

# **C40 NET ZERO CARBON BUILDINGS ACCELERATOR**

**How cities are leading the transition  
to decarbonised buildings**

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**2023 Report**

**C40  
CITIES**

# ACKNOWLEDGEMENTS

This report was created in collaboration with officials in the C40 Net Zero Carbon Buildings Accelerator signatory cities, C40 funders, and C40 staff. Thank you to everyone who has contributed to the report and the actions that are driving forward immediate and inclusive climate solutions to achieve the commitments of the C40 Net Zero Carbon Buildings Accelerator. For further information on the C40 Net Zero Carbon Buildings Accelerator, please check out the accelerator [webpage](#).

# CONTENTS

<b>Foreword</b>	<b>4</b>
<b>Introduction</b>	<b>5</b>
<b>Signatories</b>	<b>6</b>
<b>Progress Overview</b>	<b>7</b>
<b>Data Analysis</b>	<b>8</b>
<b>City Progress Summaries</b>	<b>10</b>
<b>Barriers to Achieve the Commitments</b>	<b>46</b>
<b>Conclusion</b>	<b>47</b>



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# FOREWORD

By 2050, nearly 7 out of 10 people are expected to live in cities – more than double the 4.4 billion urban inhabitants of today. As their resident populations grow, cities will need to continue delivering healthy, affordable and low carbon spaces to live, work and grow, while addressing existing inequalities and vulnerabilities in the built environment. In this critical moment for climate action, C40 cities are leading the way to deliver a net zero carbon and resilient future for everyone, everywhere.

The C40 Net Zero Carbon Buildings Accelerator was launched in 2018 ahead of the Global Climate Action Summit (GCAS) in San Francisco, with 19 pioneering mayors committing to decarbonise their cities' buildings. Since then, the accelerator has grown to include 27 signatories working together on increasingly ambitious decarbonisation actions.

As C40 Co-Chair Mayor of London Sadiq Khan reminded us in the 2022 edition of this accelerator report: this must be a decade of action. This year, signatories to the C40 Net Zero Carbon Buildings Accelerator have reported a wide range of innovative and impactful measures in alignment with their commitments to achieve net zero carbon new buildings by 2030, and net zero carbon existing buildings by 2050, while those that have signed the optional commitment for net zero carbon municipal buildings by 2030 continue to use their own properties as opportunities to lead by example. Some cities have gone above and beyond, setting decarbonisation targets and enacting policy and regulation ahead of the already ambitious accelerator pathways.

Cities are also increasingly recognising the importance of a 'whole life carbon' approach which decarbonises across the building lifecycle. In 2021, we launched the new C40 Renewable Energy Accelerator and C40 Clean Construction Accelerator, demonstrating cities' leadership on advancing a just transition across the energy and construction sectors. Signatories to the C40 Net Zero Carbon Buildings Accelerator are also working towards grid decarbonisation and net zero carbon heating and cooling systems, as well as measures to reduce embodied carbon in building materials and processes.

Recent C40 research has highlighted the climate and health detriments of fossil gas. In alignment with C40's mission to halve fossil fuel use by 2030, several C40 Net Zero Carbon Building Accelerator signatories are working specifically to phase out the use of fossil gas in buildings. Investment in climate action is also powering a wave of new green jobs, with more than 14 million already having been created across 53 C40 member cities alone.

Signatories to the C40 Net Zero Carbon Buildings Accelerator are at the forefront of climate action. We congratulate and thank them for continuing to leverage net zero carbon building pathways as a way to reduce social, environmental and economic inequities, and to build a just, inclusive and resilient future.

**Mark Watts**  
**Executive Director of C40**

# INTRODUCTION

Buildings are one of the largest sources of greenhouse gas (GHG) emissions in cities, as well as a significant source of air pollution. By 2060, a further 230 billion square metres of buildings is projected for construction globally, an area equal to the entire current global building stock. Meanwhile, an analysis of European structures has shown us that 75% of today's buildings are likely to still be standing in 2050. Net zero carbon buildings will therefore play a critical role in the action required to halve emissions by 2030 in line with the 1.5°C goal of the Paris Agreement and avoid climate breakdown. Signatories to the C40 Net Zero Carbon Buildings Accelerator recognise this as an opportunity to improve the places we live, work, and occupy on a pathway to net zero carbon and climate resilience.

Compared to business as usual, energy efficient buildings improve health, are more comfortable, create jobs, reduce energy poverty, increase climate resilience, reduce pressures on energy infrastructure, and reduce greenhouse gas emissions. Even where there is ambitious leadership at national or state level, much of the work of built environment and building decarbonisation takes place in cities. The C40 Net Zero Carbon Buildings Accelerator brings cities together to demonstrate collective climate leadership to reduce emissions, foster climate resilience and deliver thriving, liveable cities for all. This report showcases the ambitious actions cities are undertaking to deliver the equitable and inclusive net zero carbon buildings of the future.

A total of 27 cities, including 23 C40 cities, have signed the C40 Net Zero Carbon Buildings Accelerator, pledging to enact regulations and/or planning policy to ensure new buildings operate at net zero carbon by 2030 and all buildings by 2050. To meet these commitments, cities will:

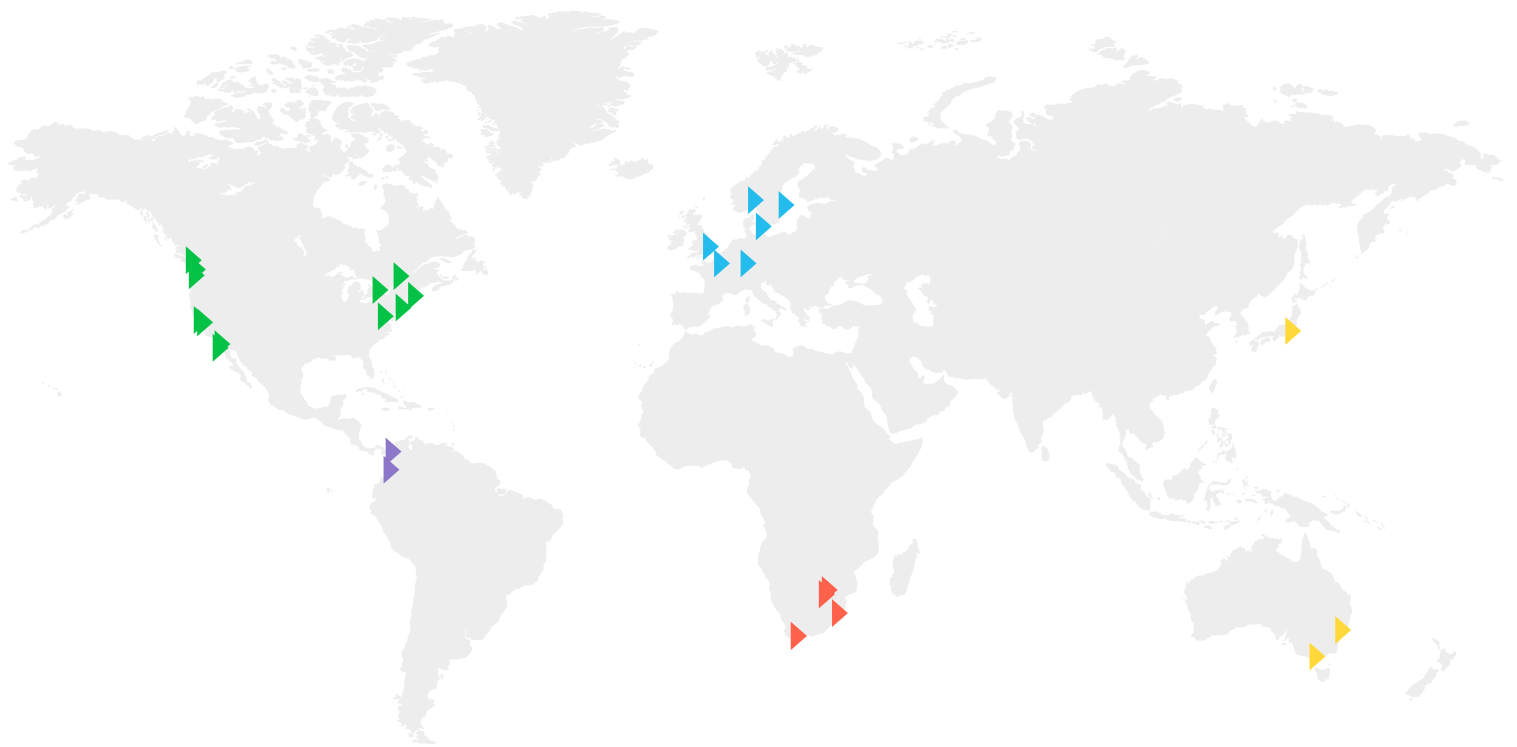
- Establish a roadmap demonstrating commitment to reach net zero carbon buildings.
- Develop a suite of supporting incentives and programmes.
- Report annually on the progress of regulations and policy towards targets, and evaluate the feasibility of reporting on emissions beyond operational carbon (such as refrigerants).

