

CDP Cities 2011 Global Report on C40 Cities



Report written for
Carbon Disclosure Project by:



cutting through complexity™



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Foreword



Michael Bloomberg

Mayor of New York City and Chair of the C40 Cities
Climate Leadership Group (C40)

Throughout my career as a businessman, mayor and now chair of the C40, I have learned the critical connection between good data and good decisions: if you can't measure it, you can't manage it. That's true in business, and it's true in government. Only by regularly and rigorously measuring and analyzing our efforts can we learn what works, what doesn't, and take effective action.

The data in this report has been compiled from a voluntary disclosure process in which C40 cities reported standardized information about their climate impact and associated plans for action. Aside from limited academic studies, no systematic reporting of carbon emissions currently exists across the large cities of the world. It is the first of its kind, and more than a symbolic gesture...

This candid report establishes an invaluable baseline of information for future actions that can be taken locally, but have a global impact. This transparency will give people everywhere confidence that cities – the level of government closest to the majority of people on the earth – have the foresight and courage to confront the greatest challenge that humanity has ever created for itself.

For the first time in history, half of the world's people live in cities and together are responsible for more than 70 percent of the world's greenhouse gas production. Collectively, the C40 cities account for approximately 21 percent of the global Gross Domestic Product. Roughly 12 percent of the world's carbon emissions are produced in our metropolitan areas. And nearly one of every 12 people on Earth lives in or near our cities' limits.

Granted there is no single solution for confronting global climate change. Still, the best scientific data tells us that it is long past time to address this challenge, and that cities must lead the way. This report represents a critical first step in our leadership – as individual Mayors and as a collective - towards a common, sustainable future.

A handwritten signature of Michael R. Bloomberg in black ink.

Foreword



Paul Dickinson

Executive Chairman, CDP

The Carbon Disclosure Project (CDP)—together with our partner C40—is proud to bring to publication this landmark report on greenhouse gas measurement, management, and adaptation to climate change in the world’s largest cities. This report is not just another assessment of climate change and urban areas. Rather, it is unique—all of the data in these pages is self-reported by city governments. Forty-two C40 cities and six voluntary cities around the world have taken the time to measure dozens of climate change related-metrics and report them to the world.

Why is self-reported data important? For the last ten years, our not-for-profit organization, CDP, has provided a reporting platform for the world’s largest companies. These companies measure, assess, and analyze their climate change-related data every year in preparation for their annual report to CDP. Last year, 410 of the world’s largest 500 companies reported to CDP. Many of these companies have told CDP that this process has helped them to better understand their businesses. Because they measure, they are able to manage. And management of carbon and other climate change-related metrics has led to benefits for many companies. In the words of Andy Green, CEO of Logica, “We have used CDP as the main tool to drive carbon reporting right across our organization. It has been really fantastic for us. We’ve discovered cost savings, and we have probably saved 10 million pounds in various ways.”

The connection between measurement and management is no less clear for city governments. As concentrations of people, businesses, and wealth, cities are both large emitters of greenhouse gas emissions and highly vulnerable to the potential physical effects of climate change. With the right processes in place, local governments, just like corporations, can gain strategic insight into their operations and reduce their exposure to climate change through assessment of climate risk. Through public disclosure, cities share their methodologies and insights as they create transparent, climate-safe places in which to live and work.

Our partner in this first year, the C40, has done as much as any organization to highlight the importance of city governments in the fight against climate change and empower them to act. Under the leadership of Mayor Bloomberg, the C40 provides an inspiring leadership example for urban areas around the world. We are also indebted to our lead sponsors, Autodesk and Jones Lang LaSalle, for their expertise and guidance over the last year.

We at CDP are delighted to welcome C40 cities to the world’s largest climate change reporting platform.

A handwritten signature in black ink, appearing to read 'P. Dickinson', written in a cursive style.

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Executive Summary

Introduction

CDP and C40 joined together in 2010 to extend CDP's proven reporting platform to the C40 Climate Leadership Group—a network of the world's largest mega-cities around the world dedicated to climate change leadership. CDP Cities builds on the last 10 years of CDP's work collecting climate change-related data in a standardized way and making it available to the global marketplace.

City governments sit at a critical climate change nexus. They are responsible for large amounts of greenhouse gas (GHG). Their populations and infrastructure are immensely vulnerable to the damaging effects of warming temperatures, sea level rise, and increased occurrences of catastrophic storm events. And they are often well-positioned to act quickly and convincingly due to their governmental structures and deep understanding of the complexity of local conditions. As such, a number of cities have pioneered extraordinary approaches to GHG reduction and climate resilience. The CDP process provides a common framework for cities to report publicly on their GHG emissions and climate change risks, how they are measuring them, and how they are tackling the challenges presented by a changing climate.

This report, prepared by KPMG, analyzes the responses from C40 cities to the CDP Cities 2011 information request.

Methodology

In November 2010, through a partnership between C40 and CDP, New York Mayor and C40 Chair Michael Bloomberg invited the C40 cities (40 participating cities and 18 affiliate cities) to report their climate change-related data to CDP by filling in the answers to an online questionnaire. 42 cities answered our call.

Throughout this report, most response rates reflect the full number of disclosing cities (42). However, due to the nature of the information request — not all cities had the opportunity to answer all of the questions — we present some statistics out of the number of cities who answered a particular question. Tables and charts clearly indicate the sample size used for evaluation.

The CDP questionnaire covered 4 main areas: governance, greenhouse gas emissions, adaptation, and strategy. CDP offered cities the chance to report 2 separate emissions inventories — 1 for the emissions from their city government (also known as “local government” or “municipal”) operations, and also 1 for the emissions from their entire city (often referred to as “community” or “citywide” emissions). The questionnaire was entirely voluntary, and cities were not scored. Cities had the opportunity to make their response available to the public or keep it private solely for use by CDP and C40.

6 non-C40 cities also participated in the first year of the CDP Cities program, choosing to voluntarily report climate change-related data to CDP. These cities are included in this report in the Voluntary Cities section; we have separated them from C40 cities for analytical purposes.

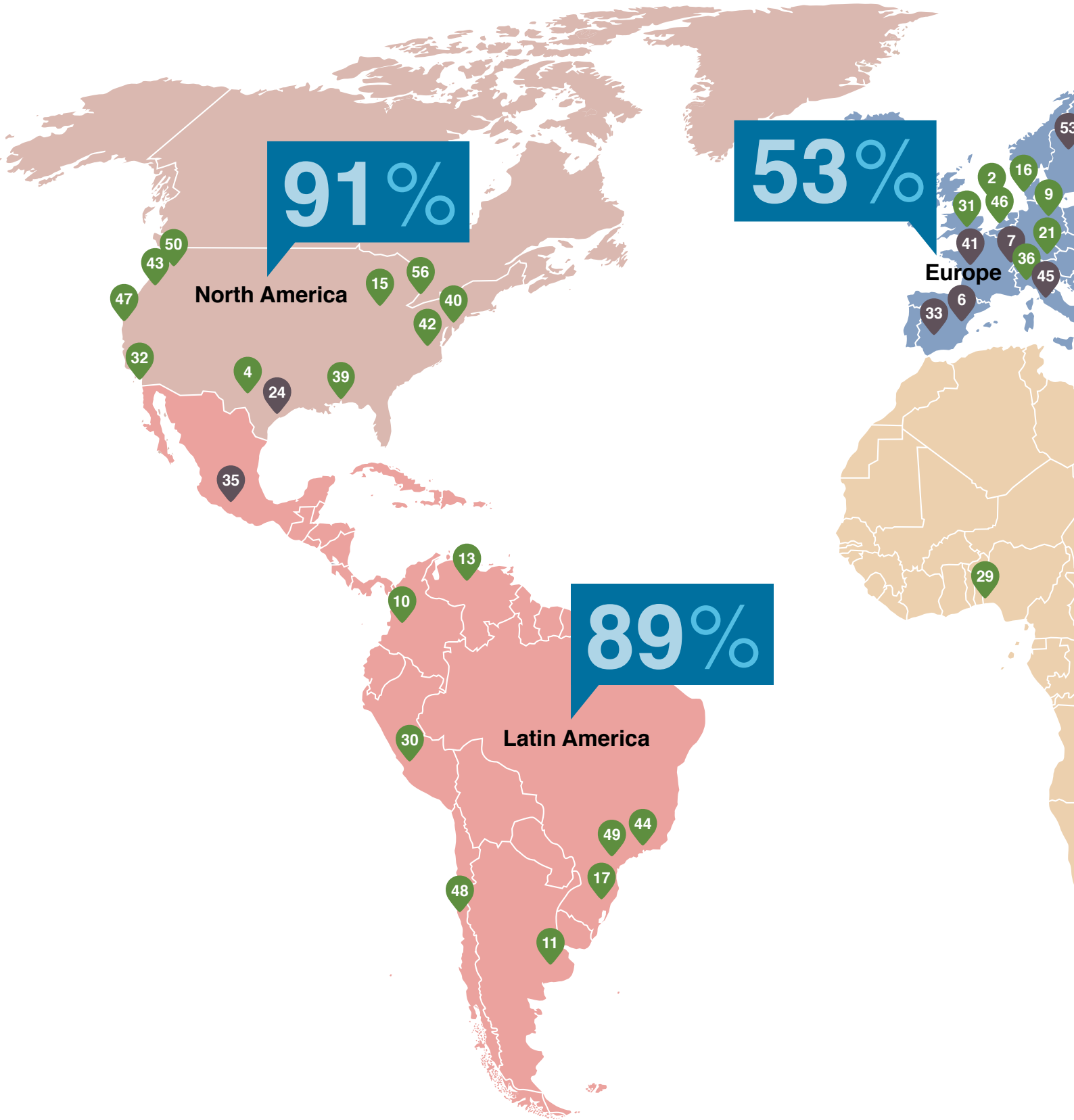
Highlights from 2011 disclosure

- **C40 cities show extraordinary awareness and commitment on climate change issues.** An impressive 42 out of 58 cities responded to CDP this year, a 72 percent response rate. 38 cities made their responses available to the public. Such high rates are unusual in what is for many cities the first year of reporting and demonstrate clear leadership by C40 cities.
- **Responsibility for climate change sits at the highest level in C40**

cities. Nearly every responding city reports the involvement of their senior leadership in taking responsibility for climate change. Many cities also make special note of their efforts to engage local citizens, businesses, and other stakeholders in climate change-related decisions.

- **Large city governments are keeping pace with major corporations on greenhouse gas measurement and disclosure.** 2 out of every 3 responding cities measure and report their GHG emissions, a number just slightly lower than the equivalent metric for the Global 500, the largest 500 companies in the world.
- **Climate change risks to cities are serious and immediate.** Over 90 percent of disclosing cities identify themselves as at risk due to climate change. And a further 43 percent report that they are already dealing with the effects of climate change in their areas.
- **Businesses in major cities could be at risk due to warming temperatures.** 79 percent of cities report that climate change could affect the ability of businesses to operate successfully in their cities. As cities grow and the climate changes, maintaining safe, resilient environments for people and businesses will be increasingly important.
- **C40 cities report city-wide GHG emissions totaling 609.5 million* metric tons CO₂-e.** This figure is equivalent to the total emissions from a country like Canada.
- **Voluntary cities lead the way among non-C40 cities in reporting their climate change-related data.** 6 non-C40 cities participated in the CDP process this year, joining the world's largest cities in standardized, international climate change reporting.

* Note this figure has changed from a previous version of the report due to an amendment to a city's response. This version is updated as of June 10 2011



