seoul and the Paris suburb of Issy-les-Moulineaux). The employment benefits of energy efficiency at the local level are largely the result of multiplier effects, as households and businesses shift expenditures from a capital-intensive sector (energy) to more labour-intensive sectors (e.g. local services). Cities can also be effective in greening industrial production by developing one-stop support services for green industry start-ups (Los Angeles); enabling existing businesses to reach energy conservation goals (the Eco-Efficiency Partnership in British Columbia) or realise profits through energy recycling (Kitakyushu and other Japanese "Eco-Towns"); providing training tailored to local labour market needs (Oakland Apollo Alliance); and by developing awareness programmes to raise consumers' preferences for green products (Blacktown, Australia Solar City project). Cities can also play a facilitative role, through the development of networking platforms for enhanced knowledge-sharing in climate change mitigation and adaptation, and an enabling role, through well-designed support for R&D and for industrial and public research collaboration in eco-innovation clusters. Cities can also promote the development of green clusters by facilitating synergies and by enabling private R&D through joint ventures (e.g. the Lahti Cleantech cluster in Finland, with 20 new clean-tech companies and more than EUR 30 million in total investment).

## **Cities can serve as laboratories for innovative and complementary climate policy packages**

*Cities have key competencies to act on climate change through their authority and responsibility in key urban sectors.*

These sectors include land-use zoning, transportation, natural resources management, buildings, waste and water services. Urban authorities make decisions that determine or influence public transportation systems, the built environment, renewable energy and energy efficiency measures, and the sustainability of public services delivery. Cities and metropolitan regions are well positioned to develop policy and programmatic solutions that best meet specific geographic, climatic, economic, and cultural conditions. They are equally well placed to develop innovative policy solutions that can be scaled up into regional or national programmes, or to provide a laboratory for national pilot programmes on the urban level.

*Cities serve as policy laboratories for action on climate change.*

Urban governments are taking serious action on climate change – even in the absence of national policies – through local regulations, urban services, programme administration, city purchasing and property management and convening of local stakeholders. While

some local and regional governments have taken action independently, others have benefited from guidance provided by networks of local governments, such as the Nottingham Declaration in the United Kingdom, and transnational networks such as ICLEI – Local Governments for Sustainability and the EU Covenant of Mayors. Activities involving government-owned property or operations are common, in part because cities have direct control over them – examples include many cities’ purchase of hybrid or alternative fuel vehicles and improving the energy efficiency of street and traffic lights (e.g. Los Angeles and Graz, Austria). Important opportunities exist where cities are service providers (water services system in Melbourne, capture of methane gas from landfills for energy in Toronto and Monterrey, and use of district heating in Copenhagen, Stockholm and Mannheim). However, cities generally are still reluctant to make full use of their regulatory authority to achieve climate goals, with the notable exceptions of Barcelona’s Solar Thermal Ordinance and San Francisco’s recent introduction of mandatory recycling.

### **Systematic, multi-sectoral strategic planning is required to exploit synergies between climate and other urban policy goals**

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*Effective climate policy packages seek policy complementarities among and within urban sectors to implement policies that enhance each other’s effectiveness.*

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For example, land-use zoning policies that allow for higher densities and greater mixing of residential and commercial uses can enhance transportation climate goals by reducing trip distances and frequency while strategic mass transit linkages can attract development and thus promote compact growth. Long-term growth plans in a number of OECD metropolitan areas aim to maximise such complementarities (e.g. Paris, New York, London). Important opportunities exist to develop and exploit adaptation and mitigation win-wins. For example, natural resource policies to increase vegetation and green space can reduce emissions and reduce the impacts of heat extremes and flooding (e.g. São Paulo’s development of linear parks along urban waterways). Within the transportation sector, policies to increase the quality and availability of public transport facilitate the application of policies to discourage or restrict personal vehicle travel (e.g. coupling congestion fees and bus service improvements in London). Energy efficiency standards for new buildings are well complemented by projects to retrofit existing buildings with energy efficiency technologies, with models including Berlin’s innovative model for contracting with private companies to meet efficiency targets and Toronto’s Mayor’s Tower Renewal programme.