Of the signatory cities, 16 have also signed an optional commitment to ensure all municipal assets they own, occupy and develop are net zero carbon in operation by 2030. To meet this commitment cities will:

- Evaluate the current energy demand and carbon emissions from municipal buildings, and identify opportunities to improve.
- Establish a roadmap demonstrating commitment to reach net zero carbon buildings.
- Report annually on building performance towards targets, and evaluate the feasibility of including emissions beyond operational carbon (such as refrigerants).

Through adopting these commitments, our signatories are placing themselves at the cutting edge of climate action. They are also committed to coalition building, working with national governments, residents, non-state organisations and the private sector – including the 146 businesses and six states and regions that have pledged to deliver net zero carbon buildings through the World Green Building Council's Net Zero Carbon Buildings Commitment.

# SIGNATORIES



- |                |                 |                    |
|----------------|-----------------|--------------------|
| ▶ Cali         | ▶ Melbourne     | ▶ Santa Monica     |
| ▶ Cape Town    | ▶ Montréal      | ▶ Seattle          |
| ▶ Copenhagen   | ▶ Newburyport   | ▶ Stockholm        |
| ▶ eThekweni    | ▶ New York City | ▶ Sydney           |
| ▶ Heidelberg   | ▶ Oslo          | ▶ Tokyo            |
| ▶ Johannesburg | ▶ Paris         | ▶ Toronto          |
| ▶ London       | ▶ Portland      | ▶ Tshwane          |
| ▶ Los Angeles  | ▶ San Francisco | ▶ Vancouver        |
| ▶ Medellín     | ▶ San Jose      | ▶ Washington, D.C. |

# PROGRESS OVERVIEW

By signing the C40 Net Zero Carbon Buildings Accelerator, cities pledge to implement a roadmap for decarbonisation of the built environment in line with the 1.5°C target of the Paris Agreement. This 2023 report highlights signatories' ongoing commitment to delivering ambitious and innovative building decarbonisation actions.

As 2030 approaches, signatories are gearing up in their efforts to ensure that all new buildings operate at net zero carbon – and the impacts are profound. London's 2022 Energy Monitoring Report shows that London Plan policies have more than halved the carbon emissions from new developments compared to meeting national building regulations alone.

Decarbonisation of existing buildings is also picking up pace towards the 2050 horizon, an area where Tokyo continues to break new ground. The city's hallmark cap-and-trade system achieved a 33% reduction in emissions in 2021, and even more ambitious standards are being set for the fourth plan period (2025–2029) – including a 50% reduction requirement for office buildings and 48% for factories.

Whether or not they have signed on to the third optional commitment of the C40 Net Zero Carbon Buildings Accelerator, cities are using municipal buildings to demonstrate their climate ambitions. As of 2021, all municipal new construction and major renovation projects in Los Angeles are all-electric – and rapidly decarbonising as the city transitions to 100% renewable energy. Meanwhile, the city has committed US\$ 30 million for renewable energy and building decarbonisation for municipal buildings.

This year's report also highlights how accelerator signatories are building an equitable and inclusive climate resilient future by focusing on meaningful community engagement and co-design processes. Paris has established a citizen assembly composed of 100 residents which participates in the development of city policies – and the city registered 15,647 comments through the public consultation process held in 2022 for the anticipated Local Bioclimatic Urbanism Plan (PLUb).

Cities are also seeing the benefits of a just transition that provides opportunities for good, green jobs, and continue to develop programmes that empower workers and residents to reap the benefits of building decarbonisation. A study commissioned by Vancouver found that between 2010 and 2020 there was 87% growth in green jobs in the city overall and 146% growth in green building-related occupations specifically.

Although the C40 Net Zero Carbon Buildings Accelerator focuses on operational emissions from energy use in buildings, many signatories are also integrating measures that reduce embodied carbon and support climate resilience. These include strategies and policies to introduce and accelerate the use of low carbon and recycled building materials, support deconstruction over demolition, and promote the use of nature-based solutions such as for shading and cooling in a rapidly heating climate.

Cities continue to express appreciation for C40's peer-learning and technical assistance programmes. In turn, signatories to the C40 Net Zero Carbon Buildings Accelerator act as local and global climate leaders, advancing a decarbonised and resilient future for everyone, everywhere.

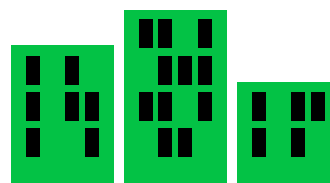
# DATA ANALYSIS

With the launch of the C40 Net Zero Carbon Buildings Accelerator in 2018, signatory cities leaped into action, rapidly developing and implementing policies in line with their commitments. Over the five years since the accelerator's launch, signatories have continued to build on that momentum, with more cities each year implementing policies and programmes that put them on track to meet the targets.



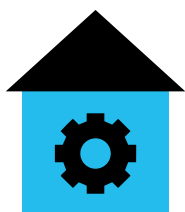
**70%**

of C40 signatory cities have already implemented/enforced building energy regulations, codes or policies on a mandatory pathway to achieve net zero carbon new buildings no later than 2030.



**22%**

of C40 signatory cities have already implemented/enforced mandatory energy or emissions performance standards for existing buildings (on a pathway to net zero carbon).



**78%**

of C40 signatory cities have already implemented retrofit programmes for existing, privately owned buildings, that put the city on a pathway to net zero carbon by 2050.

