

A report to the UN Secretary-General from the UN Secretary General's Special Envoy for Cities and Climate Change, in partnership with the C40 Cities Climate Leadership Group

Advancing climate ambition: cities as partners in global climate action

Key findings

Cities can contribute significantly to bridging the global emissions gap – with emissions reduction potential of up to two-thirds the impact of recent national policies and actions:

urban actions could decrease global greenhouse gas (GHG) emissions by 3.7 GtCO₂e below what national actions are currently on track to achieve in 2030, and by 8.0 GtCO₂e in 2050.

Therefore, **cities are positioned to make meaningful contributions** towards more aggressive national targets to reduce emissions. This can be accomplished because mayors have strong influence over key policies that influence emissions, such as building energy standards, urban planning, and public transportation.

Because city actions are rarely captured in national goals and targets, cities can be great partners to nation states in meeting ambitious goals: realizing the full potential of urban

GHG emissions abatement opportunities requires bold and swift action by the world's cities, in partnership with nation states to identify and deploy new sources of finance and supportive national policy.

This analysis helps identify actions in each of the sectors where mayors have the greatest control and the most significant opportunities for urban GHG abatement. To realize this potential and help raise global ambition in the fight against climate change, this analysis identifies significant opportunities for mayors to act:

- Deep building energy efficiency standards for new urban buildings;
- Building energy retrofits for existing urban buildings;
- Aggressive energy performance standards for urban building lighting and appliances; and
- Mode shift and transit efficiency for urban residents

Cities can help bridge the emissions gap

Nations of the world have agreed to work towards limiting global warming to 2 degrees C above pre-industrial levels. In order to meet this goal they must deepen the ambition of emissions reduction pledges below those offered as part of the 2010 Cancun Agreements. Closing the “gap” between current emissions pledges and associated trajectories and those necessary to achieve the 2 degree target will require staying within a strict “carbon budget” – and cities have a critical role to play.

National emissions pledges and action plans have tended to focus primarily on measures that can be implemented across sectors or the economy, in particular those related to electricity production and industrial processes. **Their pledges and action plans have seldom considered or reflected the impact of urban climate actions.** Cities also have unique and strong influence over several policy levers – such as urban planning and public transportation – that may be less available to national actors.

The emissions impact of new city climate actions, therefore, can largely be considered **additional** to national emissions reductions pledges, both existing or under current consideration. Cities, therefore, can be true partners to nation states and the international community in bridging the



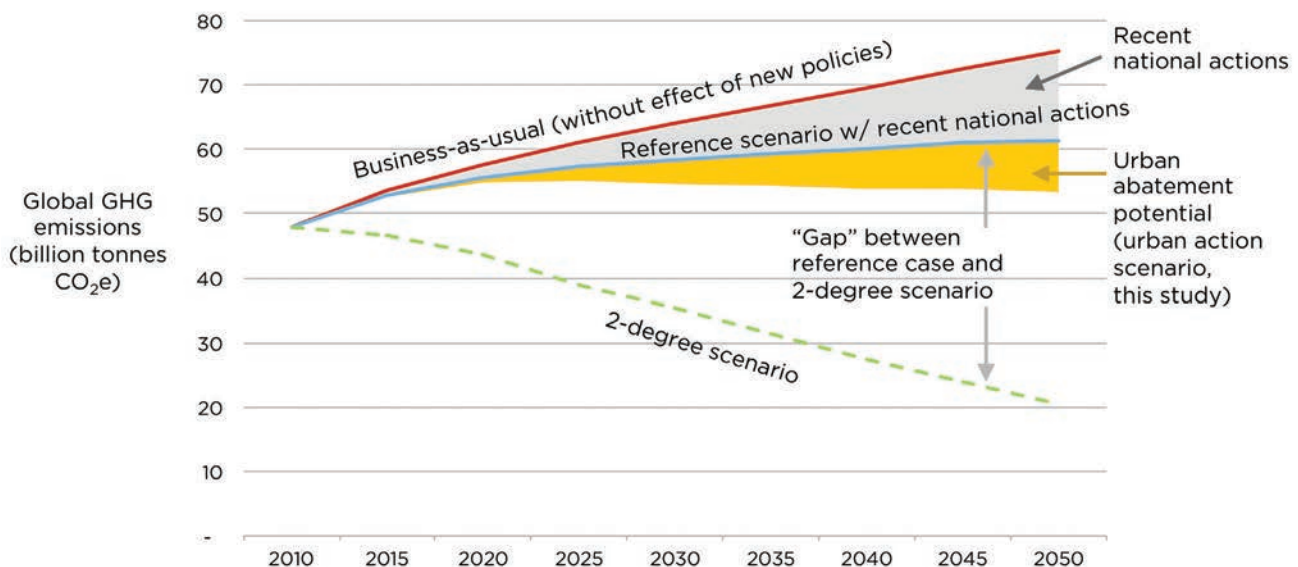
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global emissions gap through more ambitious and deeper GHG emissions targets.

