**CAM 2.0 Report: Overview**

**CAM 2.0:** The Climate Action in Megacities survey is a quantitative study of efforts to reduce GHG emissions and improve urban resilience to climate change. It does this by measuring the number of 'actions' each city has taken across seven different sectors

**Results:** The results show that C40's Mayors represent over 600 million people and in the two years since we last surveyed our members, the numbers of actions they have collectively taken **has significantly increased to over 8,000.**

**Sharing information is working**

- **Acceleration of action:**
  - In 2011, just **6 C40 cities** reported cycle share schemes. In 2013, **36 C40 cities** have now followed the example of Paris and others – a **500% increase** and **80% of C40 cities** have now introduced cycle lanes
  - In 2011, **20 cities**, just over half of those surveyed, were introducing LED street lighting. In 2013, more than **90%** of responding cities report that they are taking action to reduce emissions from outdoor lighting.
- **Breaking boundaries:**
  - Following the lead of cities like Curitiba and Bogota in South America, **35 C40 cities** now have or plan on developing BRT (bus rapid transit) systems and **57%** of these are now in the more developed northern hemisphere.

**More accountability**

- **Increased participation:** 94% of C40 cities participated in the CAM 2.0 survey compared to **61%** in the first report in 2011. *C40 is meeting Mayor Bloomberg's goal to increase city participation and move towards performance-based membership standards.*
- **Process Improvement:** high response rates for both actions and powers reflect the hard work of cities, C40 staff, and partners

**Growing need to act**

- **Cities perceive risks:** As 98% of reporting cities indicate that climate change presents significant risks to their city, C40 cities are taking a global lead in tackling climate change.

**Opportunities to catalyze further action**

- **Scaling action:** mayors have taken the lead but there is massive continuing opportunity to scale up emissions reductions and improve resilience. With 41% of actions currently in effect on a transformative scale, there has been a 22% increase in actions being reported at a transformative scale between 2011 and 2013.
- **Future emphasis:** The finance sector has emerged as a leading area for future climate action, with 62% of C40 city action currently at the "proposed" or "pilot phase". Member cities intend to expand the scale of efforts in over two-thirds of existing actions on adaption.

**Top areas for current and future action:**

- Reducing flood risk
- Climate adaptation planning and preparation

- Increasing renewable/low-cardon
- Reducing vulnerability to heat stress
- Preservation and improvement of bio-diversity and natural assets
- Developing cycle-friendly infrastructure
- Stormwater management
- Improving water consumption efficiency
- Encouraging sustainable agriculture
- Transportation demand management and other transit oriented development

## CAM 2.0 Report: Transportation

**Overview**

Transportation in cities is an essential aspect of everyday life for residents, businesses, and visitors – connecting people to their jobs, their schools, their homes and their communities. C40 cities are using their power to make important and significant strides to improve emissions and climate risks.

**Breakdown of Assessment Areas**

- Private transport: includes walking, cycling, cars, taxis, rickshaws, trucks, and private boats
- Mass transit: includes buses, rail, metro, trams, and in-city ferries.

**Key Findings and Notable Points**

Transportation

- Cities are taking 1,534 actions in transport, 873 of which are in private transport, 661 on mass transit.
- 49% of reported actions are to promote walking and cycling – more than any other action area in private transport.
- Private motorized transport accounts for less than a third of journeys, but contributes 72% of emissions
- Latin America cities rely on buses for 35% of journeys – the largest proportion reported in any region.
- Two thirds of mass transit actions are focussed on bus services
- East Asian cities reported the highest proportion of action in effect overall and at the transformative city-wide scale
- 60% of the 10 most common actions in private transport focus on cycling and 424 actions are being taken to promote walking and cycling combined.

Cycling

- C40 cities are implementing nearly 400 actions to increase cycling and walking
- Cycling actions account for nearly 60% of the reported top 5 actions
- High GDP cities are investing to catch up with low GDP cities on cycling
- The popularity of actions related to walking and cycling can be attributed to the power cities have over pavements/sidewalks, city roads and cycling.
- More cities are reporting action to install dedicated cycling lanes than any other approach to promote cycling.

Private Vehicles

- Cities are taking 201 actions to improve the fuel economy of private vehicles.

- 219 actions are in place to reduce the carbon intensity 219 of private vehicles.
- Cities show a strong preference for electro-mobility (104 actions) as a method for reducing the carbon intensity of motor vehicles.
- The three most common actions related to reducing vehicle carbon intensity are all directly connected with expanding the use of electric vehicles, with 28 cities taking related action.