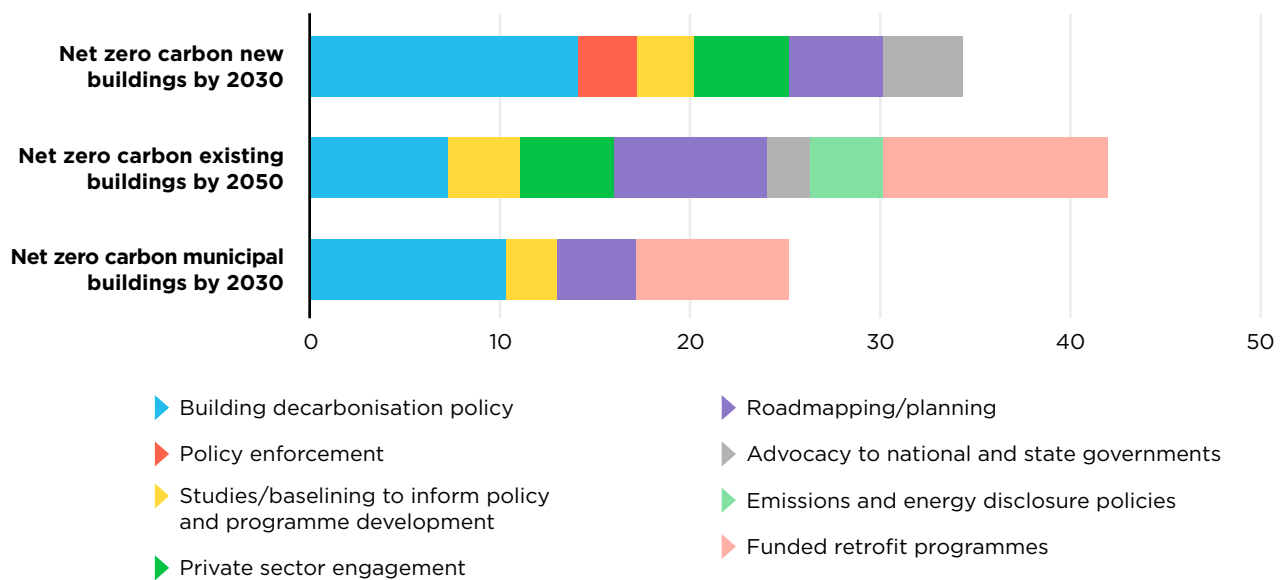


**61%**

of C40 signatory cities have already implemented policies to deliver net zero carbon municipal buildings by 2030.

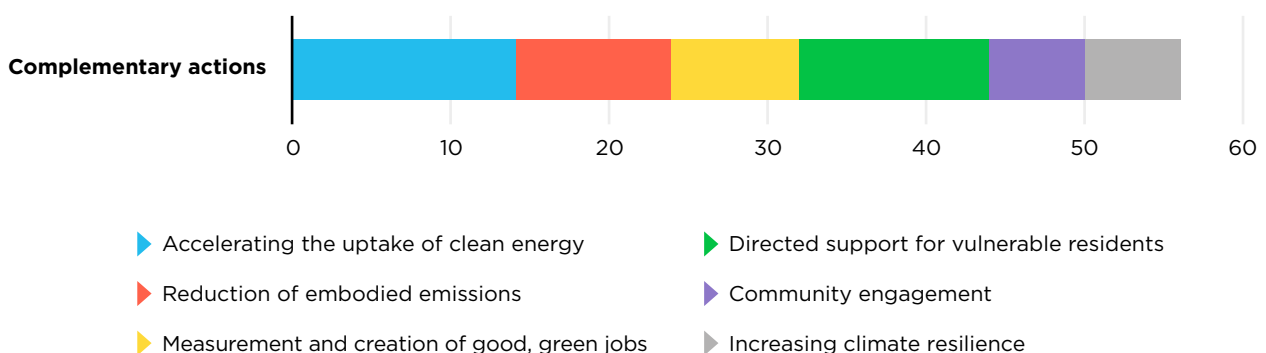
This year is no different, with cities using every means available to work towards building decarbonisation. Many cities continue to accelerate their ambition through increasingly stringent policies governing new, existing and municipal buildings; but even signatories with limited regulatory power are finding innovative ways to work alongside residents, the private sector, and national and state governments to advance towards the accelerator targets.

► **New progress reported (2021 - 2023) towards the three commitments of the C40 Net Zero Carbon Buildings Accelerator**



Both C40 and signatories to the C40 Net Zero Carbon Buildings Accelerator recognise that building decarbonisation does not take place in isolation. Actions that reduce the operational emissions of buildings (including from the energy used to heat and cool them) are most effective, and generate the most benefits, when combined with other actions that accelerate a just transition. This year, signatories reported a wide range of actions that complement their work towards the commitments of the C40 Net Zero Carbon Buildings Accelerator. These include actions to accelerate the uptake of clean energy at building and city scale, to reduce embodied emissions across the building lifecycle, and to make their climate action more equitable and inclusive through meaningful community engagement and the creation of good, green jobs.

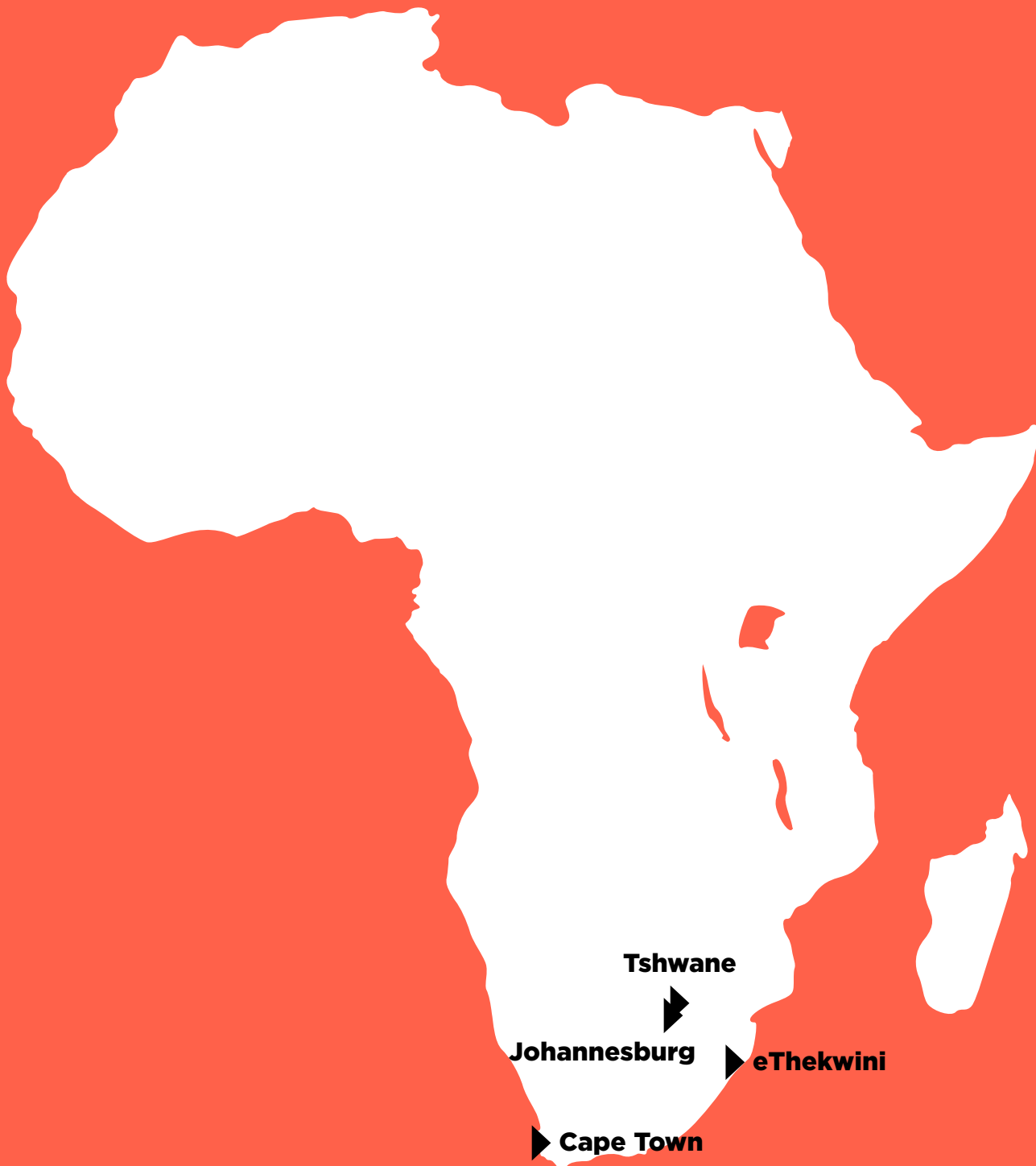
► **New progress reported (2021 - 2023) complementary to the commitments of the C40 Net Zero Carbon Buildings Accelerator**