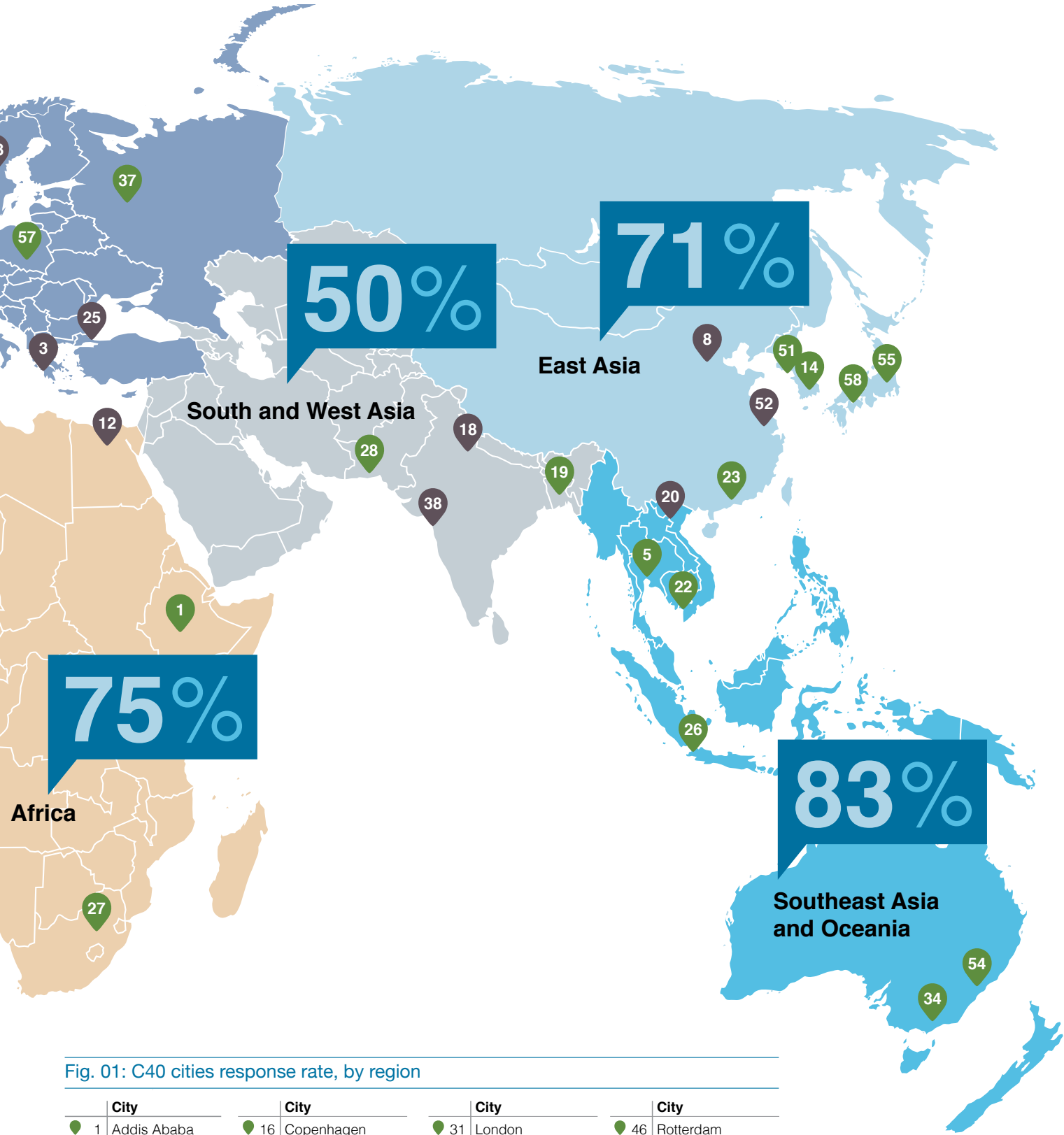


Fig. 01: C40 cities response rate, by region

City	City	City	City
1 Addis Ababa	16 Copenhagen	31 London	46 Rotterdam
2 Amsterdam*	17 Curitiba	32 Los Angeles	47 San Francisco*
3 Athens	18 Delhi	33 Madrid	48 Santiago de Chile*
4 Austin	19 Dhaka	34 Melbourne	49 São Paulo
5 Bangkok	20 Hanoi	35 Mexico City	50 Seattle
6 Barcelona	21 Heidelberg	36 Milan	51 Seoul
7 Basel	22 Ho Chi Minh*	37 Moscow	52 Shanghai
8 Beijing	23 Hong Kong	38 Mumbai	53 Stockholm
9 Berlin	24 Houston	39 New Orleans	54 Sydney
10 Bogota	25 Istanbul	40 New York	55 Tokyo
11 Buenos Aires	26 Jakarta	41 Paris	56 Toronto
12 Cairo	27 Johannesburg	42 Philadelphia	57 Warsaw
13 Caracas	28 Karachi	43 Portland	58 Yokohama
14 Changwon	29 Lagos	44 Rio de Janeiro	
15 Chicago	30 Lima	45 Rome	

- disclosing city
- non-disclosing city
- 71% percentage of disclosing cities
- *Cities which reported privately

1

Governance and Planning

“The Mayor and the council members are responsible to ensure that climate change implementation mandate is achieved. Climate Change issues are discussed in the Sub- Mayoral Committee on Climate Change.”

Johannesburg

“São Paulo created the ‘Climate Change and Eco-Economy Committee’, represented by public and private stakeholders and directly linked to senior Secretaries to the Mayor.”

São Paulo

City governments’ capacity to implement climate change policies and action plans is closely linked to policy-making structures. A mayor with direct financial or political control over areas like transport, waste, and green space can more easily take action to reduce GHG emissions. But a city’s capacity for action is also related to the governance and oversight functions that are embedded within the city. Like major corporations, cities can benefit from establishing robust, transparent governance structures. High-level leadership from the mayor, for instance, combined with wide support from citizens and local businesses can enable cities to tackle climate change aggressively.

Responsibility for climate change sits at the highest level in C40 cities

With only a few exceptions, climate change is an issue directed by the most senior leadership in C40 cities. 93 percent (39) of disclosing cities state that overall responsibility for climate change sits at the top level (Governor, Mayor, city manager, or other chief executive of the city). To demonstrate their commitment, many cities have set targets for GHG

reductions, in some cases more ambitious than national commitments and, for many, in the absence of national commitments.

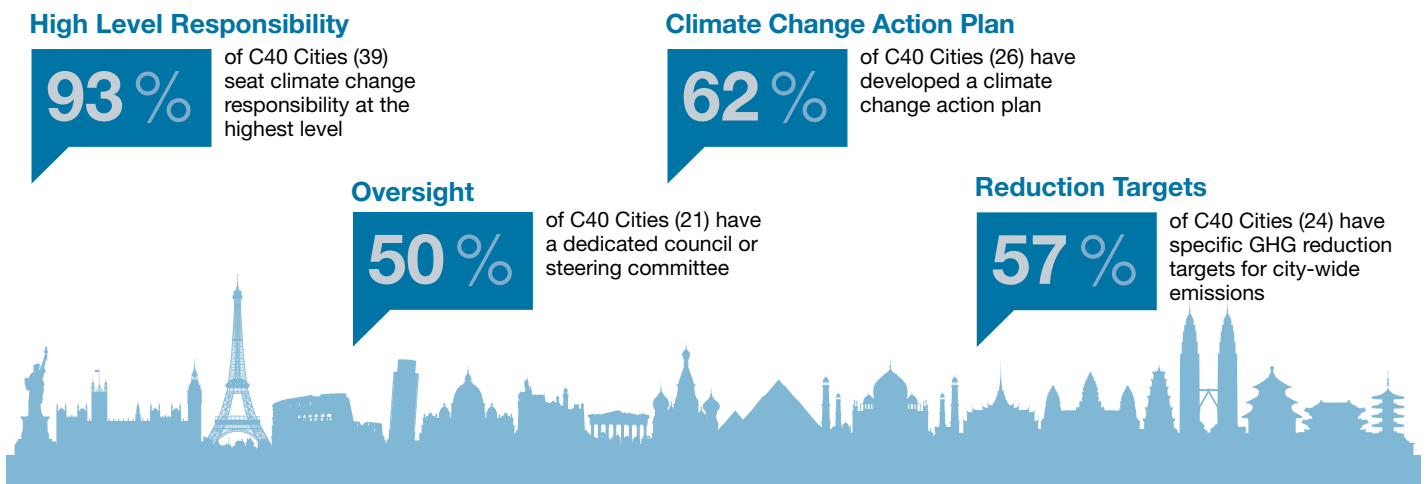
Many cities are turning to dedicated councils or steering committees for oversight of climate action

1 out of every 2 disclosing cities has created a special unit within the mayoral office responsible for the management and execution of energy and climate policy.

Some cities collaborate with stakeholders (science, business, community) in local governance and programming

An encouraging trend among C40 cities is the involvement of stakeholders in identifying, developing and implementing local solutions. 36 percent (15) of disclosing cities include some combination of local citizens, businesses, and academic experts in decision-making processes related to climate change mitigation. C40 cities are showing that it is not just city governments who must take responsibility for creating sustainable cities, but a wide cross-section of society.

Fig. 02: Emerging practices from C40 Cities in climate change governance



“BMA has set up the Steering Committee for Global Warming and 5 Working Groups to review progress and manage overall responsibility for climate change.”

Bangkok

“Recognition serves as an incentive. CCAP seeks to provide recognition through incorporating green initiatives into presentations to the Green Steering Committee (GSC) at the Executive department level, thus recognizing the efforts of project managers.”

Chicago

“The city has a financial program of rewarding public workers for achieving their targets. The reduction of greenhouse gases emissions is one of the targets and the Environment Department is rewarded if the targets are achieved.”

Rio de Janeiro

Information sharing with national governments is important to C40 cities

16 cities report to the national government on GHG emissions in some way or another. For city governments operations emissions more than 1 in every 3 cities (38 percent) reports to the national government, compared to 1 in every 4 cities (27 percent) for community emissions.

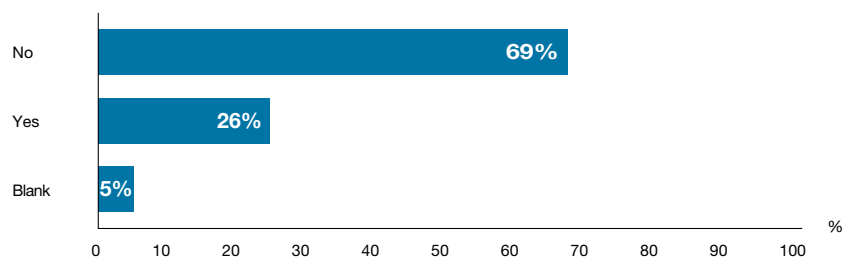
A small but significant number of C40 cities are incentivizing employees for management of climate change

Over the last 10 years in the private sector a steadily increasing number of corporations have reported using

incentives to reward climate-friendly staff behavior. In 2010, 64 percent of Global 500 companies responding to CDP’s annual request reported that they incentivize their employees for management of climate change issues.¹ The CDP Cities’ results show that an emerging number of C40 cities are thinking along similar lines. Some 26 percent (11) of responding cities provide incentives for individual or departmental management of climate change issues, including the attainment of GHG reduction targets. Types of incentives include monetary reward (6 cities), recognition (6) and / or prizes (5).

Fig. 03: Incentivizing climate change management

Percentage of cities with incentives in place



Type of incentives



¹ CDP Global 500 Report (*Figure is out of 410 responding companies)

Fig. 04: Governance across regions

City	Region	City-wide targets	Actions	Governance
Chicago	North America	To reduce GHG emissions by 25percent by 2020 and 80 percent by 2050	"... launched the Chicago Climate Action Plan (CCAP) in September 2008 – a roadmap of five strategies with 35 actions to reduce greenhouse gas (GHG) emissions and adapt to changes."	"...CCAP has been held accountable primarily by the Green Ribbon Committee (GRC), a group of business and community leaders who are appointed by the Mayor. The GRC reviews performance against CCAP goals and recommends revisions, adjustments and improvements. GRC releases an annual letter of recommendations to the Mayor and regularly convenes private sector actors to showcase CCAP progress to date, energize the community and highlight the continuing importance of effective action."
Rotterdam	Europe	To reduce GHG emissions by 50 percent by 2025	"The aim of the RCI (Rotterdam Climate Initiative) is to achieve a 50 percent reduction of CO ₂ emissions in 2025 with respect to 1990, prepare for climate change, and promote the Rotterdam economy. The RCI offers a platform for government, organizations, companies and citizens to work together on these goals."	"The deputy mayor(elder) responsible for this program has delegated the day to day governance to a city official who is Director Sustainability. She provides an official progress report three times per year to the city government about the progress of the projects."
Seoul	East Asia	To reduce GHG emissions by 40 percent by 2030	"...is actively addressing climate change issues through projects such as establishment of climate monitoring system; development of Seoul climate & energy map; development of GHG inventory; and launch of Seoul Emission Trading System."	"Under the Environmental Protection Headquarters, there is Climate Change and Air Quality Division, a dedicated division to address climate change issues in Seoul where professional staffs from relevant fields are developing and implementing climate change related measures such as mitigation and adaptation policies to encourage more participation from the citizens and the businesses. To review its progress, Seoul evaluates project analysis annually and establishes plans for the future... Based on the GHG database from the inventory and greenhouse gas management system, Seoul plans to integrate management of annual reductions."
Johannesburg	Africa	Not disclosed	"Climate Change Programmes are reviewed every quarter as part of the Environmental Departmental Balance Scorecard. Climate Change issues are discussed in Sub Mayoral Committee on Climate Change. The Executive Director Environment ensures that Air Quality and Climate Change Directorate implement the climate change programmes."	"The Municipal Manager is a Chief Administration Officer who oversees the implementation of the Council resolutions with regard to climate change. The Head of Department (HoD) of Environment ensures the operational implementation of the climate change decisions as recommended by the council."
Sydney	Southeast Asia and Oceania	To reduce GHG emissions by 20 percent by 2012 and 70 percent by 2030 below 2006 levels	"Sydney has set up Sustainable Sydney 2030 which provides a long term strategic vision of Sydney as Green, Global Connected. It suggests 5 Big Moves to make Sydney more sustainable, vibrant and successful."	"In 2007, the City of Sydney asked residents and businesses what they wanted to see happen over the next 20 years and beyond. The result is a collective vision for Sydney's sustainable development, called Sustainable Sydney 2030, which will make Sydney a green, global and connected city."
São Paulo	Latin America	To reduce GHG emissions by 30 percent by 2012 below 2005 levels	"The City of São Paulo created the first comprehensive Climate Bill in Brazil and is under final discussions for creating its guidelines for a Climate Change Action Plan. One of the actions involves 100 percent use of renewable fuel in public transportation."	"The City of São Paulo has created the 'Climate Change and Eco-Economy Committee', comprised of both public and private stakeholders. Actively involving citizens and businesses in decision-making processes can encourage and motivate them to change their behavior and attitudes – ultimately making the job of the city government much easier."