Mass Transit

- C40 Cities are taking 230 actions on buses.
- Improving bus engine technology is the most common climate action cities are taking to address the carbon impact of public buses.

Rail, Metro and Trams

- The most common action area reported is increasing the reach of rail and tram services.
- The most popular mass transit actions relate to improving vehicle fuel economy

## CAM 2.0 Report: Energy Efficiency

**Overview**

Energy used to light, heat and power buildings and public spaces makes up a significant portion of total $CO_2$ emissions in many cities. At the same time, energy efficiency measures offer strong financial returns on investment through energy cost savings. Together, these factors make energy efficiency action an attractive path for C40 Cities to take numerous actions on both buildings and outdoor lighting. The most popular activities are also the most simple, cost-effective and logical: insulating buildings and using more energy efficient lighting.

**Breakdown of Assessment Areas**

Outdoor Lighting

- Actions to reduce emissions from streetlights and to introduce smart streetlighting technology.

Buildings

- Actions on energy efficiency retrofits, energy building monitoring, and reducing emissions from industry.

**Key Findings and Notable Points**

Outdoor Lighting

- 90% of responding cities are taking action on outdoor lighting
- The most popular action with regard to lighting is striving for more efficient luminaires (e.g. LED)
- Types of lighting vary by GDP per capita:
    - Sodium lighting is the most common lighting technology in C40 cities (up to 91% in cities with very low GDP)
    - Cities in the very low, low and medium GDP brackets use increasingly more incandescents as part of their energy mix. That proportion is replaced by LEDs in the high and very high GDP brackets.
- Power over outdoor lighting (both streetlights and signals) are consistently high across all

regions
- The transition to more efficient luminaires is both the most common current action and the one most cited for expansion, followed closely by timed (or "smart") street lighting.

Buildings

- Actions to improve energy efficiency in buildings account for more than 1/5 of all activities reported by C40 cities, across all sectors.
    - Of these activities, 69% focused on reducing energy demands in buildings, regardless of city wealth.
        - The top activity? Insulation.
        - Across the board, cities are also taking extensive actions to monitor and manage their energy usage, using data from audits, benchmarking and smart meters to inform action
    - Other activities focus on promoting on-site low carbon energy generation (renewable power, lower $CO_2e$ fuels)
        - The most established action is switching from oil to natural gas. But cities are also increasingly exploring solar energy for low and zero carbon on-site energy generation.
- Asian cities report the highest number of actions to cut emissions in the Buildings sector. But these actions tend to have a transformative (citywide) impact in Europe and North America
- 70% of cities have strong powers (ownership, policy setting, etc.) over municipal buildings
- Nearly half (47%) of actions taken were projects or programs, while nearly one-third (30%) were delivered through policies and regulations. Relatively few actions (5%) involved procurement.
- Aside from insulation, three of the four most commonly reported actions for future expansion involve measurement and reporting.
- A number of cities reported having influence over budgets for privately owned buildings – both private single family (19%) and commercial and industrial buildings (15%)
- Purchasing green power is the most frequently cited action for further expansion, with a total of 16 actions identified as either in proposal or pilot phase.

**Examples from C40 Cities**

Many C40 cities are advancing citywide replacement programs for their outdoor lighting systems.

**Sydney**: The city has initiated a three-year project costing AU$7 million to replace more than 75% of city-owned lights. This program is projected to reduce the greenhouse gas emissions from the city's outdoor lighting by 51%, and save nearly AU$800,000 per year in electricity costs.

**Philadelphia:** The Energy Works, AFC First, and Keystone programs help make low-interest loans available to assist residential and commercial building owners in Philadelphia with planning, financing, implementing and assessing energy saving projects through energy efficient building retrofit.

# CAM 2.0 Report: Energy Supply

## Overview

Energy consumption – and the associated greenhouse gas impact – is exacerbated by growing urban populations and city dwellers' increased access to electricity. To combat the climate impact of rising demand, cities can either increase the efficiency of existing energy supplies, or develop new, low and zero carbon energy sources. Although mayors exercise less direct control over energy supply than other sectors, a plurality of C40 cities (42%) manage the make-up of the municipal energy supply and more than 4/5 have strong or partial power over distributed generation. For this reason, many are turning to solar and waste-to-energy for low carbon fuel.

## Breakdown of Assessment Areas

Low-Carbon and Renewable Energy Generation

- Providing incentives: Actions that focus on financial tools that stimulate low carbon energy generation.
- Increasing supply: Actions that identify and develop low-carbon generation methods.