## CITY PROGRESS SUMMARIES

The following section of this report contains progress and action summaries that were self-reported by each of the C40 Net Zero Carbon Buildings Accelerator signatory cities. The city summaries showcase past, present, and future actions the city is undertaking to achieve the implementation milestones of the Accelerator.



SIGNATORY CITIES IN

**AFRICA**



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# CAPE TOWN

## SOUTH AFRICA

Cape Town is demonstrating its commitment to building decarbonisation as a national leader in Energy Performance Certificates (EPCs) for municipal buildings, with a total of 69 EPCs to date. The city has now successfully retrofitted energy efficient, occupancy-sensing lighting in 14 municipal buildings, and a total of 1,322 Automatic Meter Reading (AMR) systems have been installed.

All of the city's building control officers and plans examiners have been trained to understand and enforce national building energy usage standards, ensuring that these remain at the core of the approval process for new buildings and renovations. An ongoing study of 500 buildings will assess compliance with various aspects of those standards to inform future strategy and interventions.

The city is working on a smart home disclosure system to encourage reductions in household energy usage and continues to engage with state-subsidised housing stakeholders to raise awareness of the need to provide energy efficient homes to the most marginalised communities.

Three internship positions have been created to support the city's work under the Urban Sustainability Internship Programme.

In the context of a national energy crisis and to ensure a decarbonised energy supply in addition to energy efficient buildings, Cape Town has taken the lead in advancing a clean energy transition. This includes small-scale municipal generation projects, such as new solar photovoltaic (PV) installations at Gugulethu Electricity Depot, Goodwood Traffic Management Centre and Kraaifontein Wastewater Treatment Works which operate at 1.5 MW capacity. Furthermore, the Small Scale Embedded Generation (SSEG) programme allows households and businesses to install generation systems such as rooftop solar PV and export power to the grid for credit. The city maintains a list of type tested, approved inverters and is currently working on an online application portal to facilitate additional SSEG generation and ensure the safety of the grid.



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# ETHEKWINI

## SOUTH AFRICA

The eThekweni Metropolitan Municipality Green Building Policy, the city's core policy to achieve net zero carbon new buildings by 2030, was developed with support from the C40 South Africa Buildings Programme and adopted in 2021. Implementation of the policy is now underway. eThekweni's Committee for Green Buildings has been established and is currently in the process of developing criteria for the qualification of rates rebates for new green buildings. A standard operating procedure has been developed and piloted in municipal buildings, ahead of the policy becoming mandatory from 2025 onwards.

The city has partnered with the national Department of Mineral Resources and Energy to develop a tool that will assist in undertaking

an energy baseline for all buildings in eThekweni. This data will be used to inform a new by-law that will require all existing residential and commercial municipal buildings to be retrofitted with energy efficient technologies. A programme to roll out smart meters throughout the city is also currently underway.

eThekweni has introduced various energy efficiency and renewable energy programmes. These include the rollout of solar water heaters in low-cost houses, the implementation of energy efficiency and renewable energy initiatives in city buildings through shared savings contracts, and the implementation of an energy management system to collect energy consumption data in the built environment and monitor energy use.



# JOHANNESBURG

## SOUTH AFRICA

Johannesburg kicked off 2023 with tailored green skills training for building control technical staff, building capacity for implementation of national building energy usage standards as well as the city's Green Building Policy and Net Zero Carbon Pathway. The Johannesburg Green Building Policy was developed with support from the C40 South Africa Buildings Programme and targets resource efficiency and high energy performance to ensure all new buildings and major refurbishments are net zero carbon by 2030.

As an outcome of the training, a draft checklist has been developed to assist staff in assessing compliance with the Green Building Policy. The checklist is currently being reviewed by the city alongside the national Council for Scientific and Industrial Research.

Stakeholder engagement is currently underway for the city's proposal to develop an energy consumption monitoring system. The city also plans to perform an energy efficiency audit across municipal buildings, and to create an implementation plan for municipal building decarbonisation, with corresponding budget recommendations. At present, lighting in municipal buildings continues to be replaced with energy efficient alternatives.

As a next step, Johannesburg intends to create a live database that will support targeted energy efficiency retrofits for existing buildings. The city also intends to draft and promulgate by-laws that will support enforcement and incentives for its Green Building Policy.



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# TSHWANE

## SOUTH AFRICA

The Tshwane Green Building Development and Net Zero Carbon Building by-law, which will accelerate the transition to net zero carbon for new buildings and major refurbishments by 2030, is currently in the final stages of approval. An implementation plan for the by-law has already been drafted with assistance from the South African Council for Scientific and Industrial Research (CSIR).

Existing buildings are the largest source of carbon emissions in Tshwane. The city has taken part in the C40 [Healthy Buildings Project](#), and the use of C40's [Healthy and Efficient Retrofitted Buildings \(HERB\)](#) tool will help the city to analyse, plan and develop a policy that will target building retrofits guided by vulnerability mapping. This will help the city to prioritise buildings to be refurbished or retrofitted in the short-, medium- and long-term.

To ensure sustainable energy consumption in city-owned buildings, Tshwane has engaged extensively with the South Africa National Energy Development Initiative (SANEDI) to ensure compliance with Energy Performance Certificates (EPC) regulation. This is a new mandatory regulation from the national Department of Mineral Resources and Energy (DMRE) that requires building owners to be transparent in their energy consumption, and have effective energy efficiency implementation measures and improvements in place. The city has now approved EPC specifications, which will be used to appoint accredited service providers for the EPC programme. Consultations on how to roll out EPCs were done with DMRE, SANEDI and local peer cities such as Cape Town which have made a head start on the roll out of the EPC programme. Tshwane's EPC project will be funded by a grant from the DMRE and is expected to be rolled out for selected buildings soon. The programme will assist the city in understanding energy usage in buildings and support the reduction of energy consumption and acceleration of renewable energy use.