Fig. 05: Master plan, by city

Region	City	How GHG reduction is incorporated into master plan	City highlights
Africa	Addis Ababa	Green areas	"Our City master plan of city mandates 39% of the total area for greenery."
Africa	Lagos	Buildings & Green areas	"Before approvals are granted for development 40% of the land area must be reserved for greening,"
East Asia	Changwon	Buildings & Transport	"...to reduce emissions from households and commercial buildings we implemented various measures to enhance public awareness about climate change such as public education and carbon point system."
East Asia	Seoul	Buildings, Transport, Energy saving, Increase share of renewable energy sources (RES) & Waste	"...planning to realize all-around green innovation ranging from building, urban planning and transportation to daily life by 2030 to become a city with world-leading green competitiveness."
East Asia	Tokyo	Energy saving	"...promotion of the '10-Year Project for a Carbon-Minus Tokyo' which includes the most advanced energy-saving measures in the world."
East Asia	Yokohama	Buildings, Transport & Energy saving	"...the Smart City Project, which will introduce 2,000 units of EV and House Energy Management Systems to 4,000 households by 2014."
Europe	Copenhagen	Buildings, Transport, Increase share of RES & Green areas	"...localizing public institutions with many visitors and work places close to public transportation."
Europe	Heidelberg	Energy saving & Increase share of RES	"Energy reduction and efficient and renewable energy supply are integral part of all city development plans."
Europe	London	Buildings, Energy saving & Increase share of RES	"...strategic planning policy seeks to reduce CO ₂ emissions in new development proposals, support retrofitting initiatives, and promote the use of RES technologies."
Europe	Milan	Buildings, Transport & Energy saving	"...enhancing energy efficiency (over current regulations) and plans new infrastructures of public transport related to the Urban Development Areas."
Europe	Rotterdam	Energy saving	"In (re)developing city areas, energy is a major aspect in design."
Europe	Warsaw	Energy saving & Increase share of RES	"...goals connected with improving energy efficiency and introducing renewable energies."
North America	Los Angeles	Buildings, Transport & Green areas	"Promoting higher density housing in areas close to transportation stops is an important component of the City's General Plan."
North America	Portland	Transport	"In our new plan we will continue to incorporate goals and policies to achieve a 50% reduction in emissions by 2035."
North America	New Orleans	Energy saving	"City wide master plan incorporates the GreeNOLA strategy as its method for energy reduction."
North America	Philadelphia	Buildings, Transport, Energy saving & Green areas	"Reduce VMT, increase % non-auto trips, encourage mixed-use development, support energy conservation in buildings, increase tree cover and support alternative energy."
North America	Portland	Transport	"In our new plan we will continue to incorporate goals and policies to achieve a 50% reduction in emissions by 2035."
North America	Seattle	Buildings	"Seattle's Comprehensive Plan has a section on climate change and includes the City's greenhouse gas reductions goals..." "...to achieve greenhouse gas reduction goals, should reduce fossil-fuel consumption in construction of existing and new City-owned buildings..."
Southeast Asia and Oceania	Bangkok	Buildings, Transport, Green areas & Waste	To reduce GHG emissions by 15% targets apply to "Expand Mass Transit and Improve Traffic Systems" ... "Improve Building Energy Consumption Efficiency" and "Expand Green Areas in Bangkok Metropolitan Region"
Southeast Asia and Oceania	Jakarta	Transport, Energy saving & Waste	"30% reduction in GHG by 2030 across all relevant sectors (energy, waste, transport, etc)...Formulate the Road Map of 30% reduction each potential sector"
Southeast Asia and Oceania	Melbourne	Resilience measures	"...planning process for precinct structure plans has incorporated consideration of future needs for sustainable infrastructure."
Southeast Asia and Oceania	Sydney	Energy saving, Increase share of RES & Waste	"...plan is being developed for Trigenation, Renewable Energy, and Advanced Waste Treatment."

“The planning process for precinct structure plans has incorporated consideration of future needs for sustainable infrastructure. This has been considered against the environmental targets (or Eco City Goals) set for the city in the Future Melbourne community plan. To date, the Southbank Structure Plan has been completed and structure plans for other precincts are being completed.”

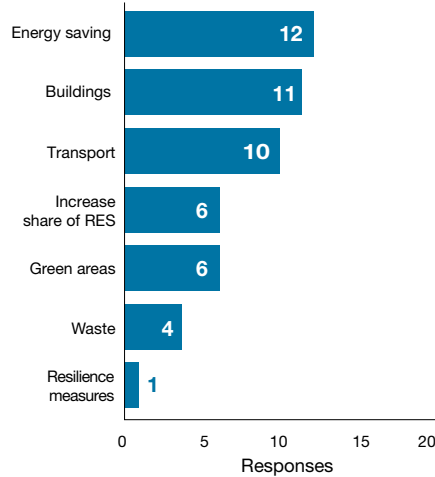
Melbourne

Cities are incorporating GHG reduction into master planning for long-term results

25 cities separately provide data on projected population growth by 2025, and the majority of responding cities report an expected positive increase. The cities of Dhaka, Lagos, Jakarta and Caracas are rapidly expanding with each projecting growth of over 2 million inhabitants by 2025. Integrating master planning with a strategy for low carbon growth can help cities to manage interconnected social, environmental and economic challenges in order to shape their long-term future.

The results of the survey highlight a trend towards the inclusion of GHG

Fig. 06: Categorization of greenhouse gas reduction measures incorporated into master plans



Number of responding cities (42)

emissions reduction into master planning. 69 percent (29) of disclosing cities are incorporating GHG reductions into master planning.

The data also shows that this trend is not simply a developed-world phenomenon. 100 percent (3) of disclosing African cities incorporate GHG reduction measures into master planning. Mega cities of Asia and Latin America report strong efforts to incorporate GHG reduction into planning. Like Melbourne, many C40 cities are beginning to consider climate resilience in their urban planning processes – a trend which we could see rise as cities gain more awareness about the risks from climate change.

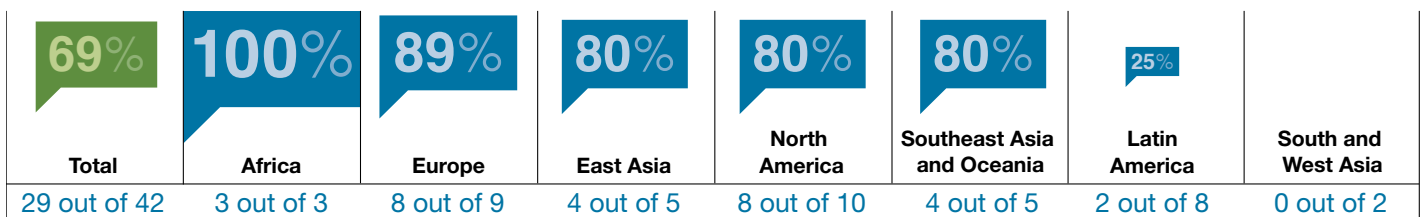
“The city legal master plan demands that climate change and its effects has to be in scope of urban planning and development.”

Rio de Janeiro

“Berlin established a high-ranking climate protection council in 2007, consisting of 16 climate experts. Their task is to advise the Senator for Health, the Environment and Consumer Protection, in all issues concerning climate protection, especially climate impact research and the adaptation of climate impacts.”

Berlin

Fig. 07: Cities that incorporate reduction targets into master planning, by region



...% as regional percentage

Pockets of C40 cities are benefiting from using digital information to manage climate change

CDP asked cities to describe the ways in which they are using digital data for sustainability planning or urban design. 37 cities responded to this question with 12 reporting that they require digital models or digital plans for infrastructure development to be submitted to the city government for planning or permitting purposes.

The results demonstrate widespread interest spread evenly across regions and suggests a large opportunity for city governments and businesses in the immediate future in both highly developed and emerging economies.

“Bangkok requires digital infrastructure data for urban design to develop an information system for city management (360 degree), integrated with GIS map.”

Bangkok

“Through GIS the planning institute develops all the plans for the development of infrastructure in the city.”

Curitiba

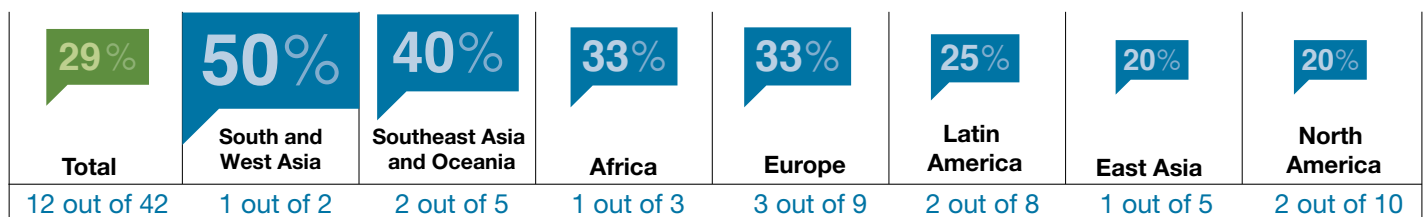
The value of digital data to cities

With global internet adoption growing at triple digit rates over the past 10 years and mobile phone penetration approaching 80 percent, citizens of the world’s cities are nearing a condition of being continuously connected. Healthcare, banking, and communication services offer online tools today that allow immediate access to personal information from anywhere, empowering users to feel more in control of their personal life and building expectations for similar visibility into public and civic life. The performance of future governments to provide timely access to information and decision making for citizens will be measured in days and hours, not weeks or months. The availability of digital data for managing, planning and designing change in the urban environment is the primary vehicle for cities to deliver timely communication and approval processes while meeting public safety, environmental, budget, and aesthetic project goals.

Paul McRoberts,
Vice President,
Infrastructure Product Line Group,
AEC solutions, Autodesk

Chris Andrews,
Senior Product Manager,
Infrastructure Product Line Group,
AEC Solutions, Autodesk

Fig. 08: Cities that require digital plans/models to be submitted for planning or permitting, by region



...% as regional percentage

2

Greenhouse Gas Measurement and Management

It is common for cities to have responsibility for 2 types of GHG emissions inventories: emissions resulting from municipal operations, and those relating to activities across the community as a whole. CDP offered C40 cities the option to disclose city government operations emissions and/or community emissions, or neither. The figures and findings in this section are based on the information that C40 cities have disclosed to CDP.

City government operations

Like national governments, city governments often own or operate a large number of assets that produce or consume energy. The emissions that result from these assets can be measured and analyzed separately from the overall emissions that arise from all public and private activities within the city's geopolitical boundary. City governments can themselves be significant energy users and carbon emitters but can also exert direct control over emissions reductions from municipal operations.

Almost half of the C40 cities disclose emissions from city government operations

45 percent (19) of the cities disclose

emissions from city government operations. The aggregate emissions from the responding 19 cities comprise 27.3 million metric tons CO₂-e, which is roughly equal to the total emissions from a major oil company like Repsol YPF, which operates in over 35 countries producing oil and gas. Estimates of emissions resulting from city government operations range between 1 percent (São Paulo, London, Melbourne) to 7 percent (New York, Toronto) of total community wide emissions.

Cities use a variety of methodologies, yet some commonalities are present

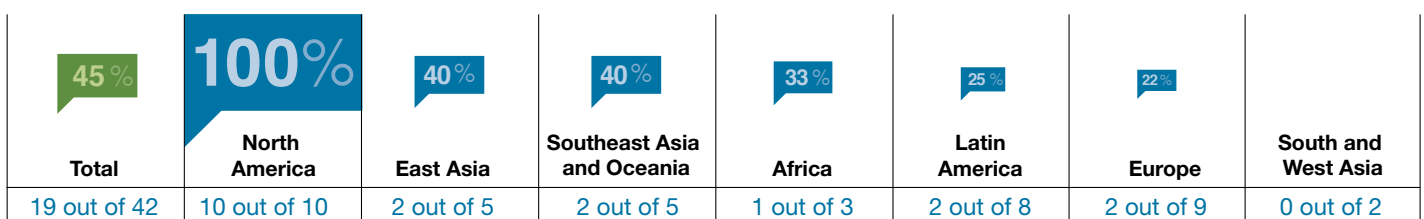
Efforts to measure GHG emissions from city government operations in a harmonized way have not yet caught on widely. Many cities utilize existing international methodologies like the ICLEI Local Government Operations Protocol or the IPCC, and then combine these approaches with their own proprietary methodologies that fit local circumstances. As such, the data suggests that many cities recognize the value of international protocols but still find them lacking. There is no 'preferred' methodology. In general, cities prefer to capture emissions data based on actual usage or activity data, rather than extrapolating from regional/national/economic sector statistics.

Between responding cities, there is variation between the GHG inventory year reported. The majority of cities report emissions data over 2009 and 2010, whereas other cities report emissions inventories for years ranging from 2004 to 2008, though overall the trend is towards calculating and reporting emissions data annually.

Spreadsheets dominate, but North American cities move toward enterprise software tools to help manage emission reduction projects

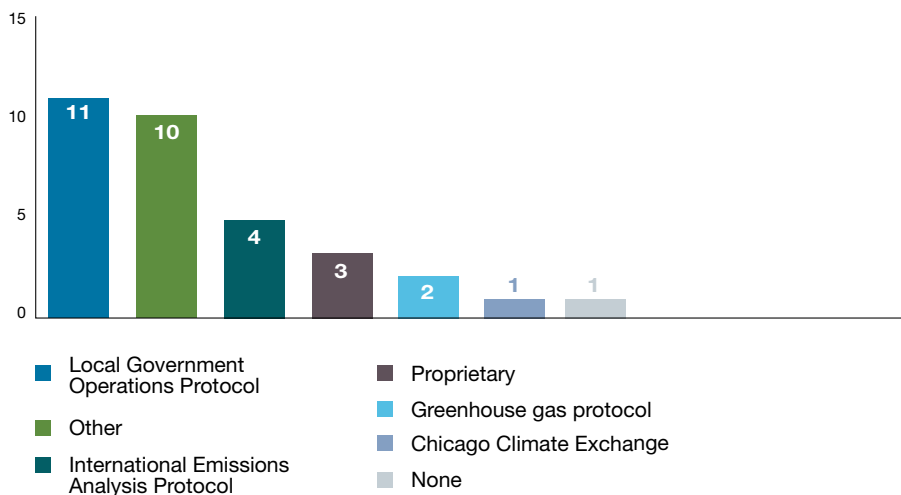
In their efforts to collect and manage emissions, city governments have adopted a number of software tools, with varying levels of sophistication. The most common approach is using spreadsheets (like Microsoft Excel); more than half of the cities report spreadsheets as their software of choice for tracking city government operations emissions. However, a few pioneering cities are utilizing more sophisticated software tools. A trend emerging from a number of cities in North America is the move towards enterprise software-based resource management systems to collect, calculate, and analyze data.