Improving the Efficiency of Conventional Energy Generation

- Optimizing heat generation: Actions that minimize the emissions impact of generating heat (for example, district heating or cooling systems).
- Optimizing existing and new power stations: Actions that improve the efficiency of current energy generation methods, especially new or old power stations.

## Key Findings and Notable Points

Low-Carbon and Renewable Energy Generation

- Cities have the least control or influence over retail power. But they do exercise power over the make-up of the municipal supply (42%), distributed generation (82%) and energy purchases for public buildings (94%).
- Solar electricity (e.g. PVs) accounts for the most low carbon/renewable action in cities, followed closely by solar heating.
    - South and West Asian cities are leading the way with the most actions in this area.
    - Interestingly, cities are making headway on solar even though few have *strong* power in the area of distributed generation.
    - Projects and programs are the most common deliver lever for solar energy, suggesting cities are using alternative means to deliver action and complete their own projects without strong power.
- Waste-to-Energy is a cross-sector success and presents the highest proportion (64%) of transformative and significant actions. These include:
    - Generating low carbon energy through anaerobic digestion at waste treatment facilities.
    - Capturing methane gas at landfills.
- More than half of C40 cities have district heating networks, but there cities are located in only three regions: East Asia, Europe and North America, with Europe demonstrating the most connectivity (50% of buildings).
- More than half of the low carbon and renewable energy generation actions are at the proposal or pilot stage, indicating that the potential carbon impact of these actions has yet to be fully realized.

- Most cities report the three most common existing actions – solar electricity, solar heat and anaerobic digestion – for further expansion, indicating these trends will continue.

Improving the Efficiency of Conventional Energy Generation

- Although the actions in this area are fewer than the low and zero carbon energy generation category, they tend to be more transformative.
- Fuel-switching is the most common means to improve plant performance, followed by the capture of waste heat.
- Fuel switching and waste heat capture present the most potential for scalability across the C40.

**Examples from C40 Cities**

**Mexico City**: The city is actively capturing and using biogas in Stage IV of the Bordo Poniente Landfill. Due to the landfill's characteristics, including its size, amount of waste stored, and biogas produced, the Bordo Poniente Landfill has obtained and confined around 72 million tons of urban solid waste in an area of 375 hectares.

**Chicago:** The city has a goal to upgrade or repower 21 Illinois power plants, reducing 2.5MMTCO2e. Implementation of a cap and trade system also helps to achieve this goal.

## CAM 2.0 Report: Adaptation & Water

**Overview**

C40 cities are recognizing and responding to the climate change risks most widely threatening urban areas: flooding, heat and water stress. These risk areas have substantial implications for the future health and well-being of urban populations, including the water supply to cities. By taking action in climate adaptation and water management, cities will continue to improve their resilience to climate change, and be able to overcome periods of sudden or long-term climate stress.

**Breakdown of Assessment Areas**

Climate Adaptation

- Planning and preparation: actions identifying and planning for climate risk to handle crises and reduce impact on urban populations
- Flood risk reduction: actions minimizing the potential for and impact of flooding
- Heat & water stress management: reducing vulnerability to heat and water stress

Water management

- Clean water supply: actions that ensure a resilient water supply by identifying and diversifying water sources, providing access to water
- Demand management: actions promoting water conservation and addressing water leakage in infrastructure
- Stormwater & wastewater: actions that capture, channel and treat stormwater and wastewater

**Key Findings & Notable Points**

Cities are taking climate adaptation seriously – 98 percent of cities recognize it as a threat that presents significant risk, and they are allocating funding (80 percent of cities) and staff resources

(83 percent of cities) to develop solutions.

C40 cities are taking steps towards mitigating their risks at a large – and accelerating – scale. Nearly half (47 percent) of the actions C40 cities have already taken are on a citywide scale, and 85 percent of cities intend to expand upon programs they've already implemented.

Eighty percent of cities taking action on climate adaptation have put in place early warning systems and crisis management strategies, and nearly all (92 percent) have assessed flood risk.

Cities are approaching the question of climate adaptation in a number of ways, including weighing potential social (81 percent) and economic (77 percent) consequences, as well as measuring potential economic opportunities (91 percent).

Climate adaptation planning is the area with the most proposed action, reflecting a strong pipeline of future actions and potential for innovation.

**City empowerment angle:** Cities are uniquely equipped to act when it comes to climate adaptation & water management:

- Cities have strong control over the assets/functions that are essential to climate adaptation and water management action, including planning, roads, parks and open space, and municipal buildings.
- In land use planning, a majority of cities have operational control of actions as well as powers to set and enforce policy. The high degree of control that mayors exert over this function enables cities to take measures in promoting climate adaptation planning, preparation and implementation at significant scales.