SIGNATORY CITIES IN

# EAST, SOUTHEAST ASIA AND OCEANIA



# MELBOURNE

## AUSTRALIA

The Retrofit Melbourne Plan, endorsed in September 2023, is a new long-term strategy designed to accelerate net zero carbon retrofits of commercial buildings, which account for 60% of Melbourne's citywide emissions. The plan was developed through extensive consultation involving an estimated 700 stakeholders and sets out 11 initiatives across four workstreams: advocacy, information and support, enabling mechanisms, and regulation. Melbourne has also been working alongside Sydney and the asset management industry to provide support through a peer forum. In addition, the Melbourne Climate Network was created in 2023 with a goal to steer the transformation of the city's economy towards net zero while enabling job creation and developing economic opportunity.

Planning Scheme C376 is anticipated to go to the city's Planning Panel for review in 2024. This new scheme would require ratings for new developments based on accredited building standards such as Green Star, the Built Environment Sustainability Scorecard (BESS), the National House Energy Rating Scheme (NatHERS), and the National Australian Built Environment Rating System (NABERS), in addition to Melbourne's own Green Factor tool.

Melbourne has also participated in the update of the Australian National Construction Code, which will be implemented at state level in 2024. The new code will increase performance requirements for residential buildings and includes a new energy reporting approach called Whole-of-Home Component (EES) which will facilitate the road to net zero carbon through solar photovoltaic (PV) installation.

All buildings owned by the city are supplied by 100% renewable electricity. Many are also highly energy efficient, but further gains could be achieved by removing fossil gas equipment. Melbourne has developed a 'gas-free roadmap' which sets out a pathway to electrify the top ten gas consuming municipal buildings by 2030, with a stretch target to electrify all municipal buildings over the same time period. The roadmap includes a cost analysis of projects and upgrades. A new Emissions Reduction Plan for 2021-2026 has also been endorsed, which includes a commitment to implement a Building Management System. This will ensure that detailed energy use data is available for all municipal buildings in order to identify efficiency opportunities.



# SYDNEY

## AUSTRALIA

Sydney has set a goal to reach net zero emissions in the local area by 2035. As a key step towards that goal, the city has set ambitious new energy performance standards for new buildings and major renovations. These apply to office, residential, hotel and shopping centre developments and form part of the Sydney Local Environment Plan and the city's Development Control Plan. Phase one requires higher energy efficiency standards that can be achieved through efficient design and on-site renewable energy. The second phase will increase the stringency of the standards and also introduce a requirement for developers to purchase five years of renewable energy. This will contribute to a predominantly renewable grid.

Sydney has several ongoing programmes supporting decarbonisation of existing buildings, including the Better Buildings Partnership, CitySwitch Green Office, Smart Green Apartments and the Sustainable Destinations Partnership. The Ideas and Innovation and Green Building grants support community-led initiatives. These might include building-scale net zero carbon plans, or testing of innovative ways to decarbonise through research, pilot or demonstration projects and the development of new technologies. A campaign ran over 2022–2023 to boost adoption of 100% accredited GreenPower electricity plans, allowing residents in dense urban environments to contribute to renewable energy generation. The city's Greenhouse Tech Hub is Australia's largest entrepreneurial hub dedicated to climate action and will support up to 500 ecopreneurs and climate supporters.

Sydney's goal for municipal buildings is to cut operational emissions by 80% by 2025 compared to 2006 levels. As of 2023, a 75% reduction has been achieved. The city buys 100% renewable energy and continues to work towards energy efficiency through a dedicated fund. Additional reductions will be realised by converting gas pool heating systems to electric, all-electric new buildings, and emissions reductions for refrigerants. Remaining unavoidable emissions in the municipality are offset, with an increasing share of offsets purchased each year from Aboriginal fire management projects.

The city continues to advocate for more stringent energy performance and climate resilience standards at state and national level. Sydney's work on the new energy performance standards influenced the latest New South Wales Sustainable Buildings State Environmental Planning Policy (SEPP), which sets new residential buildings and major refurbishments on the path to net zero by 2050.

### **Graham Jahn AM**

Director City Planning Development and Transport, City of Sydney

*"I'm incredibly proud that after years of development and input from key stakeholders, we introduced performance standards for net zero buildings in the City of Sydney planning system. They came into effect in October 2023 and will improve energy efficiency and renewable electricity in new office, residential, hotel, and shopping centre projects, as well as major refurbishments."*



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# TOKYO

## JAPAN

Tokyo has been operating a hallmark cap-and-trade system since 2010, which requires large commercial facilities to reduce their total carbon dioxide (CO<sub>2</sub>) emissions. In 2021, emissions were reduced by 33%. During the fourth plan period (2025–2029), the city will set the reduction requirement, for example, as 50% for office buildings and 48% for factories. The current system will also be revised to allow fulfilment of the obligation through introducing off-site renewable energy.

Tokyo's building environmental planning system was also revised in December 2022 and will raise energy performance standards for large-scale new buildings (total floor area of 2,000 square metres or more) by 20%, starting in FY2024. The Environmental Building Reporting Programme for small and medium-sized new buildings (total floor area of less than 2,000 square metres), which will come into effect in FY2025, sets standards that exceed national requirements.

Tokyo's Carbon Reduction Reporting Programme was also revised. This ordinance requires businesses in Tokyo to report on CO<sub>2</sub> emissions if their total energy usage at multiple small and medium-sized facilities exceeds a certain level. From 2025, energy conservation requirements will be a 35% reduction by 2030 in energy consumption at small and medium-sized facilities in Tokyo (compared to FY2000 levels), with the replacement of 50% of electricity use with renewables. In addition to the reporting requirement, businesses will be required to have goals and plans in place to halve emissions by 2030.

Tokyo has also been working on a range of initiatives to advance renewable energy, towards the city's commitment as a signatory to the C40 Renewable Energy Accelerator.



SIGNATORY CITIES IN

**EUROPE**



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# COPENHAGEN

## DENMARK

Copenhagen's ongoing work to implement the CPH2025 Climate Plan will ensure the city is supplied by 100% carbon neutral electricity and heat by 2025. As national building energy codes set high requirements for new buildings, the City of Copenhagen is focusing on existing buildings and on decarbonising electricity and heat supply via publicly owned utilities.

In the past year, the city has been working on implementing initiatives for energy efficiency and renewable energy, which were approved in the latest version of the climate plan roadmap. These include a partnership to reduce electricity consumption in retail and service companies, energy screenings, funding of resident energy efficiency initiatives and rooftop solar installations, and expansion of wind power.

Energy consumption in municipal buildings continues to fall relative to 2010 levels. The city is currently considering setting up a company for municipal solar installations as well as a power purchase agreement (PPA) for renewable electricity to cover municipal building electricity consumption.

Work continues on a revised climate plan post-2025. The new plan is currently being developed in two tracks. The first addresses areas already covered in the existing plan, including energy supply and transport. The second focuses on consumption-based emissions. The current climate plan also includes initiatives that target buildings in low-income areas, or that offer support or funding for evaluations and investments. The new climate plan will expand on existing commitments to the education of school children, to include adult education and vocational training.