Fig. 09: Cities that disclose city government operation emissions, by region



...% as regional percentage

Fig. 10: Methodologies applied to calculate city government operations emissions



Number of responding cities (23).
Cities were instructed to select as many as apply.

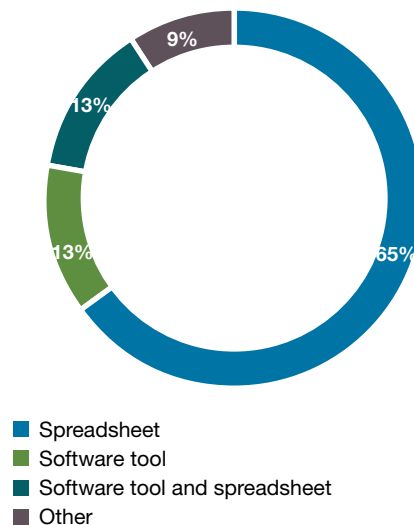
Cities include a variety of emissions sources in their inventories

To specifically address the differences in methodologies between city governments, CDP asked C40 cities to identify the emissions sources that were included in their GHG inventories. The results indicate concordance in some areas while showing variation in other areas. More than half of the cities, for example, include buildings, transport (public transport and fleet) and street lighting in their city government operations emissions inventories. Some cities extensively disclose emissions subcategories of sources (e.g. Toronto and São Paulo each include over 10 primary sources in their inventory), whereas other cities disclose total emissions only.

“The City has formed a partnership with ENXSuite and will be using ENXSuite’s software, Green City Suite, to collect and analyze data in the future. Among its abilities, ENXSuite software will specifically help CCAP by: collating data; inserting data into a dashboard of CCAP progress; providing analysis and reporting capabilities; administrative abilities to maintain a flexible software platform; and helping to benchmark progress against other entities.”

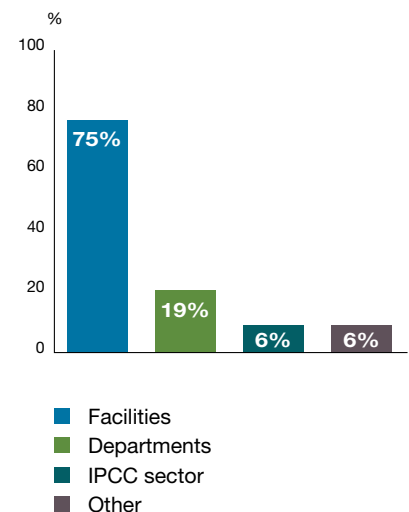
Chicago

Fig. 11: IT used to collect, calculate and manage city government operations emissions data (% of respondents)



Number of responding cities (23)

Fig.12: Categorizations for reporting city government operations emissions (% of respondents)




Number of responding cities (16)

“The City of Seattle measures the following Scope 3 emissions: employee commute, municipal solid waste, and employee air travel.”

Seattle

Fig.13: Breakdown of city government operations emissions, by scope

	Total GHG emissions	Scope 1	Scope 2	Scope 3
	45%	26%	24%	10%
total emissions (in million metric tons CO ₂ -e)	27.3	2.72	1.56	0.02

 Number of responding cities (42)

Assessment of Scope 3 emissions is still uncommon

4 cities provide separate figures for Scope 3 emissions, suggesting that a small number of C40 cities believe that their indirect emissions are important to measure and track. Scope 3 emissions are indirect emissions that lie under the influence of the city government, excluding electricity and energy consumption. They might include, for example, contracted services (like school buses), business travel (like air travel/taxis) and paper use. Toronto, Sydney, Seattle, and New York in particular provide clear information about how they calculate Scope 3 emissions. In the private sector, research has demonstrated that on average more than 75 percent of an industry sector’s carbon footprint is attributable to Scope 3 sources².

Natural gas is the most common fuel type

The CDP Cities questionnaire also offered C40 cities the chance to report on the types and quantities of fuel that they consume. Natural gas (often associated with heating of buildings) is the most commonly reported and represents 91 percent of total reported fuel consumption. The total amount of fuel consumption reported by the 15 cities answering this question was approximately 800 million GJ, which is almost as much as the total energy consumption of Denmark³. As reported, the largest consumer of fuel is the Moscow city government, followed by Buenos Aires and New York, although consumption figures relate to the scope of services provided by each city and are therefore difficult to compare.

² Categorization of Scope 3 Emissions for Streamlined Enterprise Carbon Footprinting
Huang, Y.A., C.L. Weber and H.S. Matthews (2009).

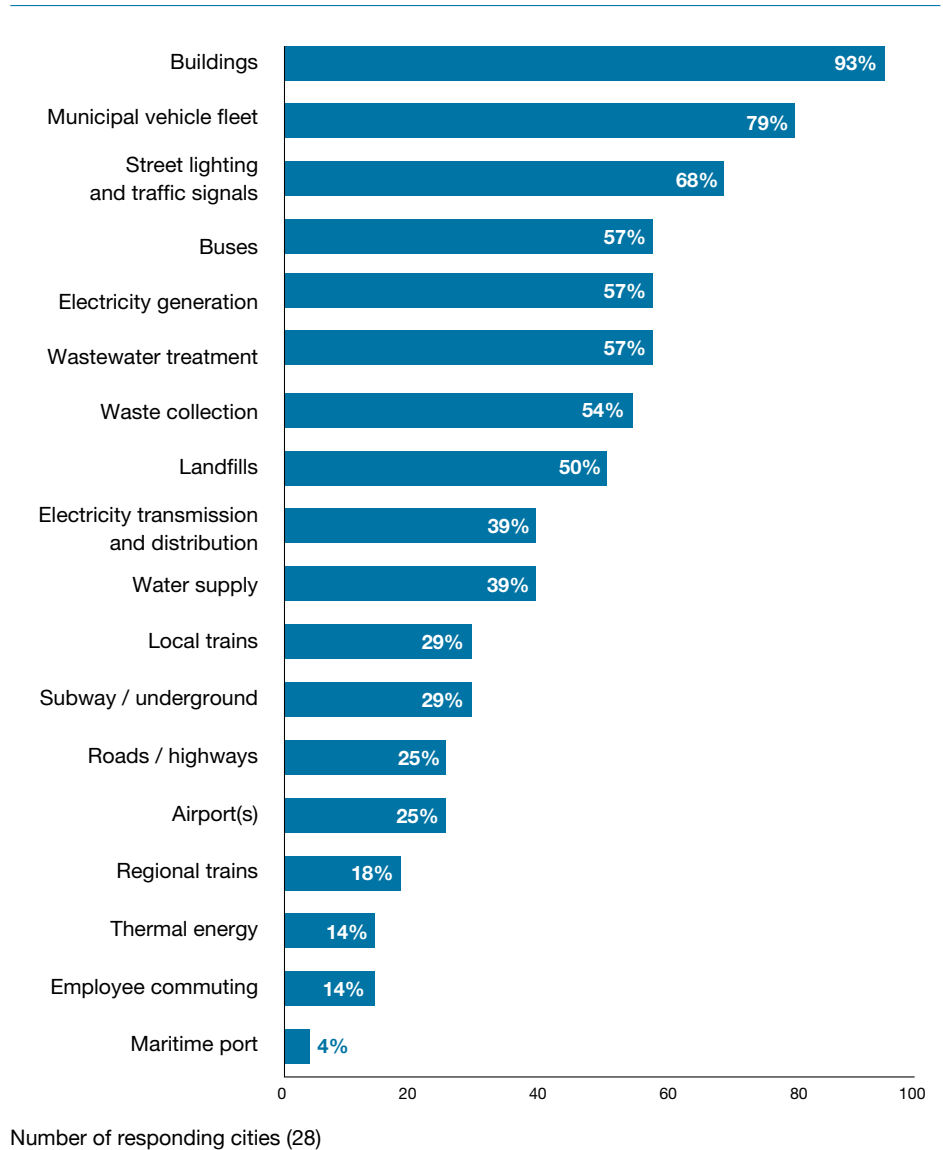
³ U.S. Energy Information Administration. Total Primary Energy Consumption (2008).

Many cities also purchase energy such as electricity, heat and steam. 11 cities report the percentage of their budget that goes towards purchasing energy: for roughly half, electricity purchases represent less than 1 percent of municipal budgets, indicating that energy procurement is not a significant cost factor for large cities. Although for some cities, the budgetary impact is more substantial: New Orleans, for instance, estimates that 10 percent of its budget goes towards energy procurement. As with fuel consumption, energy purchases depend on the level and scope of services provided by a municipal government.

Emissions reporting is mostly voluntary for city government operations emissions

10 cities report that they comply with national reporting requirements or report via voluntary national registries, often as part of the national government's commitment to report to the United Nations. 7 cities report that they undertake international reporting for city government operations emissions (e.g. through ICLEI or the EU Covenant of Mayors), while 7 cities do no reporting.

Fig. 14: Sources of emissions included in city government operations greenhouse gas inventory (% of respondents)



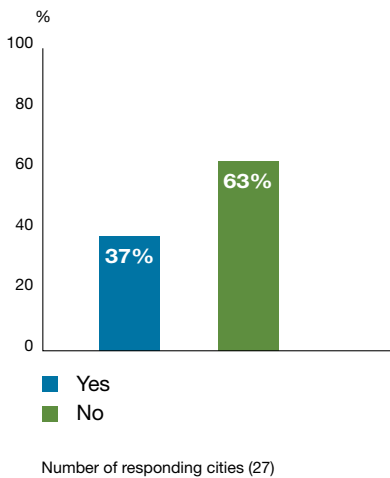
“Verification is now underway and to be conducted to a “reasonable” level to comply with the recently introduced National (Australian) Carbon Offset Standard.”

Sydney

Adding value through data validation and verification

In the private sector, the verification of emissions data is becoming fundamental for establishing credibility of data with stakeholders. Although less common to public sector organizations, the 2011 responses show that a small number of C40 cities have their government operations emissions verified by a third party. 10 responding cities indicated that all or part of their emissions data has been verified in some manner.

Fig. 15: External verification of city government operations emissions data (% of respondents)



Cities have set targets to reduce government emissions by up to 100 percent, but details vary greatly

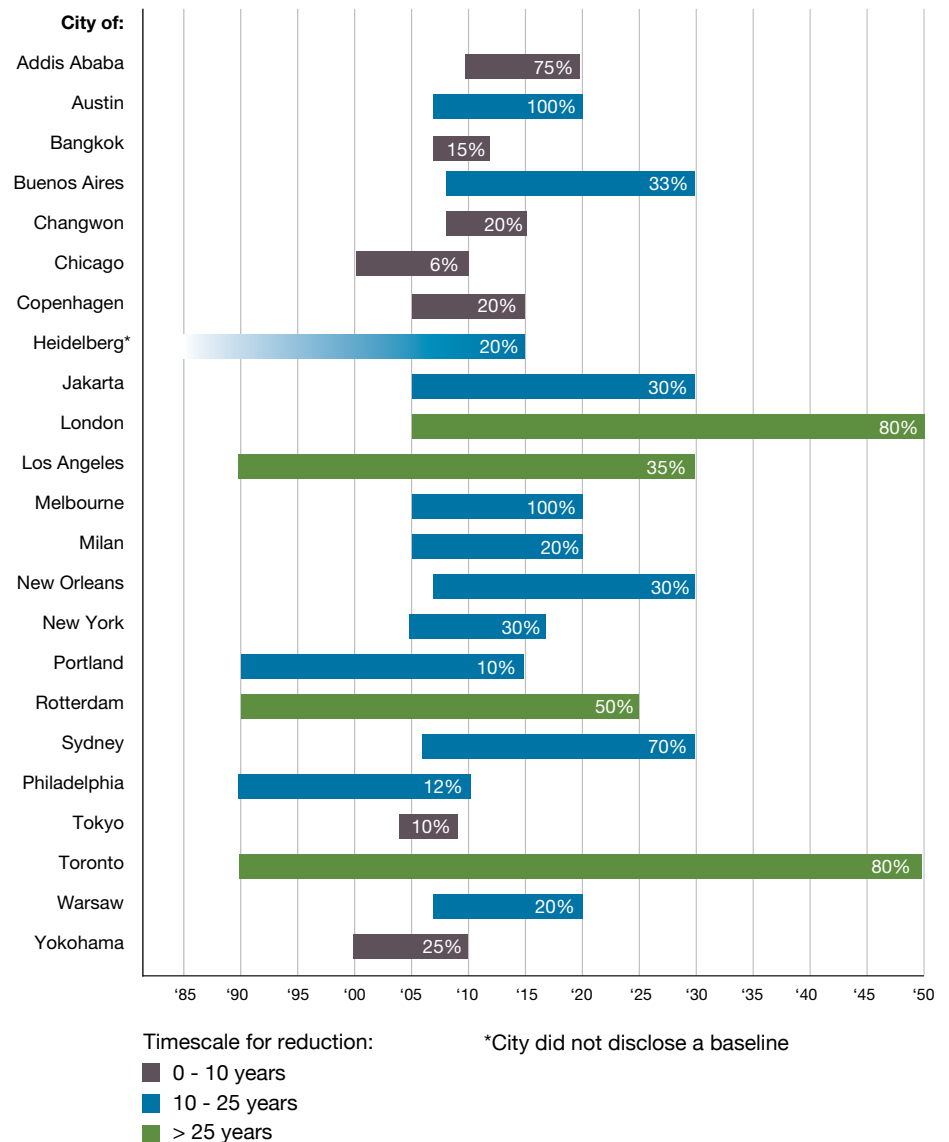
69 percent (27) of responding cities indicate they have set GHG reduction targets. Additionally, some cities that report no targets mention a desire to do so in the near future. Some examples of city targets include Los Angeles, which aims for a 35 percent reduction by 2030, and Warsaw, which aims for a 20 percent reduction by 2020.