This analysis quantifies the global GHG reduction potential of urban action over the next few decades. It covers the world’s entire urban population – rising from over 3.6 billion today to over 6.3 billion in 2050 – and details the potential of urban action in three core sectors: buildings, transport and waste.

We find that aggressive urban action could close the emissions “gap” (the difference between the blue and dotted green lines in Figure 1.) by at least 10% in 2030, and by approximately 15% in later years, as ongoing construction of compact, efficient urban infrastructure continues to yield dividends. This represents a reduction in global emissions of 3.7 GtCO₂e in 2030 and 8.0 GtCO₂e in 2050.

Figure 1. Urban action could help deepen the aggregate, global ambition of current national pledges¹



¹ Chart sources (other than this study): BAU and “reference scenario” differ only in their assessment of energy-related CO₂ emissions: BAU uses IEA’s GDS scenario, reference uses 4DS⁹; for other gases, both scenarios use the average of BAU scenarios in the IPCC AR5 scenario database, 2-degree pathway from Rogelj et al.

Sector focus: urban building energy

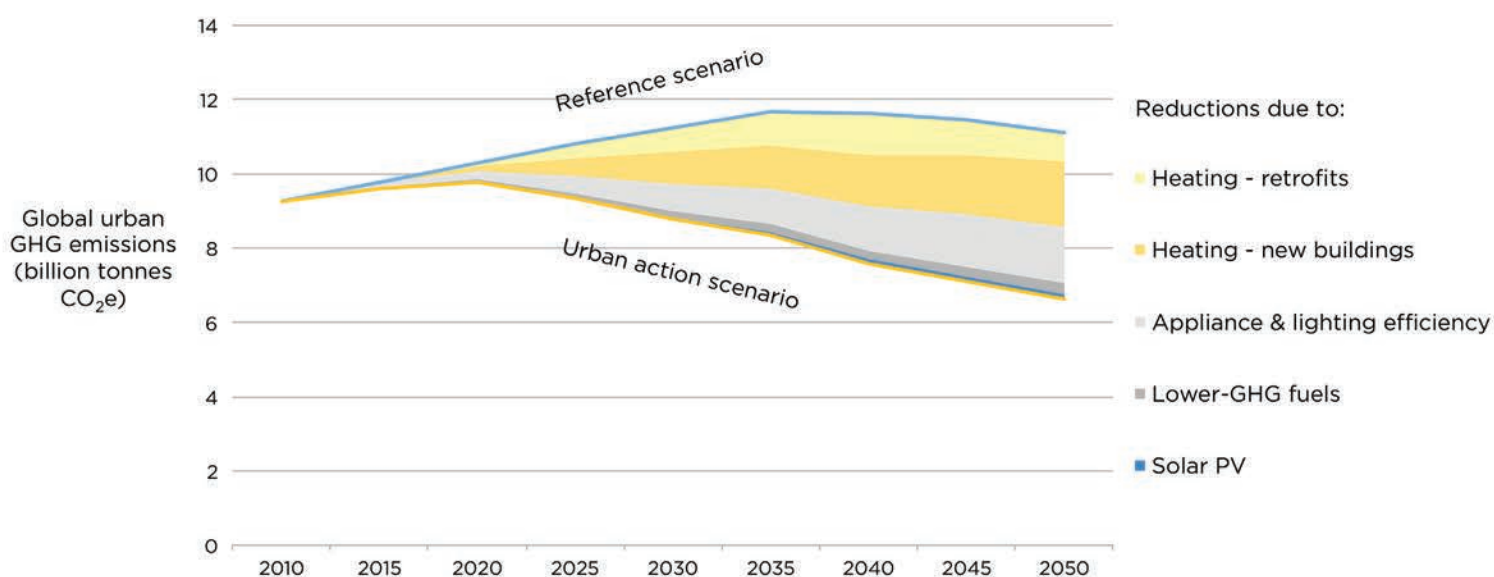
Globally, the greatest opportunity for mayors to reduce GHG emissions is in urban building energy use.