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# HEIDELBERG

## GERMANY

Federal subsidies for new buildings in Germany have recently been updated to require compliance with the highly efficient Effizienzhaus 40 standard. The Heidelberg municipal energy retrofit funding programme has been revised accordingly, with Passive House Plus, a standard combining energy efficiency with renewable energy generation, introduced as a new fundable standard in addition to Passive House Classic. The city has also partnered with the local energy agency and a non-governmental organisation (NGO) to deliver a district-level retrofit campaign which encourages homeowners to start retrofitting for energy efficiency. The programme provides information for residents on financing and funding options and assists with identifying opportunities for serial retrofits.

The Heidelberg Municipal Energy Concept has been drafted and is expected to be adopted in 2024. This concept will raise the energy standard for municipal buildings and buildings on municipal land to Passive House Plus, as well as setting requirements for solar photovoltaic (PV) installation. Several new Passive House

recognised municipal buildings have been completed, including a youth centre and a fire station. Both include on-site solar PV installations and use low carbon heating sources (district heating and heat pumps).

A new Municipal Heat Plan came into effect on 1 January 2024, setting a roadmap towards net zero carbon heating for the city. The plan will focus on decarbonising the local heat network and investing in heat pumps. Heidelberg also continues to support residents by providing general guidance and financial support in the face of the current European energy crisis.

Heidelberg anticipates a growing need for energy consultants and skilled workers in the construction sector. The city has previously worked with the local Climate Protection and Energy Consulting Agency to provide skills training and is currently working with the SRH University of Applied Sciences Heidelberg to add a practical experience component into their dual degree programme in Climate Change Management and Engineering.



# LONDON

## UNITED KINGDOM

In January 2022, C40 Co-Chair Mayor of London Sadiq Khan published the Analysis of a Net Zero 2030 Target for Greater London Report alongside a Mayoral Response Paper. The report analysed four possible pathways to net zero, looking at the different ways London could reduce emissions. The mayor's response selected the Accelerated Green pathway. Among other things, achieving this will require nearly 40% reduction in the total heat demand of London's buildings, requiring over two million homes and 250,000 non-domestic buildings to become properly insulated.

In June 2022, the UK government adopted updated national building regulations enhancing energy efficiency standards for new developments. In response, London published an updated an Energy Assessment Guidance. The city's approach strengthens the requirements for developers to achieve high on-site carbon savings before offsetting, ensuring that London sets ambitious energy efficiency standards that go far beyond national requirements. The 2022 Energy Monitoring Report shows that London Plan policies have more than halved the carbon emissions from new developments compared to meeting national building regulations alone.

The Be Seen portal tracks energy performance of all major new developments in London through planning, as-built and in-use performance. The city has also published a Whole Life-Cycle Carbon Policy which requires developers to calculate and reduce embodied carbon emissions.

The Mayor of London is currently delivering a record £40.2 million (US\$ 50.2 million) in government Sustainable Warmth funding to upgrade 3,200 homes facing energy poverty. This will be delivered through the Warmer Homes scheme and will offer grants of up to £25,000 (US\$ 31,000) for heating, insulation and ventilation improvements to low-income Londoners who own their own homes or rent privately.

The Greater London Authority (GLA) will continue to tailor London's annual £330 million (US\$ 412.4 million) Adult Education Budget to support Londoners hardest hit by the COVID-19 pandemic into good work. The £44 million (US\$ 55 million) Mayor's Academies Programme, launched in January 2022, will support sectors key to London's recovery and long-term economic growth. In addition, the city received £18.9 million (US\$ 23.6 million) from the Department for Education to deliver Skills Bootcamps. It is understood that a significant proportion of green skills training will be needed for a range of existing roles in London. These training opportunities and Skills Bootcamps are inclusively open to all adults, whether employed, self-employed, or unemployed, ensuring broad access to upskilling in vital green sectors.

Furthermore, the Mayor of London's Green New Deal Fund allocated £1.8 million (US\$ 2.3 million) to the Advance London and Better Futures programmes, focusing on supporting businesses in deprived areas and enhancing access to the sector for Black and Minority Ethnic (BAME) and women-led small and medium-sized enterprises (SMEs).



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# OSLO

## NORWAY

Oslo's electricity grid is fuelled by 95% renewable energy – similar to Norway's national grid. The Norwegian Water Resources and Energy Directorate have estimated carbon dioxide (CO<sub>2</sub>) emissions from electricity consumption to be only 19 g CO<sub>2</sub>e/kWh. Oslo has a district heating system which distributes energy generated at the city's waste management facilities. The district heating system is currently phasing out the use of heating oil in peak load and will soon commence the phase out of liquefied natural gas (LNG).

National legislation prohibits fossil fuel heating installations and sets stringent limits on energy use according to building typologies. Oslo plays an ongoing active role in reforming national regulation based on its experience and climate ambitions. The city is also a founding municipal partner of the FutureBuilt programme, which aims to promote best practice across the supply chain in the building and real estate sectors.

Oslo provides financial and technical support for localised energy production and energy efficiency, with a focus on multi-residential buildings (housing cooperatives and apartment

complexes). New municipal buildings are required to meet the highest standards of national energy use code. In addition, energy efficiency measures and solar power installations are being carried out for municipal buildings. Oslo invested €6 million (US\$ 6.6 million) for this purpose in 2023.

Since 2014, all new city construction has been required to meet Passive House Standard, with the requirement recently upgraded to Passive House Plus. When space is rented green contracts are used, which require the landlord to upgrade the property to meet the standard.

Renovation and rehabilitation projects for municipal buildings are required to meet Passive House classification wherever feasible and must include installation of separate energy meters to collect data on energy use for heating and cooling, hot water, lighting and more. These will assist with the targeting of future measures. Energy Performance Certifications (EPCs) are required for social housing to reduce energy costs for residents.



# PARIS

## FRANCE

In June 2023 the Municipality of Paris adopted a new town planning regulation (Plan Local d'Urbanisme, PLU) to accelerate efforts to combat environmental and climate crises and ensure housing for all Parisians. This new building regulation was developed over more than two years of studies and consultations. The 'bioclimatic PLU' project in particular constitutes a decisive moment in municipal action in the fight against climate change. It will work to make Paris a carbon neutral city by 2050 through encouraging low-carbon buildings, the development of renewable energy and a zero waste approach.

For more than 20 years, Paris has acted with ambition and determination within the framework of its Climate Plan. With its new 2024-2030 Climate Action Plan, Paris is stepping up its fight against climate change and accelerating its transformations to adapt. The plan was presented to the Council of Paris in December 2023, and will be submitted to a vote by elected officials in 2024. The energy renovation of Parisian buildings is the first lever to reduce emissions, with the aim to renovate 100% of the existing built stock to very low levels of energy consumption by 2050. The city will lead the way by launching a major renovation plan for municipal buildings and continuing to renovate 5,000 social housing units per year.

The Eco-rénovons Paris+ programme was launched in 2022 and aims to retrofit 22,500 private housing units between 2020 and 2026. The programme is supported by a city investment of €58.9 million (US\$ 64.5 million). Retrofits were rolled out to 12,701 private housing units in 2022, bringing the total to 37,703 since 2016. An additional 4,327 social housing units were also retrofitted, for a total of 63,186 since 2009.