Average targets equate to around 2.3 percent per year, which is in line with the annual targets set by large corporations such as Arriva, Boeing or IBM. Based on regional averages, targets set by North American or European cities fall below the C40 average.

Retrofitting buildings emerges as most common GHG reduction measure

28 cities provide specific details about the types of measures underway to achieve emissions reductions – with the results showing a priority on the retrofitting of existing public buildings, followed by renewable energy projects and street lighting upgrades. Seattle, for instance, reports that it has “completed 30 municipal energy audits and will retrofit 14 municipal buildings to improve energy efficiency.” For renewable energy projects, many cities focus on 2 types of interventions: the installment of renewable energy sources in municipal buildings (e.g. photovoltaic power generation systems) and the

Fig. 16: City government operations emission reduction targets, by city



introduction of procurement programs for renewable energy. 8 of the 28 cities which responded to this question (29 percent) formulate employee awareness campaigns aimed at creating behavioral change.

The missing link: financing GHG reduction measures

Only a small number of cities responded to the question of how much financial investment will be required to achieve GHG reduction targets. Cities such as Berlin and Toronto provide specific information about the financial investments they have made over the last 3-10 years. 3 cities (New York, Austin, Sydney) have clear statements about how they intend to fund future reduction measures. However, among the responding cities, investment estimates vary considerably.

“...\$30M AUS will be invested into energy efficiency upgrades, solar photovoltaics, trigeneration and LED street lighting to achieve the 70 percent reduction target by 2030.”

Sydney

“The inventory of GHG emissions of Moscow’s energy industries (section 1.A.1 IPCC classification) is executed in accordance with the statement of chapter 1 “Introduction” and chapter 2 “Stationary Fuel Combustion” of the “Leading principles of national GHG inventory” (IPCC 2006, vol.2 “Energy”).”

Moscow

Fig. 17: What percentage of your city government’s budget goes towards purchasing energy?

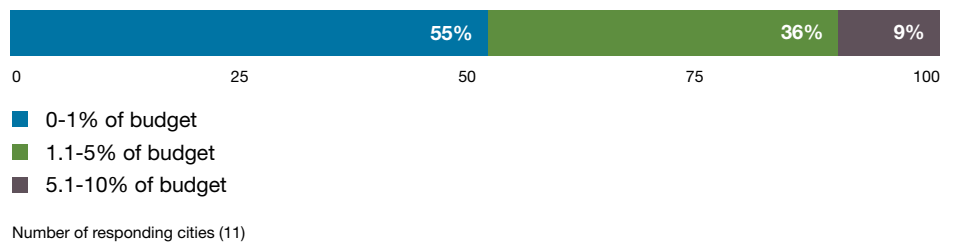
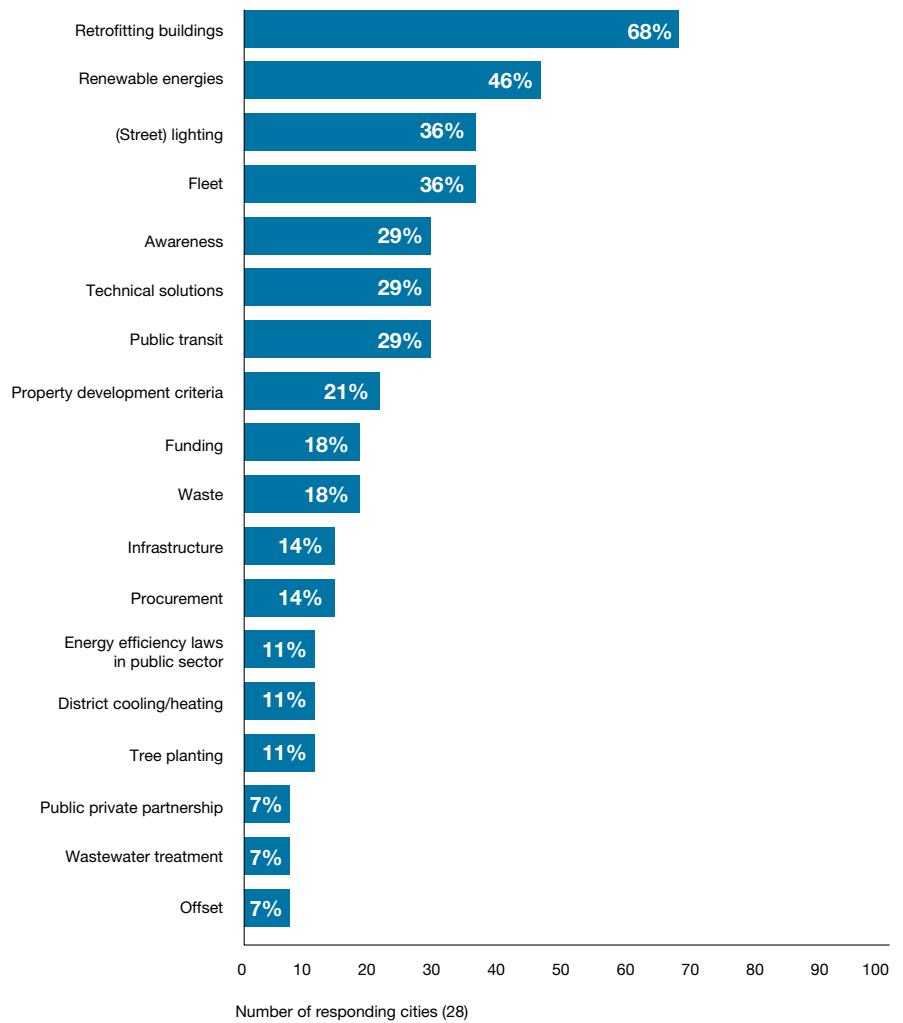


Fig. 18: City government operations emissions reduction measures (% of respondents)



“We collect statistical data from other organizations such as national ministries and utility companies. With this data, we estimate the amount of GHG emissions and release it on our website”

Tokyo

“Data for community transport is collected from the air quality monitoring stations; water data is collected from Joburg Water and electricity from Eskom and City Power.”

Johannesburg

City-wide emissions

City governments often take responsibility for measuring GHG emissions produced and/or consumed within the entire city. This task is a difficult one. Each city faces unique challenges ranging from boundary definition to data collection. Yet few dispute that the task is important: a city government that measures its city-wide GHG inventory is better placed to manage reductions and implement specific reduction measures.

2 out of every 3 cities disclose community emissions

An impressive 67 percent (28) of C40 cities report city-wide emissions data. This high number is an excellent start for the first year of public disclosure and bodes well for future efforts by C40 cities on carbon measurement and reporting. The total quantity of emissions is also significant: these 28 cities account for 609.5 million metric tons CO₂-e, roughly the emissions produced by an entire nation such as Canada. There is no doubt that C40 cities are major players in the fight against climate change.

Measurement approaches vary among C40 cities

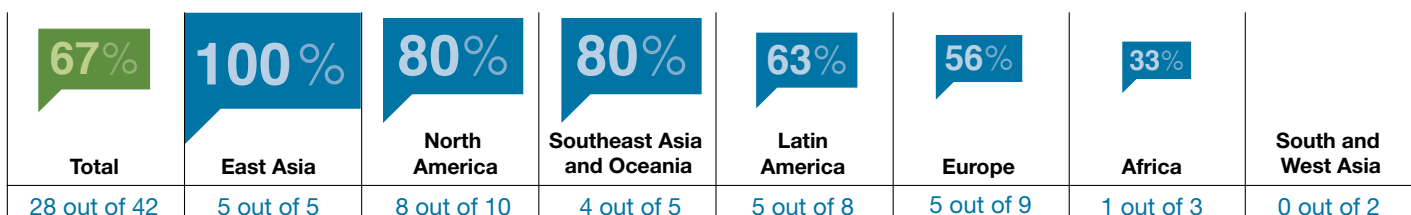
The results from the CDP Cities program show some standardization in the methodology or approaches that C40 cities follow in measuring and calculating their emissions inventories. Just as for city government operations, the majority of responding cities combine standardized approaches (ICLEI’s IEAP, EU Covenant of

Mayors, World Bank, or an international framework like IPCC) with proprietary approaches that fit local circumstances. The unbounded nature of cities, in terms of where they draw their resources from and the goods and services that flow in and out, presents great complexity in calculating emissions. Even cities that use similar approaches show variations in what data is collected and how.

The differences in methodology are reflected in a wide variety of GHG categorizations. Some C40 cities categorize their emissions by sector (residential, commercial, industrial). Some C40 cities use categorization by end user (transport, waste, water, etc). A third of responding cities provide emissions data using the “Scope 1, 2 and 3” categorization embraced by IPCC and World Resources Institute. Some use an entirely different categorization, while some cities categorize their emissions in multiple ways.

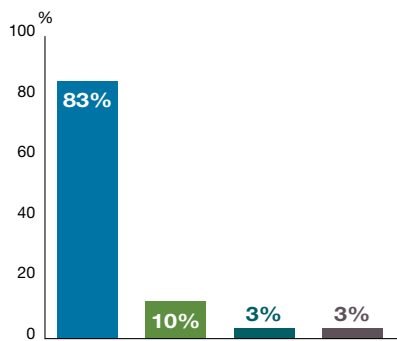
Variations in size, makeup and methodology combine to create massive differences in the amount of emissions reported by from each C40 city, with the spread between cities up to ten-fold. 4 cities report total community emissions of 5 million metric tons CO₂-e, whereas 2 other cities show community emissions to be greater than 50 million metric tonnes CO₂-e. As methodologies improve and cities coalesce around common emissions accounting approaches, we can expect this variation to decrease substantially.

Fig. 19: Cities that disclose community emissions, by region



...% as regional percentage

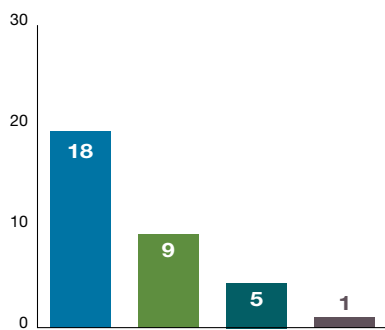
Fig. 20: Boundary used for community emissions inventory (% of respondents)



- Geopolitical boundary
- Part of the geopolitical boundary
- Geopolitical boundary (incl. parts of external transport)
- Geopolitical and organizational boundaries

Number of responding cities (29)

Fig. 21: Methodologies applied to community emissions



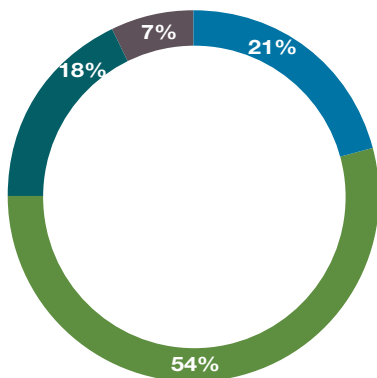
- Other
- International Emissions Analysis Protocol
- Proprietary
- International Standard for Determining Greenhouse Gas Emissions for Cities

Number of responding cities (27).
Cities were instructed to select as many as apply.

“An emission factor for power from the Danish power grid is provided by the company, which runs the Danish transmission system, Energinet.dk. An emission factor for district heating in the regional district heating system is provided by local energy companies. Emission factors for different types of traffic are provided by the Danish Ministry of Transport.”

Copenhagen

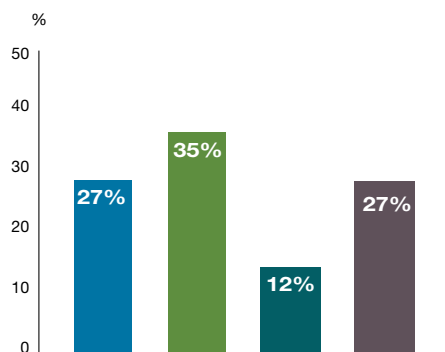
Fig. 22: IT used to collect, calculate and manage community emissions data (% of respondents)



- Software tool
- Spreadsheet
- Other
- Software tool and spreadsheet

Number of responding cities (32)

Fig. 23: Organizations to which cities report community emissions (% of respondents)



- National government
- International body
- Both
- None

Number of responding cities (26)

The City of Seoul has let Lloyd’s Register Quality Assurance (LRQA) verify “the GHG emissions data for the calendar years from 1990 to 2008” using the ISO 14064-3 standard.

Seoul

“The City of Melbourne incorporates all emissions from the geopolitical boundary plus emissions from half of all external transport trips originating or terminating in the municipality.”

Melbourne

Fig. 24: Breakdown of community emissions, by scope

	Total GHG emissions	Scope 1	Scope 2
	67%	33%	31%
total emissions (in million metric tons CO ₂ -e)	609.5	160.1	101.8

...% Number of responding cities (42)

Between responding C40 cities, there is also great variation between the years chosen for reporting through CDP on community GHG emissions. Few cities (5 out of 28 respondents) report community emissions data for 2009 and 2010. The majority of C40 cities report emissions inventories for years ranging from 2000 to 2008, with 2008 being the most common accounting year disclosed to CDP.

Despite these challenges, there are some commonalities in the ways cities measure emissions. For example, most cities identified their “geopolitical boundary” as the reference for their community emissions inventory. While the size and breadth of this boundary varies from city to city, the fact that most cities use a similar metric is an important point of concordance.

Neighborhood-level data is not widespread

CDP asked cities to define the spatial scale at which they collect data.