**Threats:** Cities expect some of the most significant threats to come from heat and water stress – every reporting C40 city is experiencing more hot days, and most of them seriously expect heat and water stress risks now or in the future.

- 80 percent of reporting cities consider heat risks to be extremely serious
- 28 percent of cities anticipate drought risks – yet more cities perceive risks related to increased rainfall rather than decreased rainfall
- To combat these risks, cities like Chicago, Philadelphia and Sydney are increasing permeable area and increasing area covered by soil and plant systems.

Of the 51 C40 cities located near bodies of water, the vast majority is taking action to combat flood risk, including site restoration and greening and flood storage. Other actions in water management include stopping leaks, permeable paving, green roofs, water recycling, using rainwater, watching for peaks in water usage (like Washington DC), using water data monitoring systems (like Tokyo) and replacing old pipes (like in Mexico City).

**Examples from C40 Cities**

**Chicago:** The city has achieved a 20 percent increase in permeable area and added 32,000 square feet.

**Philadelphia:** The city's water department plans to replace at least 1/3 of all impervious surfaces with soil and plant systems that intercept stormwater and allow infiltration or evaporation

**Sydney:** the city provides 'Living Color Displays' – vegetation cover in public squares – during spring and summer to provide cooling in hot weather.

**Mexico City:** In 1986, Mexico City had some of the worst air quality in the world, negatively affecting the health of its citizens. Since then, the city has operated an Automatic Ambient Air Monitoring Network to help quantify the magnitude of the problem in an effort to ameliorate it. In 2012, Mexico City's Secretary for the Environment launched ProAire, a program to reduce pollutants, which won a C40-Siemens City Climate Leadership Award in 2013.

**London:** The Drain London project has mapped flood risks for the entire city from the various nearby bodies of water, while London's Thames Estuary 2100 program has assessed risk management options to protect London against various magnitudes of sea level rise.

## CAM 2.0 Report: Waste Management

### Overview

Waste management is a key area for climate action as methane emissions released during waste decomposition are more than 20 times more powerful than carbon dioxide as greenhouse gases. Moreover, out of all the climate action areas, waste management is the sector most controlled by mayors.

Waste management had the largest percentage of actions at the transformative stage, with 56% of cities' waste-related actions implemented on a citywide scale. 53 C40 cities are taking 1,039 actions. For the additional 44% of actions, 86% of C40 cities intend to scale up waste management actions towards a citywide scale that are not already there.

### Breakdown of Assessment Areas

1. Waste reduction – 40% of waste actions reported
2. Waste collection – 10% of waste actions reported
3. Waste treatment – 50% of waste actions reported

### Key Findings and Notable Points

1. **Waste reduction:** 65% of actions in the waste reduction area are in the transformative stage and are being delivered citywide.
2. **Waste collection:** Cities such as Athens, Copenhagen, Seoul, Tokyo and Mexico City have introduced single stream waste collection so different types of waste are collected on different days to increase separation and recycling.
3. **Waste treatment:** 24 C40 cities are generating energy from their landfill gas.

<u>The Economic Angle</u>

**GDP and Waste Management:** C40 cities with lower GDPs tend to operate only small-scale recycling programs and lower rates of waste-to-energy technology use. This may be due to the high levels of investment needed to implement energy converting technologies.

**Waste collection fees:** 16 C40 cities are implementing waste collections fees for residential buildings including Lagos, Barcelona, Hanoi and Sydney. This system offers tiered fees based on the size of deposal bins to discourage high volumes of mixed waste disposal thereby encouraging waste separation at the original source of disposal.

### Examples from C40 Cities

**Rio de Janeiro:** The city is currently conducting a pilot program that generates between 15,000$m^3$ and 18,000$m^3$ of fertilizer per year by separating and composting organic matter and

then using it in Rio's City's Reforestation Project. The project is intended to expand upon successful assessments of the pilot stage.

**Portland:** To encourage saving money and reducing waste, the city partnered with Multnomah County, Oregon's Aging and Disability Services to offer a series of presentations in low-income communities focused on how to re-use commodities. As a result, the city had conversations with 5,000 residents about fixing and maintaining, sharing, repairing and purchasing durable equipment.

## CAM 2.0 Report: Finance and Economic Development

**Overview**
It is vital that we not only highlight how cities are identifying, advancing, and supporting innovative financing solutions for sustainable urban infrastructure investments, but also how cities are achieving this while driving local economic development through the promotion of green industries and clean technology clusters.