The city adopted its plan for tackling energy insecurity in November 2021. It was accompanied by the creation of the Local Intervention Service for Energy Control (SLIME) which helps to identify and assist people who are currently not registered with social services. The Paris Climate Agency (APC) has now trained 450 volunteers to assist in identification of households facing energy insecurity, and 350 social workers were trained in supporting these residents. A specific Energy Sobriety Plan for municipal buildings was launched in September 2022. Key actions include lowering the temperatures for heating in all city buildings, setting back the winter heating season by one month, and reducing ornamental lighting. The results at the end of winter 2023 show a reduction in the energy consumption of municipal buildings of 6.7%. The overall objective of the plan is to achieve a saving of 10% by 2024.



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# STOCKHOLM

## SWEDEN

Stockholm aims to become fossil fuel-free as a municipality by 2030, and across the city by 2040. It aims to halve scope 3 emissions, which are embedded in goods and services produced outside of city limits, by 2030. The energy company that provides district heating in Stockholm is 50% owned by the city and services 80% of heat demand. The company has adopted a net zero goal for scope 1, 2, and 3 emissions by 2032, with the electricity production mix expected to be fossil fuel-free by 2050. Municipal buildings are already nearly entirely heated by district heating, but the few remaining fossil oil heaters will be phased out in 2023.

An update to the requirements for buildings on city-owned land, which accounts for 70% of Stockholm's land area, will see these buildings exceeding national energy performance standards by 25–50%. The city has also developed a common methodology for assessing the climate impact of building materials and processes for new buildings which goes beyond national standards. The private sector has

now adopted this methodology and the city is currently investigating a limit on embodied emissions per square metre for construction on city-owned land.

The city's pilot Bio Energy Carbon Capture and Storage (BECCS) project for the district heating system is on track with a full-scale facility expected to be operational by 2028. The facility's capacity will be 800,000 tonnes in negative biogenic emissions per year. The BECCS project will help to fully decarbonise heat supply to buildings through the district energy networks, reducing the overall greenhouse gas (GHG) emissions of the built environment sector.

A Centre for Circularity has been established in Stockholm to assist municipal property owners in developing and adopting methods for more sustainable and circular construction. A large number of new green jobs are also being created in architecture, construction, consultancy, and recycling.

A map of Latin America with a light beige background. The landmasses are outlined in dark grey. Two cities are highlighted with red dots and labels: Medellín in Colombia and Cali in Colombia. A red line connects the two dots, passing through a red triangle. The text "Medellín" is above the first dot and "Cali" is to the right of the second dot.

**Medellín**

**Cali**

SIGNATORY CITIES IN

**LATIN AMERICA**



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# CALI

(Non-C40 city)

COLOMBIA

Cali's new Sustainable Construction Manual was recently approved, and the city looks forward to working on the regulation and implementation of the Manual in 2024. Cali has been working with the Swiss Agency for Development and Cooperation as part of the Strengthening Capacities for Energy Efficiency in Buildings in Latin America project, to develop supporting regulatory processes.

Alongside its own Cali Sustainable Construction Seal, the city has developed a system that helps to analyse equivalencies in the requirements of sustainable building certifications including Edge, Leadership in Energy and Environmental Design (LEED), and the national certification Casa Colombia. The system is expected to assist project developers to avoid duplication in their applications for one or more of these certifications. The city has also been working alongside the Colombian Council for Sustainable Construction (CCCS) to develop an online certification platform for the Cali Sustainable Construction Seal, with feedback from construction sector stakeholders. The Seal's

criteria have also been harmonised with similar green building certifications during the process.

Solar photovoltaic (PV) has been installed for 100 residential buildings under the Energetically Sustainable Homes Initiative, supported by national government funding and the Resilient Cities Network. The programme is currently being expanded to an additional 2,639 buildings. The city is also undertaking technical studies for the implementation of six district heating initiatives for industrial, commercial and residential buildings.

Cali expects its range of initiatives, including the implementation of the Sustainable Construction Manual and the district heating programme, to create a number of new green jobs in the city. There is also a focus on environmental skills and awareness across all levels of education. The city's environmental authority offers a Green Business certification to businesses that promote good social, environmental and economic practices. The 80 businesses currently certified have directly created 378 good green jobs.



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# MEDELLÍN

## COLOMBIA

Medellín's District Administrative Centre was renovated in 2023 and certified net zero carbon and zero waste. An additional 12 new carbon neutral buildings have also been constructed in the Ciudad del Río, at an average of 15 storeys tall with 2,000 square metres per storey. The city is currently working towards a baseline across development typologies to support the Energy Efficiency Code for Medellín and is rolling out solar energy for institutions in marginalised communities via a programme supported by C40 and UK Aid Direct.

The city developed an Environmental Health strategy during the COVID-19 pandemic which included a roadmap for carbon neutral hospitals. The Nueva Unidad Hospitalaria de Buenos Aires was recently renovated in alignment with this strategy, with 2,000 square metres of solar photovoltaics (PV) installed.

Medellín has recently updated its Sustainable Construction Manual to include criteria for embodied carbon reductions, circular materials, certification of low-carbon materials, and to provide incentives for sustainable construction. Since 2017, at least 7,761 sustainable construction projects have been registered for a total of 55 million square metres. A new recycling plant for construction waste has also been opened.

Drawing on Medellín's experience with the Sustainable Construction Manual, the city is collaborating with the Colombian Chamber of Construction (CAMACOL) to develop a national roadmap. They have also collaborated to create

the 'Camacol Verde' platform, which facilitates engagement between unions and the public sector to develop sustainable construction strategies and promote sustainable, circular materials.

The Rosario-Bogotá Labour Observatory found that in Colombia, of 23 million people employed, only 1.3 million have 'high potential' for green employment, 30% have 'intermediate' potential, and 67% 'low'. As such, Medellín recognises the need for more entrepreneurship, capacitation, and institutional support. The Secretariat for Economic Development is promoting the creation of green jobs, and specialised green jobs in particular, for women and low-income communities.

Medellín's Green Cooperatives are boosting women's employment in sectors such as recycling and cleaning. In the construction industry, companies like Cementos Argos and Prefabricados INDURAL provide key research roles to women employees. The city's Environment and Physical Infrastructure Secretariats, in collaboration with the Botanical Garden, are actively developing Green Infrastructure Strategies. These strategies focus on expanding green jobs, especially in climate crisis management and sustainable construction, and emphasise the need for more entrepreneurship and training that is currently being discussed with the District Secretary of Economic Development. Through these initiatives, Medellín is committed to offering inclusive green job opportunities, particularly to residents of low-income communities.



## Carlos Bohorquez

*Environment Engineer Geographer, Environmental Coordination in Medellín Planning Bureau*

### > What is your role within the city, and what actions have you been involved in with your team that make you proud?

I work in the Planning Office of the Medellín District of Science, Technology and Innovation – the second largest city in Colombia, with 2.6 million residents. I coordinate environmental workstreams related to climate breakdown. Our office manages the development of projects, strategies, directives and technical standards for sustainable construction, the Climate Action Plan, forest fires, environmental health, air and noise pollution, solid waste management, the circular economy and environmental resilience, all related to climate change mitigation and adaptation. To complement these workstreams, we develop policies related to social and economic issues including community context, public participation, innovation, and planning for the future. I am proud of all of these actions and our work to achieve a better quality of life above all for the lowest-income communities in the city, to reduce their vulnerability to extreme climate events.