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*Successful policies for compact cities rely on strategic urban plans.*

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Policies to increase the density of urban areas in the long term and manage outward expansion have gained popularity across many OECD countries, particularly in the Netherlands, United Kingdom and Japan, which has initiated an “Eco-Compact City” policy. While the higher residential densities targeted by these policies have the most direct effect on greenhouse gas emissions, transportation linkages – particularly between employment centres and residential zones – are crucial to ensuring that increases in density translate into reductions in personal vehicle use. Increasing the mix of land uses in urban

neighbourhoods also reduces travel distances between home, work, and activities and can also promote non-motorised travel. High quality urban services and amenities, including open space, are also crucial to the long-term attractiveness and effectiveness of compact cities' policies. Tools to assess costs and benefits and conduct cost-effectiveness planning also play a key role in strategic planning.

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*Long-term strategic planning needs to take into account interaction between urban development and vulnerabilities to climate change.*

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Cities and urban planning provide a key entry point to act on the adaptation agenda and reduce vulnerabilities. However, adaptation is made difficult by the fact that modifications to urban infrastructure and the built environment may be expensive, especially if not designed up front. Vulnerability to storm and hurricane risks can be reduced through spatial planning and land management, but land-use changes occur over decades and urban buildings typically last 50 to 100 years, if not longer. As a consequence, urban adaptation options often must be anticipated by at least decades to be effective. Vulnerability assessment models, developed by some cities (e.g. Washington DC, United States) are essential but they remain costly and require scientific expertise that may not be available to urban governments. Current adaptation efforts are challenged by the uncertainty about the nature of future climate change impacts, especially given that adaptation costs are immediate while benefits are delayed and based on present assumptions of climate impacts. Thus a risk management strategy that has both near and longer-term co-benefits is likely to be most attractive given inevitable resource constraints.

### **Integrating climate priorities into the urban policy-making process and improving inter-municipal and regional co-ordination can overcome barriers to effective local action**

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*Climate priorities still need to be integrated in each stage of the urban policy-making process: agenda setting, policy design, implementation and policy evaluation.*

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While city leaders have begun to incorporate climate change mitigation priorities into city policy agendas, driven by the social, environmental and economic potential benefits of action, urban-level adaptation strategies are rare and need greater attention. The policy design stage represents an opportunity to use cities' roles as enablers of non-governmental action to involve individuals and the private sector in climate policy design. However, urban climate policies are often developed outside of an integrated urban planning framework, thereby favouring short-term responses and hampering long-term systematic approaches, such as those designed to address sprawl. Key barriers to climate integrated policies are a lack of appropriate climate governance institutions or necessary authority, insufficient expertise, and a lack of funding or central government support. Relatively few urban climate policy evaluations have been conducted, and measuring progress remains a challenge for many cities, although innovative approaches such as the greenhouse gas "speedometer" (Newcastle, Australia) provide models for monitoring of city emissions.

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*When climate policies spill over city borders, inter-municipal action is needed.*

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In many cases, the administrative structure of urban climate policy governance does not fall precisely within cities' actual boundaries, so that carbon-relevant functions, economic interchanges, flows of materials and energy, and transportation between activities and households in the city's core area and localities overlap across multiple municipalities. The task of co-operation with other local governments is often made challenging by an absence of regulatory frameworks to guide inter-municipal initiatives. Metropolitan regions that provide models of successful climate policy co-ordination among municipalities (London, United Kingdom; Hanover, Germany; Portland, Oregon, United States) are endowed with an inter-municipal collaborative framework or benefit from technical infrastructure that transcends city borders.

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*Regional approaches to climate change mitigation and adaptation can broaden the impact of urban actions.*

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At the regional level, greater technical and financial capacity, and environmental know-how may exist than within individual cities or towns. Regions can also develop strategies that can link policies and programmes that would otherwise operate in isolation (e.g. connecting initiatives in urban and rural areas). By achieving levels of scale not possible at the local level, regional strategies have the potential to make larger reductions to greenhouse gas emissions. Thus, whereas an individual city might be able to think of ways to improve energy efficiency in housing within existing structures, at the regional level it may be possible to consider urban planning strategies that will result in not only more efficient housing designs and standards, but also consider where houses are built and their relationship to the regional environment. Regions can also come together to fund research and development (Eindhoven Region, the Netherlands) and enact infrastructural and technological changes necessary to "green" transportation structures and reduce emissions from transport through the introduction of low emission and alternative fuel vehicles (San Francisco Metropolitan Transport Commission).

## **Robust frameworks for multi-level governance and enabling national policies can advance climate action**

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*There is no "one-size-fits-all" framework for effective national-local co-ordination.*

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Successful co-ordination can be driven from the top by national or regional authorities, grow from the bottom up as local policy innovations provide models for regional or national action, or feature a hybrid of both approaches. Nationally led "top-down" approaches do best when they leave wide latitude for local authorities to shape policies on climate change to fit local contexts. "Bottom-up" frameworks allow for experimentation on models for urban climate action that regional or national governments can subsequently adopt or promote. They can provide urban climate policy knowledge and governance capacity that complement and may even exceed those of regional or national governments. Hybrid approaches, in which national



frameworks also include opportunities for local policy experimentation, may involve voluntary guidelines from national authorities towards cities or may include mechanisms for involving the private sector.