In the next few decades, urban buildings will be constructed at unprecedented rates. This is especially true in areas that are both rapidly urbanizing and experiencing large increases in standards of living. Constructing these buildings now to be highly energy efficient – e.g., down to “passive house” levels – can dramatically reduce energy costs to residents and GHG emissions. Buildings that already exist today, however,

will still comprise the majority of urban building stock for decades to come and, given their older construction, an even greater share of energy use. Building retrofits, therefore, are a central strategy to reduce urban building energy use.

Together, these reductions in heating energy, along with application of other technologies, such as rapid introduction of low-energy appliances and lighting (especially LED lighting) and increased installation of solar PV technologies on buildings and rooftops and facades, could reduce urban building GHG emissions by 2.4 GtCO₂e in 2030 and 4.5 GtCO₂e in 2050 (Figure 2).

Figure 2. Urban building emissions in the reference and urban action scenarios



Sector focus: urban transport

Planning for compact urban communities that support greater public transport is one of the most significant actions that mayors can take to decrease GHG emissions.

Personal travel demands are changing in many parts of the world, especially in rapidly growing and urbanizing China and India, where passenger travel is expected to double by 2030. City governments, especially those in developing countries, can increasingly plan compact, pedestrian and transit-oriented communities and slow the trend of increasing personal vehicle use.

Together, the changes in urban form and transport habits, along with more-efficient vehicle technologies, allow overall urban passenger transport emissions to peak and begin declining in urban areas within developing countries by 2050, and in urban areas within OECD countries decline by roughly half of current levels by 2030. The total reductions in personal urban transport GHG emissions amount to 0.9 GtCO₂e in 2030 and 2.3 GtCO₂e in 2050.