While there are financial costs associated with taking climate change action, there are often also significant economy-wide benefits. In order to ensure effective climate action, investment and access to capital is required. By understanding the fiscal approaches cities are employing across the global C40 network, individual cities can identify appropriate financial tools and adapt them to achieve local investment in emissions and risk reduction activities.

**Breakdown of Assessment Areas**
Finance

- Low carbon infrastructure: actions that provide a range of financial instruments to fund emissions and risk reductions in cities.

Economic Development

- Green industries: actions that encourage the development of private enterprises with production methods and products/services that are low carbon and resource efficient.
- Clean technology clusters: actions that increase the size of urban green economies through city support, research and private-sector-partnering by co-locating clean technology companies.

**Key Findings and Notable Points**
C40 cities are pursuing 167 actions in the finance and economic development sector.
Green manufacturing, together with support for clean technology clusters, are the most commonly reported actions.

Over 50% of future climate actions in economic development will be in the pilot stage, suggesting strong innovation and scaling potential.

25% of cities indicated they have their own municipal bank, which suggest city autonomy to make investment decisions that align with their climate action strategies.

47% of cities have established their own funds to invest in energy efficiency, renewable energy or carbon reduction projects. Cities report strong powers to set policy for property or municipal taxes; as well as to tax local businesses to create revenue for sustainable infrastructure investments.

City empowerment angle: *Cities are using their powers to promote a low carbon economy*

- Cities report an even mix of power (from limited to strong) over the ability to borrow from national governments through multilateral/bilateral climate funds.
- Cities have access to a variety of financing mechanisms, including property or municipal taxes, business taxes, bonds, capital borrowing, and financing through municipal banks. It is unclear, however, how these different mechanisms have been utilized to support climate change action.

- A high number of cities have set up their own investment funds, suggesting cities are seeking to establish stable, on-going funding sources to support climate change action.

Green economic investment angle: *Green economic development remains a top priority*

- Cities are placing a strong emphasis on green businesses (e.g. clean tech clusters and green industry) to encourage future economic growth: over half of the total actions currently associated with economic development are in the pilot stage.
- When pilot totals are combined with reported actions in the proposal stage, C40 cities report that 69% of all actions still have considerable room to scale. This indicates that C40 cities plan to continue prioritizing support for clean tech clusters, green industry and green manufacturing.
- ESCo financing, loans and fiscal incentives were reported as the most commonly used form of financing for future and planned low carbon infrastructure actions in cities.

## CAM 2.0 Report: Sustainable Communities

**Overview**

As cities continue to grow and evolve, they must balance economic vitality, livability, and resource constraints, while facing the impacts of climate change – an ever-increasing challenge. Insights into integrated urban planning, enhancements in information technology, and progress in establishing stronger local food sources are key factors in the creation of sustainable communities, making cities healthier, and more livable.

**Breakdown of Assessment Areas**

Community-Scale Development

C40 cities are implementing more than 350 actions on sustainable community development, with a trend towards more transformative or significant actions (especially in land use and the environment) rather than pilots or proposed actions. Energy performance rating in new buildings is the most popular community-scale development, with only eight cities (out of 54) responding that they are not taking action in this area. Building codes have real power. Indeed, half of all community scale development actions are delivered using regulatory levers.

Information and communications technology (ICT)

Increasing access to the Internet for city residents is the most common ICT action. Modernizing the public transport ticketing and travel information is also amongst the most frequent actions, with 84% of reporting cities taking action on smart ticketing. Cities with very low and very high GDP per capita have the largest pipelines of emerging ICT actions.

Food and Agriculture
32 C40 cities have programs to support community gardens or allotments, and among those, 56% are transformative or significant (as opposed to just a pilot project). 76% of reporting cities are taking action to promote organic/sustainable farming. Agricultural initiatives, such as vertical farming and rooftop gardening, are emerging but not yet scaled significantly in most cities. Wealthier cities are less food self-sufficient because they tend to devote very little land to agricultural production and so may be largely reliant on food imports. (see page 230 for chart).

Transit:
Over half of responding cities (27 of 51) have measures in place to locate new developments in zones with strong mass transit connections. 30 cities are expanding existing mass transit to serve the needs of new development.

Land Use and the Environment:
80% of C40 cities have identified major regeneration sites in their city. 78% of reporting cities have tree-planting programs and 67% are delivering large-scale open space.

**Key Findings and Notable Points**

- Cities report pursuing 1,024 community-scale development actions, including a total of 176 actions to reduce emissions from the food and agriculture sector and 348 information communication technology actions.
- 76% of cities intend to expand a community-scale development action already in progress, showing that cities are accelerating their response to climate change.

41% of cities state that smart public transport will be an area for future development.