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*National governments play a key role in supporting and removing barriers to greater urban governance and enhancing cities' capacity to act on climate change issues.*

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They can empower local governments, leverage existing local policy experiments, accelerate policy responses and learning, foster resource mobilisation and help engage local stakeholders. Key roles include providing funding and technical assistance to cities and regions, such as in Finland and Sweden. Climate mandates in national urban and regional policies in Australia, Austria, Canada, the Czech Republic, France, Germany, Japan, Mexico and the United Kingdom, and in the Korean “Green New Deal”, can advance local climate action. Strong national targets for adaptation and GHG emissions reductions can help prevent regional competition based on environmental regulations and even promote a “race to the top” through incentives, such as Japan’s “Environment-Friendly Model City” award. Identifying national policies that conflict with or prevent local climate action, such as through a regulatory impact assessment process, is an important way national governments can improve their alignment with local climate policies.

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*National regional development frameworks need to more systematically integrate climate change policy goals.*

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Very few OECD countries are applying a “climate change lens” to the implementation of regional spatial or economic development policy framework. Instead, regional development policies are typically applied independently of national sectoral strategies to address climate change. Similarly, national climate change policies are being applied in many countries without regard to regional strengths and opportunities. Greater horizontal co-ordination between national regional development and national sectoral climate change policies is lacking in most countries. Japan, Korea and Sweden provide the best examples of cross-sectoral, holistic regional approaches to address climate change by national governments. Alignment of incentives across sectoral and cross-sectoral policy areas is required to deliver policy coherence.

## **Finance is an issue – greening local revenues and financing local green activities**

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*Climate change puts additional pressure on cities' budgets.*

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It calls for changes in urban infrastructure investments and thus will create new challenges for urban finance. Cities will need additional revenue sources to finance costly new transportation systems, service improvements, building retrofits and protections for the built environment. Cities are now responsible for a range of sectors that impact environmental sustainability and greenhouse gas emissions, sometimes as the sole authority, but more often in partnership with other levels of government. For example, local governments in OECD countries are

responsible for 70% of total public investment and amounts of public spending on environmental protection (which includes waste management, waste water management, pollution abatement, protection of biodiversity and landscapes, and research and development [R&D] on environmental protection), which is almost similar in amount to that of their respective national governments.

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*Local fiscal instruments and incentives at the disposal of cities could be “greened” to achieve urban sustainability goals, including climate change targets.*

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Local revenue sources are not neutral: their provenance, rates, exemptions and composition all impact the price citizens and firms pay for certain goods and services, such as urban transportation options, land development and housing. Currently, some sub-national taxes in certain countries promote sprawl. For example, compact housing options, such as multi-family rental housing in the United States, bear an effective tax rate that is considerably higher (18% in 2001) than the rate for single-family owner-occupied housing. Several cities in the world depend on land sales for a large part of their revenues, which also can create incentives for urban sprawl: the contribution of land sales to local revenue in Guangzhou (China) has been estimated to be 55% in 2006. There is room for greening sub-national taxes, especially those that have an impact on the city’s built environment, transport and energy, such as property taxes and transportation taxes.

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*Cities and metropolitan areas could make more use of fees and charges as instruments to influence behaviour and thus mitigate climate change.*

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As they confront users with the real costs of their choices, these instruments could reduce the inefficient use of resources and limit sprawl. For example the congestion charge, applied in a growing number of cities, has proved effective in reducing congestion and reducing CO<sub>2</sub> emissions from transport (emissions reductions between 10% and 20% in London, Stockholm and Milan). Development charges and value-capture taxes, such as used in Miami, Milan and Bogotá, could finance the construction of new infrastructure needed to serve new suburban developments, whereas transport-related revenue sources (fuel taxes, congestion charges, parking fees) could charge for the use of the infrastructure. Congestion charges will arguably be more appropriate for those cities whose parking fees are already high. Fiscal disincentives for car use will be more effective when alternative traffic solutions, such as public transport, are in place, which is why some metropolitan areas, such as London, use these types of revenues to finance public transit.