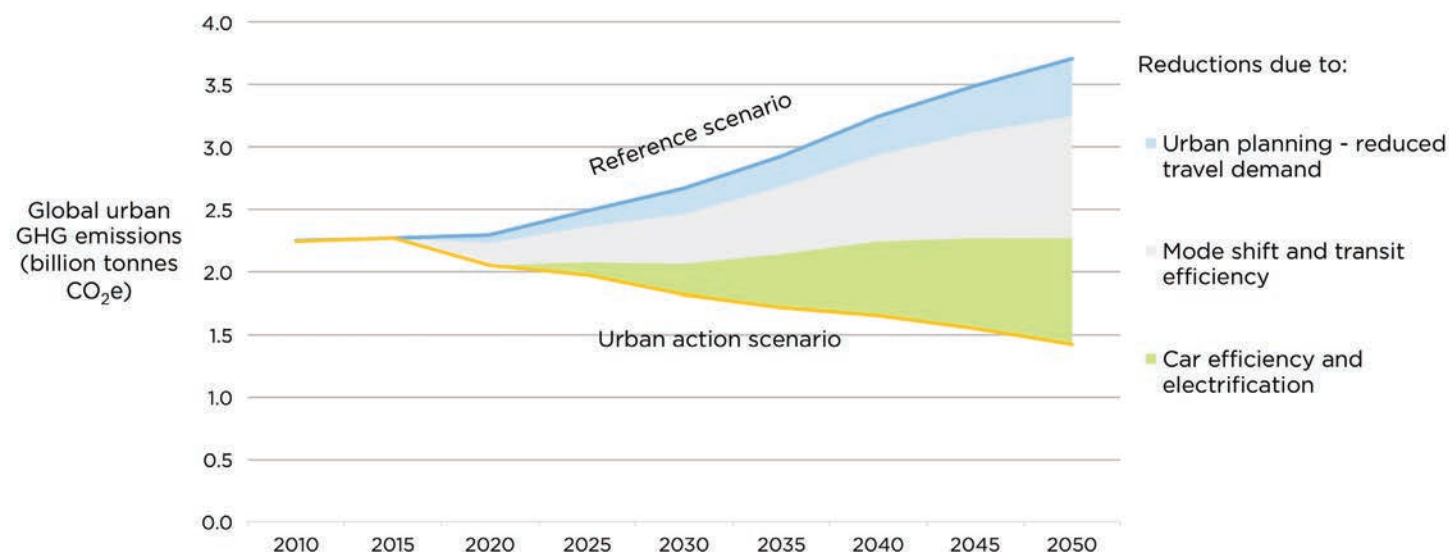


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Spotlight on C40 Cities:

Fifteen C40 cities have made public commitments to reduce their emissions by 80% by the year 2050 and other cities around the world are striving to do the same. Achieving deep emission cuts will require the fundamental redesign of many core urban systems, development of new technologies, and transformative leadership from the public, private, and nonprofit sectors in cities.

Figure 3. Urban passenger transportation emissions in the reference and urban action scenarios



Optimizing urban freight logistics – and vehicles – are critical actions for reducing “last leg” freight energy consumption.

Increasing global wealth is enabling higher consumption and, in turn, demanding ever-greater shipping of products. About one-quarter of an average product’s travel (as measured in tonne-kilometers) occurs in the final transportation

step – from producer to the final retailer or consumer. This “last leg” may be influenced by urban policy on roadways and vehicles.

Improvements in freight logistics and vehicle efficiency could reduce urban road freight GHG emissions by about 0.2 GtCO₂e in 2030 compared to a reference case and 0.6 GtCO₂e in 2050.

Sector focus: waste management

Recycling and landfill gas management remain critical strategies for reducing urban waste GHG emissions.

Rising global consumption levels are increasing demand for products and, in turn freight and waste management infrastructure. Cities can reduce GHG emissions associated with solid waste by increasing recycling and operating landfills with highly-effective methane collection systems (and, where possible, use that methane to create energy). Similar GHG reductions can also be achieved in some cases via systems to convert waste directly to energy, whether through combustion or other processes. In total, the urban action scenario sees waste collection, recycling, and methane capture rates increase to very high levels in all cities, leading to an elimination of (net) landfill GHG emissions and a total GHG emissions reduction of 0.2 GtCO₂e in 2030 and 0.6 GtCO₂e in 2050.

Increasing urban ambition

This research indicates that, in aggregate, aggressive urban actions have the potential to reduce GHG emissions by about 3.7 GtCO₂e in 2030, rising to approximately 8.0 GtCO₂e in 2050 (Figure 4, Table 1).

This analysis suggests that the most significant GHG abatement opportunities for cities (those that comprise at least 10% of the abatement potential) are related to deep building shell energy standards, building energy retrofits, appliance and lighting standards, and mode shift and transit efficiency for personal urban mobility (Table 1).