23 cities collect community emissions data at the city level. A small number of cities take a more granular approach and collect emissions at the street level or by postcode. More granular data is more challenging to collect and track, and may not necessarily provide greater insight into emissions drivers. But for some cities, having this level of understanding can enable them to better tailor policy.

Few cities have their emissions data externally verified

24 percent (7) of C40 cities reporting city-wide emissions have their inventories externally verified or audited. Although verification is still at an early stage, based on number of respondents, the ability to call on verified data may provide government organizations with a powerful tool in their efforts to influence policies or regulations at other levels of government or to communicate with other community stakeholders, or even to qualify for international funding.

“We are aware that the actions we are implementing are not enough to attain the behavioural changes we need in order to fight climate change. An enormous task lies before us, as we need all of the city’s inhabitants to become aware of the responsibility that each of them has in reversing this trend.”

Buenos Aires

Community-wide emissions reporting is mostly voluntary

The CDP questionnaire asked C40 cities to identify the reporting requirements to which they are subject. 19 responding C40 cities report emissions to at least 1 national or international body, mostly voluntarily. 7 cities respond as a result of national requirements (i.e. national laws, national reduction program or national communications to the United Nations). 7 of the responding cities do not report community emissions data to any other bodies.

C40 cities have set aggressive, but widely divergent, targets

27 cities have established GHG reduction targets for community emissions – although baseline years and ambitions vary. Targets for community emissions are generally set for a longer time period than for city government/municipal emissions. Results show that 50 percent of responding cities set targets for a time period longer than 20 years, and with a GHG reduction target less than or equal to 50 percent. 2 cities have set the very ambitious reduction target of 100 percent. Among the different baseline years, 1990 is the most commonly reported and 30 percent is the most popular reduction goal.

Subsidies, fiscal incentives and building standards are the most popular GHG reduction activities

Disclosing C40 cities identify a wide range of measures to achieve their reduction targets, including physical, financial and behavioral measures. The most commonly identified activities are subsidies, fiscal incentives, and building standards. For instance, Heidelberg has implemented a “passive house standard for the new city district Heidelberg Bahnstadt, one of the largest city development projects in Germany.”

For fiscal support, cities focus on energy efficiency loans and rebates, tax reduction for cleaner transport or cleaner vehicle technologies. The Tokyo Metropolitan Government applies various subsidies and fiscal incentives, such as “tax deductions on electric vehicles, energy-conservation equipment and other related goods” together with “subsidies for solar energy appliances for households”. Tokyo also provides “low-interest loans for energy conservation equipment for small and medium-sized business.”

Fig. 25: Spatial scale of community emissions data collection (% of respondents)

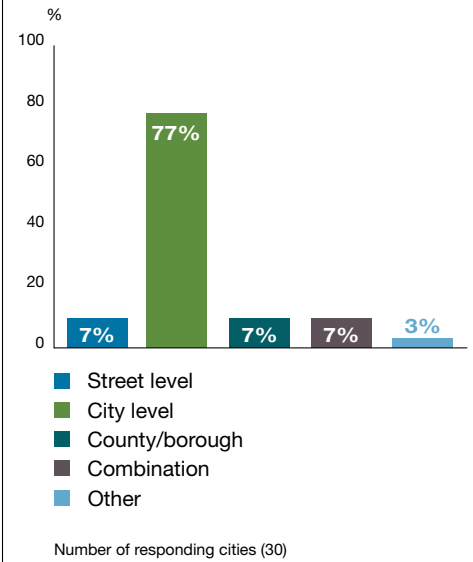
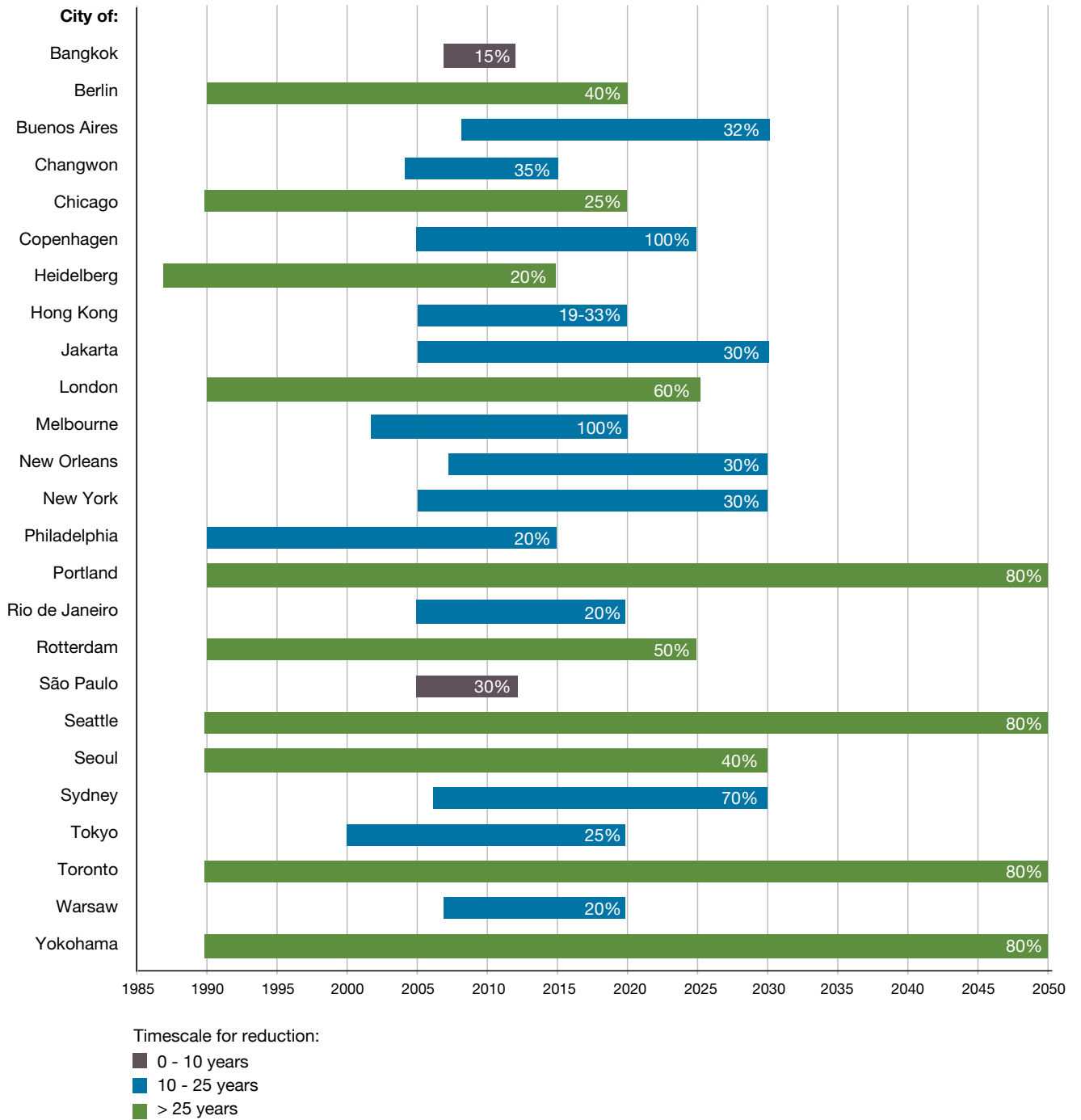


Fig. 26: External verification of community emissions data (% of respondents)



Fig. 27: Community emissions reduction targets, by city



Physical measures include transport infrastructure (including designated lanes for buses and taxis, pedestrian areas, cycling network), renewable energy, retrofitting of buildings, district heating and tree planting. Changwon is “constructing green networks (parks, roads and rivers)” and also “implementing a One Million Tree Project”. Importantly, 17 responding cities reported awareness-raising as an important means of reducing GHG emissions in their communities.

Financing GHG reduction measures

Despite the large number of cities reporting a reduction target, only a few of these cities calculate the financial investment that may be required.

London has “estimated that £40bn will be required to meet the Mayor’s target to reduce CO₂ emissions by 60 percent (1990 levels) by 2025.” In order “to deliver the Mayor’s existing climate change mitigation programme in full it is expected to cost in the region of £14bn by 2025.”

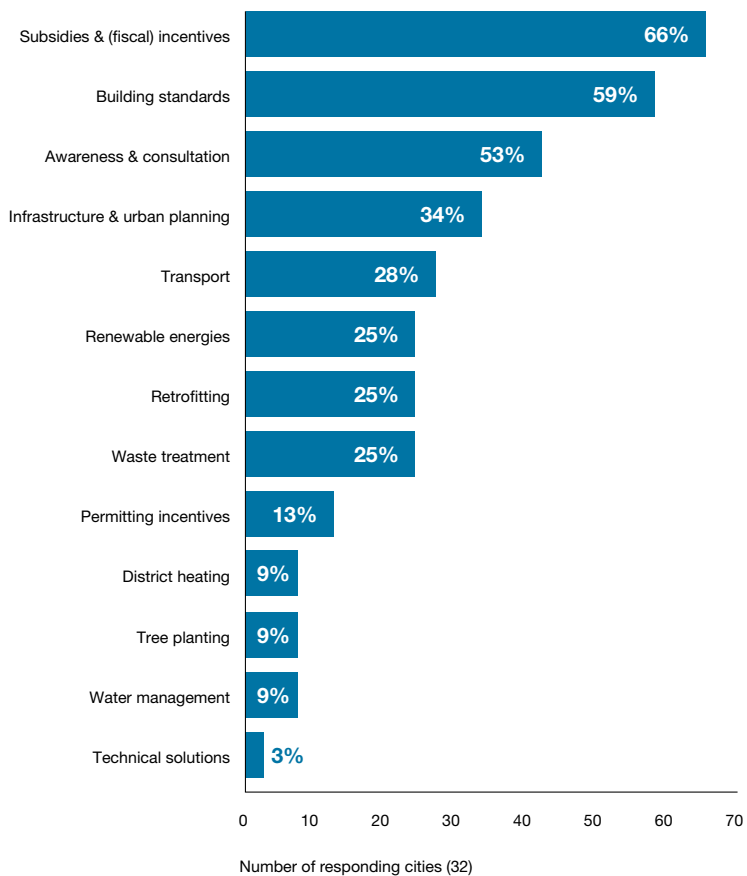
“After a thorough analysis of the various mitigation and adaptation measures, and after evaluating their potential GHG emission reduction, the City of Buenos Aires has set a goal to reduce 32.7 percent of GHG emissions by 2030 in reference to emissions in 2008.”

Buenos Aires

“Hong Kong Government has proposed...to adopt a voluntary carbon intensity reduction target of 50% - 60% by 2020 as compared with 2005 level through the implementation of proposed action agenda.”

Hong Kong

Fig. 28: Community emissions reduction measures (% of respondents)



3

Climate Change Risk Assessment and Management

“Some parts of the City are built on reclaimed land areas that are already subject to flooding which would be exacerbated by impacts of climate change such as sea-level rise, more frequent and intense storm events, king tides, and storm surges.”

Sydney

“60 percent of residents of Karachi city live in slum areas and do not have the adequate facilities to sustain the heat waves.”

Karachi

Adaptation to the adverse effects of climate change is a key issue for all cities. While the world moves to reduce GHG emissions, cities already face devastating impacts from climate change including increased incidences of extreme weather events, floods, droughts and water scarcity.

Nearly every C40 city is exposed to significant physical risks from climate change

93 percent (39) of disclosing cities report that they consider themselves at risk due to climate change. The near unanimity of this response demonstrates a high level of awareness in C40 cities about the potential dangers resulting from warmer temperatures and other local climate impacts, and shows that many cities have passed a crucial first step on the road to climate resilience.

Climate change is already affecting cities—and they anticipate it will get worse

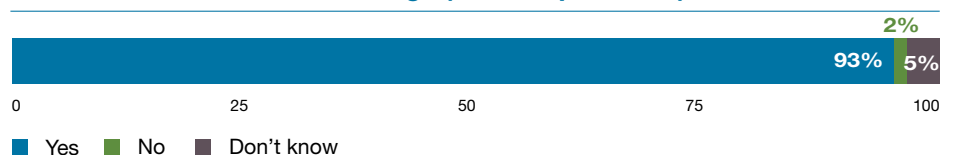
23 C40 cities (54 percent of reporting cities) identify risks from climate change effects that are already underway or that are expected to occur in the short term. Of these 23 cities, more than half (15) indicate that they currently face serious to extremely serious levels of risk. Temperature changes (e.g. more hot days), more intense rainfall, increased severity of storms and floods, and rising sea level are the most frequently mentioned. Some cities describe compounding factors that may worsen the physical effects of climate change in the city.

For instance, many port cities mentioned that their low lying topographies in combination with dense populations (Sydney, Jakarta, Dhaka, Lagos, Rotterdam) and rising sea levels, flooding and increased storm surges put them at greater risk for adverse impacts on urban infrastructure, citizens and local businesses.

C40 city governments are conducting local climate change risk assessments

To fully understand the effects of climate change and anticipated risks, many C40 cities are conducting climate change impact and vulnerability assessments. 35 responding cities identify or are in the process of identifying the specific risks they face from climate change. The scope of these assessments generally covers the city as a whole, while sometimes focusing on certain economic sectors (such as industry, commerce, leisure, agriculture) or city functions (such as transport, infrastructure, public services, public health, urban parks). Portland, for instance, is currently undertaking a vulnerability assessment and working to “evaluate the extent to which Portland’s natural, built, and human systems are resilient across a variety of scenarios.” Caracas is “establishing climate scenarios in Venezuela by 2060 by using simulation models of the UK UKTR Meteorological Office and CCC-EQ of the Canadian Center for Climate Modeling and Analysis.”