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*Urban areas should leverage existing financial instruments and explore complementary new instruments.*

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The budget pressures caused by climate change might require cities to exploit available financial instruments, e.g. increased access to capital markets or carbon finance

mechanisms. For example, increased access to capital markets could aid cities in seeking additional and complementary financing from carbon market mechanisms. Funding from the clean development mechanism (CDM) and the joint implementation mechanism – the two main Kyoto carbon offset instruments – currently provides a supplemental income stream through carbon offsets for projects that reduce cities’ carbon emissions, such as landfill gas utilisation. Other CDM opportunities for the urban sector could be explored, including easily attainable targets for urban greenhouse gas sources related to urban transportation planning, urban forestry, street lighting, and waste energy used for transportation purposes; however, the CDM mechanism may need to be re-tooled to facilitate urban access to it.

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*National governments could play a key role in greening urban finance.*

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Their role could involve re-designing sub-national taxes and grants to sub-national governments, especially those that have an impact on the city’s built environment, transport and energy. Re-design of sub-national taxation could include property tax reform to correct for biases towards unsustainable behaviour. For instance, property tax reform favouring compact development could be promoted through a split-rate property tax (Sydney; Hong Kong, China; Pittsburgh), differential taxation, a special area tax applied on suburban properties, or a set of cascading taxes that gradually increase as one moves away from the city centre towards the periphery (Austin). A relatively simple form of such a tax might be a higher standard property rate for suburban inhabitants or preferential rates for multiple dwellings (Denmark, Sweden). In addition, inter-governmental grants, such as those applied in Germany, Portugal and Brazil, could take environmental indicators into account to compensate local governments for the external benefits of their environmental expenditures. A comprehensive greening of urban finance would also increase the coherence between urban finance and urban planning frameworks to enhance urban sustainability and contain outward urban growth. Carbon taxes and climate change levies, although occasionally introduced at the local level (e.g. Boulder), may be more suitable instruments for the national or supra-national level rather than the city or regional level, as they could distort competition between regions.

**National governments will need to create a sound institutional foundation and knowledge base to help local decision makers engage stakeholders and identify and carry out cost-effective actions**

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*National governments have the opportunity to help cities fully engage the broad range of stakeholders and develop the relevant tools needed to address climate change.*

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Local and regional governments often are able to address problems within their jurisdictions by responding with solutions that are within their legal and financial authority. Yet, often local governments are not provided with sufficient support from intermediate and national levels of government to perform at their fullest or to implement what is expected of them. Working with sub-national and national governments, as well as with the international

community on the development of a number of tools could assist cities to be more effective. Relevant tools or support mechanisms include:

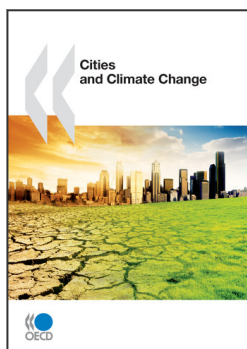
- **Harmonised greenhouse gas emission inventory and reporting protocols for cities** to allow them to monitor and compare progress in mitigating emissions, to assess cost-effectiveness of additional mitigation options and eventually to become active participants in international carbon markets.
- **Regional impact science and other policy relevant research programmes** to support the interface between expert information and local knowledge and promote local understanding of climate change risk and policy options – from assessment to management – for better mitigation and adaptation decision making.
- **Urban climate policy networks**, building on regular channels of communication among national planners and regional and local government officials as well as among local stakeholders and decision makers about targets, goals, strategies, and measures. An appropriate response to climate change needs to transcend a government-policy based approach to embrace governance mechanisms that harness the creativity and advice of civil society, from business and academia to community leaders. These are essential not only to enrich the policy development and implementation process but to optimise transparency in accountability and reporting.

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*A robust quantitative, evidence base is required to inform sound public policy development and implementation.*

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Climate change is becoming an increasingly important policy driver for regional and urban economic development policies. Currently, large information gaps remain related to inter-jurisdictional comparability, common indicators and metrics to measure progress. Front and centre is the need for an evidence base to enhance the ability to identify and diffuse best practices, not only at local scale but also in terms of how national and local government partners can work better together. Strengthening empirical evidence – including through improved local inventories of greenhouse gas emissions – will advance understanding about where climate change regional and urban development practices are performing well and why, and about how national policy frameworks enable or constrain performance at sub-national scales. Few cities worldwide have real knowledge of the impact of new development on their long-term fiscal condition. Introducing qualitative assessment in cost-benefit analyses – such as the performance-based planning approach in use in the San Francisco Bay Area, United States – can be challenging but an important input for decision making.



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