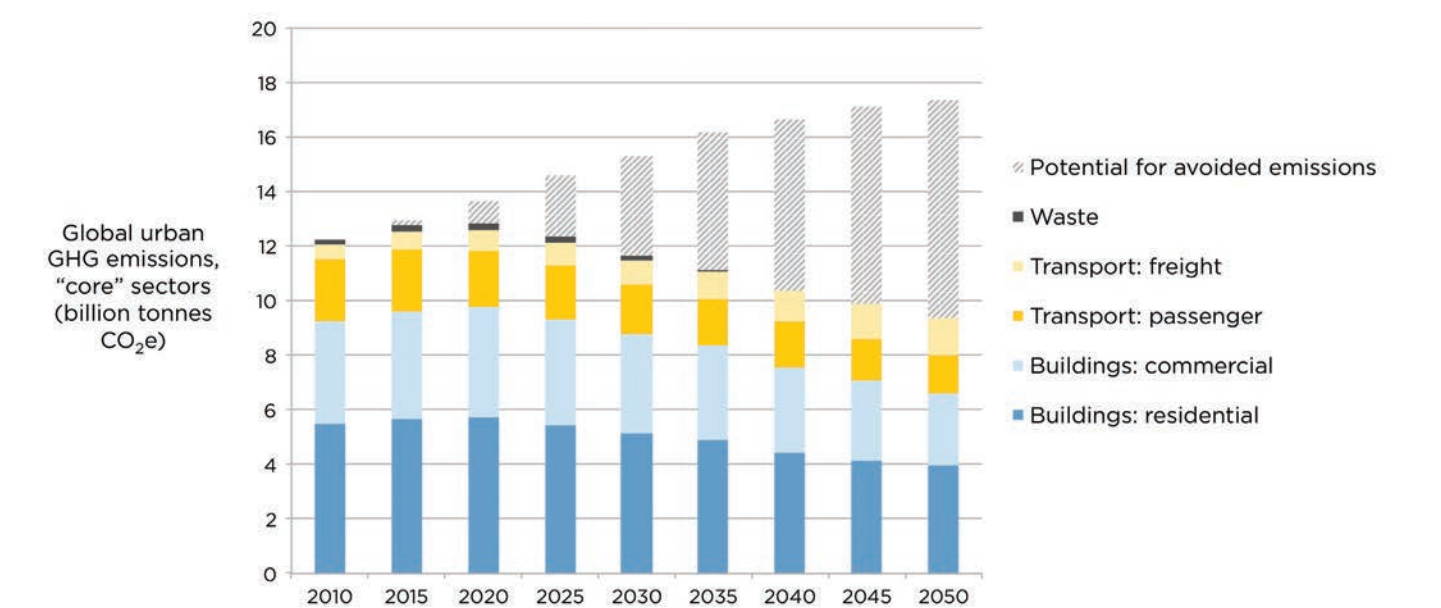
Cities are positioned to make meaningful contributions towards more aggressive national targets to reduce

Table 1. Urban abatement by sector in the *urban action* scenario, 2030 and 2050

Sector	Action	Abatement, GtCO ₂ e		Share of total Abatement, %	
		2030	2050	2030	2050
Buildings, residential	New building heating efficiency	0.6	1.2	16%	15%
	Heating retrofits	0.4	0.5	12%	7%
	Appliances and lighting	0.4	0.9	12%	11%
	Fuel switching / solar PV	0.1	0.2	3%	3%
Buildings, commercial	New building heating efficiency	0.3	0.5	7%	7%
	Heating retrofits	0.2	0.2	6%	3%
	Appliances and lighting	0.3	0.7	8%	8%
	Fuel switching / solar PV	0.1	0.2	3%	3%
	Subtotal, buildings	2.4	4.5		
Transport, passenger	Urban planning–reduced travel demand	0.2	0.5	5%	6%
	Mode shift and transit efficiency	0.4	1.0	11%	12%
	Car efficiency and electrification	0.2	0.9	7%	11%
Transport, freight	Logistics improvements	0.1	0.2	2%	3%
	Vehicle efficiency	0.1	0.3	3%	4%
	Subtotal, transport	1.0	2.9		
Waste	Recycling	0.2	0.3	4%	4%
	Landfill methane capture	0.0	0.3	0%	4%
	Subtotal, waste	0.2	0.6		
Total		3.7	8.0		

emissions. Realizing the full potential of GHG emissions abatement opportunities requires bold and swift action by the world’s cities, with new sources of finance and supportive national policy. Additionally, opportunities for cities to share best practices and lessons learned can play a role in driving action and improving implementation efforts through 2050.