Fig. 29: Cities that said they were exposed to significant physical risks from climate change (% of respondents)



Number of responding cities (42)

Risk assessment methodology is varied and unstandardized

22 responding cities base their risk assessment on an established methodology, like UNDP, IPCC, or World Bank guidelines, or the UK Climate Impacts Programme (UKCIP). Other cities extrapolate methods and data from national centers for climate modeling. A number of cities report to CDP the step by step process they follow for assessing risk.

Some cities use scenario analyses for mid- and long-term projections of the future effects of climate change. Buenos Aires for instance has prepared future climate scenarios based on global climate models provided by the World Climate Research Program (Couples Model Intercomparison Project), a set of models used by the IPCC in preparing the Fourth Report Synthesis.

“Since Curitiba is located in the head of the Iguazu river basin, which ends at the Iguazu Falls, flooding has always been a concern. With climate change the probability of harder and more frequent rain is very high. The City Hall is commissioning the Vulnerability Study to confirm this tendency.”

Curitiba

“The approach to assessing climate risks and impacts consists of the following sequential steps: (1) determining climate variables at the level of the city/watershed through downscaling techniques; (2) estimating impacts and vulnerability through hydro-meteorological modeling, scenario analysis, and GIS mapping; and (3) preparing a damage / loss assessment and identification/prioritization of adaptation options.”

Bangkok

“CCAP consulted the University of Illinois Urbana Champaign and Texas Tech University to study the physical impacts of climate change on the Midwest and Chicago. Chicago climate change projections were assessed over the coming century through statistical downscaling.”

Chicago

Fig. 30: Physical effects of climate change identified by cities

Effect	% of respondents	Top 3 sectors affected
Temperature increase/heatwaves	85%	Human health, Energy, Water
More frequent/intense rainfall	79%	Buildings, Water, Transport
Sea level rise	67%	Buildings, Waste, Transport
Storms and floods	58%	Human health, Buildings, Water
Drought	42%	Water, Human health, Energy

Number of responding cities (33)

The Business Value of Climate Change Data

Since its launch, CDP has been instrumental in driving businesses to develop a sophisticated understanding of the risks and opportunities associated with carbon management and climate change. As a result, many businesses have made public commitments to cut their emissions.

They are now seeing the benefits in their operations from both revenues and cost. At Jones Lang LaSalle, we expect that consideration of climate change-related risks will play an increasing role in businesses' location decisions. This is particularly the case as energy prices and risks of supply chain disruption increase.

To attract private investment, cities will need to provide the right physical and regulatory environment. This will enable cities to foster local economic development and to become more resilient in an increasingly competitive environment. The CDP Cities initiative provides a unique platform for marketing cities' climate change strategies, which will enable businesses to make informed location decisions.

Lauralee Martin

Global Chief Operating and Financial Officer
Jones Lang LaSalle

"In 2008, Mayor Michael Bloomberg convened the New York Panel on Climate Change (NPCC) to ensure that the City's climate resilience efforts were based on state-of-the-science information. Modelled on the Intergovernmental Panel on Climate Change (IPCC), the NPCC consists of a multi-disciplinary group of leading climate and impact scientists, academics, economists, and risk management, insurance, and legal experts."

New York

"Under the UK Government's Climate Change Act, the Greater London Authority is required to report to the UK Government on adaptation."

London

"Businesses' activities in the city are highly dependent on certain predictable weather conditions such as agriculture, water, transportation system, energy and tourism."

Addis Ababa

Several cities take impact assessments a step further. Melbourne uses socio-economic and sensitivity factors (demographics, infrastructure condition and capacity, institutional control measures, community knowledge and skills, and emergency services capacity) in their impact assessments. Sydney uses a tool to assess the impacts of rising sea levels, floods and extreme heat events, and the city's adaptive capacity.

7 cities are adopting a collaborative approach by teaming up with research agencies, universities, businesses, citizens and other stakeholders to study the physical impacts of climate change and formulate actions.

National and international adaptation reporting is at an early stage

Very few C40 cities noted that they report on their actions to adapt to climate change. According to the survey results, only 4 countries require cities to report on adaptation to national governments. In Ethiopia, Addis Ababa is mandated by Federal Environmental Protection Authority to report about their climate change

Water: A Careful Balance

Of all the issues that cities face, water deserves special mention. It is vital to cities, but too much or too little water can push a city to the brink. Cities reported that extreme changes to the amount of rainfall they receive pose a serious risk for their citizens and the ability of businesses to operate successfully in their jurisdiction.

Cities inundated with increased frequency and intensity of rainfall are experiencing floods, landslides and other natural disasters which are claiming lives and destroying property. In 2010, Rio de Janeiro experienced one of the worst natural disasters in Brazil's history due to an intense rainfall. Intense rainfall also results in reduced water quality in urban areas—particularly around combined-sewer drainage systems which are overwhelmed during heavy precipitation events leading to sewage overflow into water bodies.

On the other hand, C40 cities are facing the opposite situation—more frequent/intense droughts are creating water supply issues. Water shortages have implications not only for drinking water, but for industry located in the watershed. In water-stressed regions water is often jointly managed and a decrease in flow can have political implications. Las Vegas reported that ‘changes in the availability of water would complicate the complex water-rights and interstate compacts that govern water allocation regionally’. In Seattle, reduced average annual rainfall will decrease the quantity of water available for electricity generation. In Rotterdam, when water levels drop due to drought, river transport and navigation becomes limited. A variable and unpredictable water supply disrupts the careful and often precarious balance that cities have struck- arranging sufficient water for people, industry and agriculture while avoiding danger. Cities that identify the risks their city will face and make plans for the future are those that will best be able to guarantee security for citizens and business alike.

adaptation strategy. 6 responding cities are working in partnership with international organizations on their adaptation work, including ICLEI, IPCC, or the World Bank, but consistent risk and adaptation reporting remains a long-term goal.

Nearly every city government noted that climate change could threaten the ability of businesses to operate successfully in their city

79 percent (33) of responding cities believe that the physical impacts of climate change could threaten the ability of local businesses to operate successfully. Extreme weather events may interrupt businesses directly or indirectly. Direct impacts relate to property damage, human mobility or health, whereas indirect impacts could cause disruption to supply chains. In addition, extreme weather events (or risk of) may lead to an increase in the cost of insurance premiums and security.

Several cities also mention that they foresee additional risks for some social groups, such as low-income individuals, (pregnant) women, children, elderly people and the disabled.

“The City has a staggering amount of blighted properties that it is still dealing with after Hurricane Katrina. As we deal with this excessive blight, encouraging developers to invest in the City as time goes by becomes increasingly difficult.”

New Orleans

“In February 2007, Jakarta was hit by one of the worst floods ever experienced covering 70% of the metropolitan area, with total Financial Losses of US \$ 879 million, 79 lives lost and 223,203 refugees.”

Jakarta

“In December 2010, our city formulated the Midterm Four Year Plan (2010-2013) and eight ‘Yokohama Growth Strategy’, and the first strategy, ‘Environmental Cutting Edge City Strategy’ aims to vitalize the economy in our city by creating demands necessary to shift to a low-carbon society.”

Yokohama

“Copenhagen has an ambition of becoming the world’s first carbon neutral capital and the city has a goal of using this as a catalyst for ‘Green Growth’, focusing on green energy, green transportation and green construction.”

Copenhagen

“The Mayor wants London to be a leading low carbon capital and maximise the economic opportunities from this low carbon transition. London already has strengths in areas such as carbon markets, financing, legal services, and research and development.”

London

Most cities have a plan for increasing their resilience

26 cities have plans to protect infrastructure, business sectors, and citizens against extreme weather events for increasing resilience to the expected impacts of climate change. Between regions and cities, large differences exist:

- In Japan, Tokyo and Yokohama have formulated local disaster management plans
- In North America, most cities have a dedicated Office of Emergency Management
- In Europe, 50 percent of the European cities indicate that they have an adaptation plan
- In Latin America, cities (excluding Brazil) are in the process of initiating actions plans

A small but significant number of cities identified opportunities for their cities stemming from climate change

At present cities seem to be more focused on capturing risks rather than identifying the potential opportunities.

However, 24 cities state that they expect to see some positive effects of climate change.

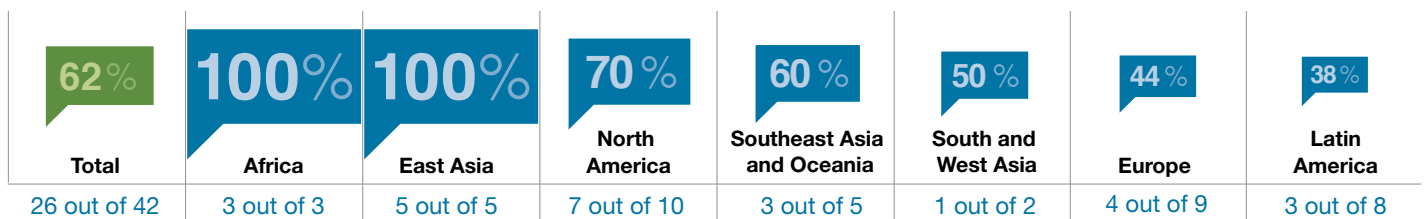
Cities highlight how growing interest in climate change by stakeholders has helped obtain new levels of funding (Los Angeles), has expedited the implementation of a drainage master plan (São Paulo), or has created incentives to collaborate with business on energy efficiency.

Jakarta, for instance, anticipates benefits from increased rainfall, through the provision of greater amounts of clean water, which can be used to extend green areas.

Some C40 cities are capitalizing on the opportunity

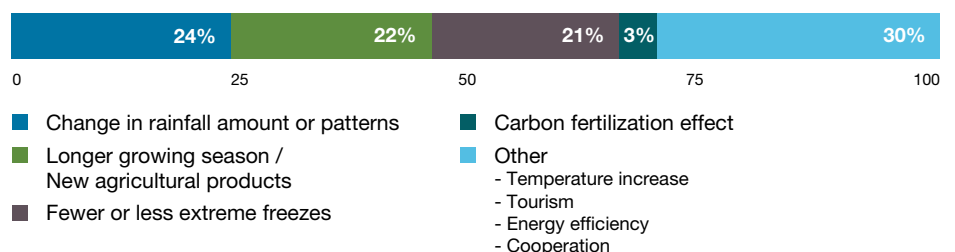
In the corporate sector a number of companies see climate change as an opportunity for innovation and a pathway for competitive advantage. This trend has not gone unnoticed by C40 cities. 6 cities (Seoul, London, Copenhagen, Tokyo, Yokohama, Rio de Janeiro) see climate change management as an opportunity for economic growth and as a key area for differentiation, improved competitiveness and a timely opportunity to kick start a green economy.

Fig. 31: Cities that have a plan for increasing city’s resilience to climate change, by region

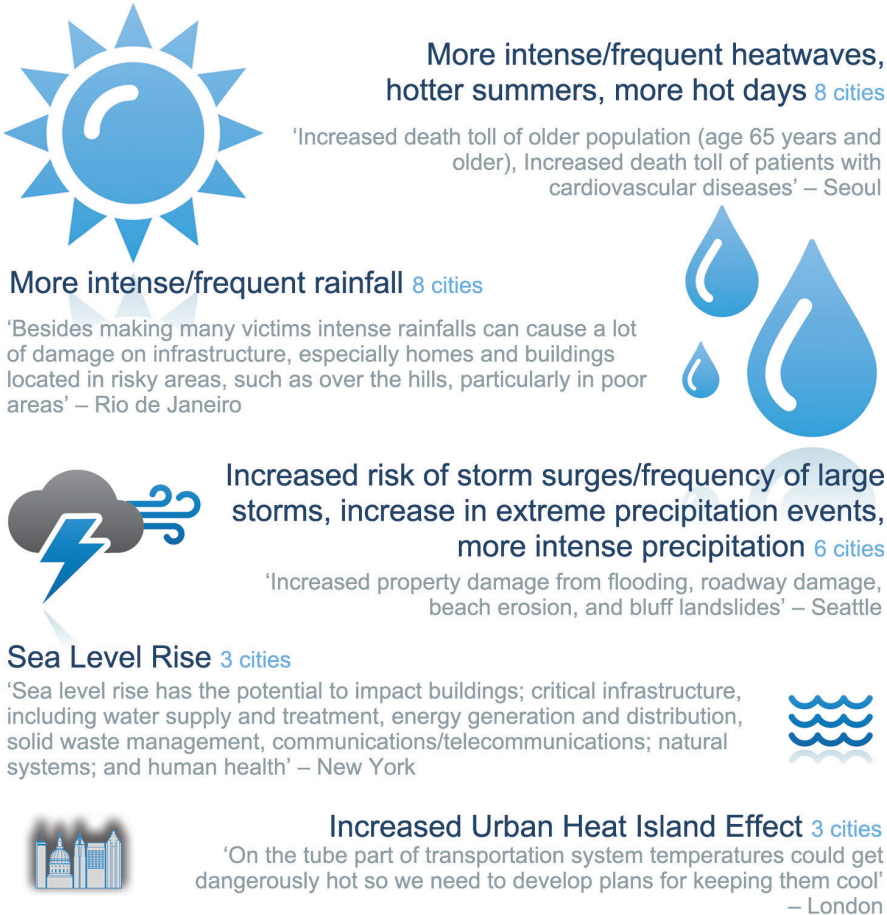


...% Number of regional percentage

Fig. 32: Positive physical effects of climate change identified by cities (% of respondents)



Number of responding cities (24)

Fig. 33: Serious effects of climate change currently faced by cities

The size of the symbols represents the number of cities that report they currently experience the above effects of climate change at a level of risk identified as serious or extremely serious.

Cities as leaders in climate change fight

Climate change is widely recognized as one of the most serious challenges the world faces, with consequences that go far beyond its impact on the environment alone. It is no longer a question of 'if' we have to move into a low-carbon energy future but 'how' we will get there.

Despite a complex array of challenges, it is encouraging to see that both C40 cities and non-C40 cities are (voluntarily) taking great strides towards shaping the global approach to climate change. An overwhelming number of cities have responded to the CDP Cities questionnaire, highlighting cities' commitment to sound disclosure and climate change. Cities that measure and analyze their emissions will be in a better position to manage them and adapt to new circumstances. Each city is a frontrunner in the combat against climate change in its own right.

Although it is encouraging to see that many cities have articulated a strategic vision around energy & climate and have developed GHG reduction emissions targets and innovative measures, it is only through a collective effort that climate change can be seriously contested.

Yvo de Boer

Special Global Advisor, Climate Change and Sustainability
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4

Voluntary Cities

“The City of Kaohsiung has positioned sustainability as ‘one of the core policy objectives’ for the overall city development”

Kaohsiung

“The Edina City Council has created an Energy and Environment Commission, significantly expanding Edina’s commitment to comprehensively address environmental and energy issues.”

Edina

Burlington’s emissions reduction plans were “created through a cross-sectoral, multi-jurisdictional process involving government officials, community stakeholder group leaders and experts.”

Burlington

In addition to the 42 C40 cities that have responded to the CDP Cities 2011 questionnaire, a further 6 non-C40 cities have voluntarily reported to the CDP. Throughout this chapter we refer to these cities as “voluntary” cities. Voluntary cities are Kaohsiung and Taipei (East Asia), Burlington, Edina and Las Vegas (North America) and Dublin (Europe). Some of these cities, like Burlington, Edina, and Las Vegas, participated in the CDP Cities Pilot program in 2009. The other cities are new to CDP this year. City sizes vary strongly, from 47,000 inhabitants (Edina) to 2.6 million inhabitants (Taipei). However, by reporting voluntarily to CDP, these cities have all demonstrated a strong commitment to transparency and climate action.

Climate change is high on the radar of voluntary cities

In 4 cities, overall responsibility for climate change lies at the mayoral (or equivalent) level. Where climate change is not overseen by the mayor, strong governance structures are in place. In Burlington, for example, responsibility for climate change sits not with the mayor but rather with a Climate Action Planning team. In addition, most voluntary cities have articulated energy & climate programs and have incorporated GHG reduction emissions targets into urban master planning.

Voluntary cities show strong leadership on city government emissions

All cities report GHG emissions for local government operations. On average, these cities report more recent emissions data than the C40 average, with the majority choosing either 2007 or 2009 as their accounting year. It is encouraging to

see strong evidence that cities beyond the C40 are demonstrating leadership and commitment to measurement and disclosure.

Measurement methodology varies between cities. 3 reporting cities utilize the ICLEI protocol, while the other cities use either an IPCC-derived methodology or a proprietary approach. Voluntary cities all include buildings in their analyses of their own emissions, and a majority of cities include emissions from the municipal fleet, street lighting, and traffic lighting. 2 cities report Scope 3 emissions. They both calculate their emissions from employee commuting. Only 1 city has its city government operations emissions data externally verified.

Voluntary city governments have set targets for reduction of emissions

5 voluntary cities are committing themselves to GHG reduction targets for city government operation emissions. Interestingly, voluntary cities differ from C40 cities in two ways. Firstly, voluntary cities on average set shorter targets: 4 cities have set targets that are designed to be met within 15 years. Secondly, when annualized, targets of the voluntary cities fall below the C40 average. Targets of voluntary cities equate to less than 1.7 percent per year, as opposed to an average of 2.3 percent per year for C40 cities.

Like C40 cities, voluntary cities apply a wide range of measures in order to achieve targets. These cities particularly focus on retrofitting of buildings and the upgrading of street lighting. The most popular ways to reduce emissions from transport are by encouraging employees to change

Fig. 34: Emerging practices from voluntary cities in climate change governance

	Burlington	Edina	Kaohsiung	Las Vegas	Taipei
Highest level of responsibility for climate change	Team-based approach	Chief executive of the city	Chief executive of the city	Chief executive of the city	Chief executive of the city
Incentives for management of climate change issues	No	No	No	No	All employees are entitled to non-monetary recognition

modes (e.g. bicycle over car) and introducing alternative fuel fleets (e.g. hybrid cars and buses). However, few voluntary cities have a grasp of the financial impact or GHG reduction potential of measures. Having an understanding of the GHG reduction potential alongside cost can enable cities to identify the GHG reduction efforts with maximum returns.

Community emissions inventories vary across voluntary cities

3 voluntary cities measure and disclose community related emissions. Comparable to C40 cities, emissions data collection and management are conducted in different ways across different cities. Kaohsiung City, for example, makes use of IPCC guidelines for their emissions, subdivided into different categories, while Burlington uses the ICLEI methodology together with the Clean Air and Climate Protection software tool.

As with C40 cities, an important methodological area of concordance between cities is the boundary definition for community emissions profile. Every city that reported its community emissions identified the “geopolitical area” of the city as its boundary. None of the voluntary cities report emissions by scope. None have their community emissions verified by a third party.

Across both C40 and voluntary cities, the physical risks of climate change have captured the attention of city governments

5 voluntary cities state that current and/or anticipated effects climate change present significant physical risks to their city. 5 cities have taken steps to identify these risks through risk assessments. Drought and heat topped the list, with 4 cities reporting risks due to warming temperatures.

“The city is currently reviewing new software tools that will facilitate data integration, information sharing across different departments and communication of GHG emission data to the City Council and residents.”

Edina

“Ever since 2008, we have appropriated budget for energy saving and carbon reduction projects, and for the expenses of increasing or replacing energy saving equipment in government agencies & schools.”

Taipei

“The City of Las Vegas contracted with a software provider to deliver an energy management solution to track energy consumption across the organization. This software program provides a centrally and securely managed repository of all (GHG) emissions, environmental and energy activities and associated emissions for reporting and real-time view of progress.”

Las Vegas

“The City of Burlington has conducted a cost-carbon-benefit analysis to highlight the top strategies of a list of 200 generated through an intensive stakeholder engagement process.”

Burlington

Fig. 35: Risk profile of voluntary cities

	Burlington	Edina	Kaohsiung	Las Vegas	Taipei
Identified physical risks from climate change	Yes	-	Yes	Yes	Yes
Compounding factors that may worsen physical effects of climate change	Largest urban area in State of Vermont	Projected considerably warmer and drier climate, especially in summer	Over-development along the coast (erosion, impacts of sea level rising)	Desert location	-
Threat to ability of businesses to operate successfully	Increased flood risk could imperil many farms located in low-lying floodplains	-	Flooding affects water supply, transportation	Water shortages and increased aridity impact leisure and hospitality	-
Other risks	Increased demand for social services	Climate change and demographical changes (aging population): health risks, isolation	Regulation: major emission sources are to report GHG emissions and energy performance		-

Cities consider climate change a serious enough threat that many of them report a potential impact on local businesses

Voluntary cities report that the potential impacts of climate change could threaten the ability of businesses to operate successfully in their city. Potential impacts mentioned are damages to water supply, infrastructure, buildings and agriculture due to floods as well as drought affecting water supply, energy and food prices and the tourism industry.

4 cities indicate that they have a plan for increasing their city’s resilience to the expected physical effects of climate change. Responses include emergency preparedness plans, the management of river catchment areas, strengthening infrastructure including drainage works and awareness campaigns on integrated water control.

The Kaohsiung City Government is setting up a database of the vulnerable and sensitive areas for the city. The database is expected to be the reference for future urban development and disaster prevention.

“Water shortages and increased temperatures will negatively impact the tourism industry. However, it is likely that outdoor recreational activities will be hit the hardest by climate change.”

Las Vegas

“Decreased snow pack makes for increased flood risk in spring, as larger amounts of water are expected to melt in a short amount of time. Decreased snowpack also adversely affects Vermont’s ski tourism, a large source of revenue across the state.”

Burlington

66%

of voluntary cities identified opportunities such as: longer growing season, fewer freezes, less extreme freezes

“Taipei City is located in the Taipei Basin in northern part of Taiwan. It is bordered by the Xindian River on the south and the Danshui (Tamsui) River on the west, with the Keelung River meandering slowly across the city from east to west...Although these three rivers have been extensively embanked in the past decades, Taipei city is still vulnerable to flooding.”

Taipei

Conclusions

In 2002, when CDP first began inviting global companies to report their climate change-related information publicly, many were skeptical. Less than half of the companies responded, and the quality of the responses was, in the words of CDP's first report, "highly variable."

C40 cities, by contrast, have set a high standard in their first year of reporting. The results from the CDP Cities 2011 report showcase an encouraging movement by many of the world's largest cities: to assess their liabilities, to act to reduce those liabilities, and to publicly disclose their progress and actions.

The results evince a strong start but also indicate a number of areas where cities need more support. National governments, non-governmental organizations, and the private sector can all work to help cities by:

- Improving and standardizing GHG measurement methodologies. Results show cities are using many different methodologies to guide them in their GHG measurement activities. City governments will benefit from coordinated efforts to standardize these protocols to make measurement of emissions

easier, more transparent, and more comparable between cities. Much work is already underway to improve these protocols by various bodies.

- Accelerating development of robust data management software. The spreadsheet is the tool of choice for tracking and managing emissions, and it may remain this way for some time. But as more robust software tools for managing GHG emissions emerge, city governments will have more options from which to choose.
- Enabling financial forecasting related to climate change investment. City governments, like many entities, are struggling to put clear numbers on the investments needed to achieve their GHG reduction targets. Technical assistance and private sector input might help cities to improve their ROI on climate change projects.
- Creating better tools for city-level risk assessment. City governments are leading the way to analyze the risks from climate change in their regions. The international community can support these efforts by offering better tools, including specific risk assessment methodologies for urban areas.

- Adding value through city emissions data validation. In the private sector, data validation and verification is becoming fundamental for establishing credibility with key stakeholders. An emerging number of cities indicate that all or part of their emissions data (city government operations and / or city-wide emissions) is verified to some degree.

Climate change is the greatest challenge of this century, and cities have a front-row seat. Each city will meet the challenge in different ways, as befits its individual circumstances. By arming cities and their stakeholders with high-quality data, CDP strives to make the challenge a little bit easier to overcome.

Appendix

Fig. 36: Table of emissions, by city

City	Response status	Voluntary City	City government operations emissions		Community emissions	
			Year reported	Total emissions (in metric tons CO ₂ -e)	Year reported	Total emissions (in metric tons CO ₂ -e)
Addis Ababa	AQ		1987-1993			
Amsterdam	NP					
Athens	NR					
Austin	AQ		2009	5,843,695		
Bangkok	AQ					42,750,000
Barcelona	NR					
Basel	NR					
Beijing	NR					
Berlin	AQ				2007	19,948,000
Bogota	AQ				2008	15,921,690
Buenos Aires	AQ		2008	789,665	2008	14,893,181
Burlington	AQ	Voluntary	2007	23,285	2007	432,423
Cairo	NR					
Caracas	AQ				2000	980,040
Changwon	AQ				2006	6,331,097
Chicago	AQ		2009	1,072,000		36,200,000
Copenhagen	AQ		2009		2009	2,654,129
Curitiba	AQ				2008	
Delhi	NR					
Dhaka	AQ		2010		2010	
Dublin	NP	Voluntary				
Edina	AQ	Voluntary	2007	25,168		
Hanoi	NR					
Heidelberg	AQ					
Ho Chi Minh City	NP					
Hong Kong	AQ				2008	42,000,000
Houston*	NR		2005	1,786,108	2007	39,066,427
Istanbul	NR					
Jakarta	AQ		2010		2005	33,250,000
Johannesburg	AQ		2007	276,600	2004-2007	19,543,372
Kaohsiung	AQ	Voluntary	2009	103,574	2009	37,254,450
Karachi	AQ					

* Could not be included in the analysis of this report due to publication timeline

AQ Answered questionnaire

NP Answered questionnaire but response not made publicly available

NR No response

Appendix

City	Response status	Voluntary City	City government operations emissions		Community emissions	
			Year reported	Total emissions (in metric tons CO ₂ -e)	Year reported	Total emissions (in metric tons CO ₂ -e)
Lagos	AQ		2008-2010			
Las Vegas	AQ	Voluntary	2009-2010	132,040		
Lima	AQ		2009			
London	AQ		2008	234,000	2008	45,000,000
Los Angeles	AQ		2008	817,989		
Madrid	NR					
Melbourne	AQ		2009-2010	53,341	2005-2006	6,430,000
Mexico City	NR					
Milan	AQ					
Moscow	AQ		2008			
Mumbai	NR					
New Orleans	AQ		2007	4,652,867	2007	4,467,896
New York	AQ		2009	3,472,512	2009	49,301,948
Paris	NR					
Philadelphia	AQ		2006	491,046	2006	15,123,513
Portland	AQ		2006-2007	112,942	2009	8,026,995
Rio de Janeiro	AQ				2005	11,706,000
Rome	NR					
Rotterdam	AQ				2009	27,920,000
San Francisco	NP					
Santiago de Chile	NP					
São Paulo	AQ		2003	49,556	2003	15,738,240
Seattle	AQ		2009	230,890	2008	6,771,274
Seoul	AQ				2008	50,330,356
Shanghai	NR					
Stockholm	NR					
Sydney	AQ		2009-2010	47,941	2005-2006	5,457,064
Taipei	AQ	Voluntary	2009			15,549,687
Tokyo*	AQ		2009-2010	2,057,775	2008-2009	65,904,620
Toronto	AQ		2004	1,598,511	2004	24,400,000
Warsaw	AQ				2007	10,727,200
Yokohama	AQ		2008-2009	650,008	2007-2008	20,573,000

* Note this figure has changed from a previous version of the report due to an amendment to Tokyo's response. This version is updated as of June 10 2011.

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