Figure 4. GHG emissions and emissions avoided in the urban action scenario





Rooftop park, New York City, NY.

About this report

This analysis was conducted by Peter Erickson and Kevin Tempest of the Stockholm Environment Institute – US Centre, in support of the UN Secretary-General’s Special Envoy for Cities and Climate Change and C40. We thank John Dulac of the International Energy Agency, Lew Fulton of the Institute of Transportation Studies at the University of California (Davis), and Ksenia Petrichenko of the Global Buildings Performance Network for input on modeling assumptions and for other helpful comments on our methodology.

The C40 Cities Climate Leadership Group (C40) is a network of the world’s megacities taking action to reduce GHG emissions and climate risks. C40 cities work collaboratively to help each other achieve their respective goals. C40’s network model is working to spread and accelerate best practice, helping cities to have an even greater impact through the transfer of knowledge on proven climate solutions.

UN Secretary-General’s Special Envoy for Cities and Climate Change. Michael R. Bloomberg is an entrepreneur and philanthropist who served three terms as Mayor of New York City, from 2002 through 2013. In 2014, UN Secretary-General Ban Ki-moon appointed Bloomberg to be UN Special Envoy for Cities and Climate Change, where he is focusing on helping cities and countries set and achieve more ambitious goals for mitigating and adapting to climate change.

Stockholm Environment Institute (SEI) is an international nonprofit research organization that has been engaged in environment and development issues at the local, national, regional and global policy levels for more than 20 years. Its goal is to bring about change for sustainable development by bridging science and policy. SEI has seven centres worldwide, in Stockholm; Oxford and York, UK; the United States; Bangkok, Thailand; Nairobi, Kenya; and Tallinn, Estonia.

Analytical approach

The model is built upon a reference scenario of the future (through 2050) economy, energy patterns, and GHG emissions in the absence of aggressive urban climate action, but that considers recently adopted national policies, such as vehicle efficiency standards in China, the EU, and the US. The reference case draws heavily from the highly respected and widely used Energy Technology Perspectives series of the International Energy Agency, with consideration of additional, urban-focused research from a number of other institutions, including the Global Buildings Performance Network (GBPN) and the Institute for Transportation and Development Policy (ITDP).

The reference case is compared against an urban action scenario, that assumes the application of a set of aggressive technologies and practices to curb urban energy use and GHG emissions. Abatement potential is then calculated as the difference between the two scenarios.

Delineating between “urban” and “non-urban” climate actions is an enduring challenge for the research community. Some policies and measures, such as bus and metro systems and land use planning, are squarely (and uniquely) in the hands of cities and other local government partners. Some policies and measures, such as those directed at improving building energy efficiency, are implemented at both local and national levels, often with shared responsibility for achieving targets or standards. Others, like increasing vehicle efficiency, have historically been uniquely pursued largely at the national, state or provincial levels, though cities are increasingly adopting measures such as licensing incentives for higher efficiency vehicles. For the purposes of this analysis, “urban action” is any GHG emissions reduction associated with the following sectors:

- **urban passenger transport**, whether due to land use planning for compact urban form, expansion of public transit, measures to improve vehicle efficiency (including electrification), or transport demand and flow management (such as variable speed zones and better signal timing);
- **urban road freight transport**, due to better urban freight logistics management, and measures to increase urban road freight vehicle efficiency;
- **urban building energy use**, due to building energy codes, standards, and retrofit programs or requirements, including for lighting and appliances, as well as provision of district energy or incentives for solar PV, in both residential and commercial buildings; and
- **urban waste management**, due to increasing waste collection, recycling, and landfill management for methane capture.

Urban policymakers have unique and strong influence to implement the policies and measures in these core sectors, even as national policies may complement or support local action. For further information, including a working paper that further details the methodology and findings, please go to www.C40.org/research and www.mike-bloomberg.com/unenvoy.