### > What inspires you in the work you do in Medellín to achieve the accelerator commitments?

I am inspired by creativity and use it in my job to support other residents of the city so that we can stop destroying nature and life on this planet with traditional methods of construction. Globally, the education of most engineers and technicians is based on maximising productivity and excessive extraction of natural resources to create infinite growth and guarantee grand and lucrative ambitions for a small, unscrupulous minority. I am motivated by a commitment to strengthen the value chain for a circular construction economy, to reduce carbon emissions and to recover the embodied carbon in materials and structures through reuse.

### > Do you have an example of something you learned from another city official (whether in Medellín or another city) that has inspired you or changed the way you approach your job?

The best example was the development of Medellín's Sustainable Construction Manual, which needed to fit in with the city's existing urban principles and construction standards. We learned a lot during its development and implementation. The manual establishes mandatory reporting of carbon emissions and reductions for all construction projects as part of a sustainable construction methodology. This is a basic requirement to access economic grants and helps to promote sustainable construction. I was inspired by the dedication and rigour that C40 staff bring to their work, in particular Paul Cartwright (C40 Programme Manager, New Building Efficiency) and Cécile Faraud (C40 Head of Clean Construction).





SIGNATORY CITIES IN

# NORTH AMERICA



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# LOS ANGELES

## UNITED STATES

Buildings represent 46% of greenhouse gas emissions in Los Angeles – the single largest emissions category. However, Los Angeles continues to reduce building emissions year-on-year, achieving a 35% reduction between 1990 and 2020. There are currently 31,065 residential units across the city that run on all-electric power. An additional 153 permits were issued for all-electric buildings in 2023, and a further 1,152 are under evaluation. Los Angeles City Council has recently passed two motions to decarbonise new and existing buildings, with corresponding ordinances in the pipeline.

As of 2021, all municipal new construction and major renovation projects in Los Angeles are all-electric. The city has also committed US\$ 30 million for renewable energy and building decarbonisation for municipal buildings. To date, 63 LEED certified projects have been completed, with ten more in the pipeline. A project to assess the city's more than 1,200 municipal buildings and provide recommendations on retrofit and solar installation potential is currently in the procurement phase.

The Los Angeles Department of Water and Power (LADWP) paid out US\$ 35 million in rebates through its energy efficiency programmes in 2021–2022, unlocking 340 million kWh in energy savings, equivalent to 1.3% of citywide energy consumption. In 2022–2023, LADWP's Distributed Energy Solutions Commercial, Industrial and Institutional (CI&I) rebate programmes saved over 63 million kWh. This is equivalent to the annual energy consumption of 11,179 homes and represents a reduction of 19,034 tonnes of carbon dioxide equivalent (CO<sub>2</sub>e).

The new Cool LA initiative offers increased rebates on energy efficient air conditioners for low-income customers, to help protect residents facing socioeconomic hardship from extreme heat. LADWP has also committed US\$ 75 million to the new Comprehensive Affordable Multifamily Retrofits (CAMR) programme, which supports energy efficiency and electrification upgrades for multifamily buildings serving low-income renters. An additional US\$ 75 million has been committed to the Home Energy Improvement Programme, which provides free energy efficiency upgrades for eligible customers.



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# MONTREAL

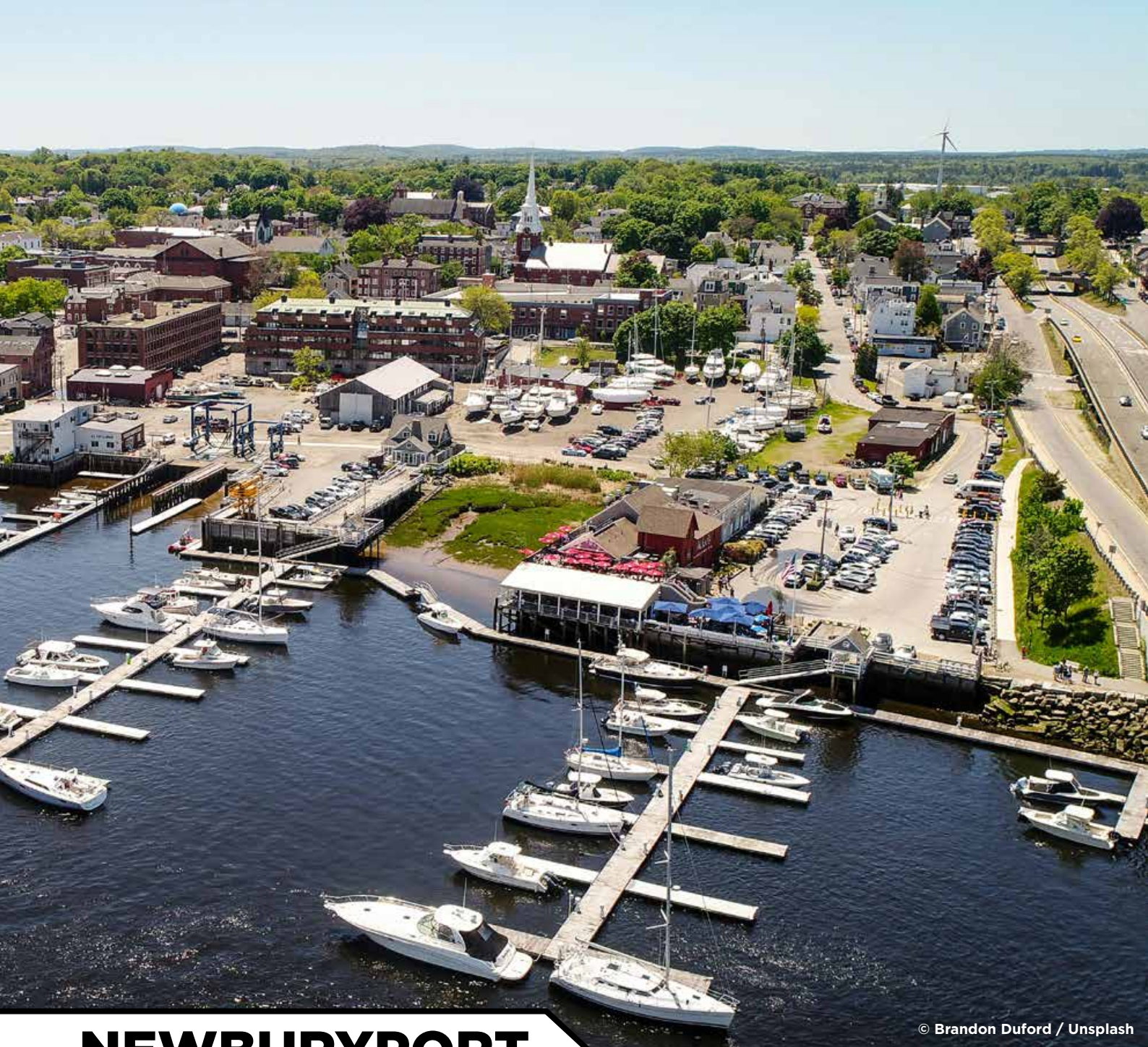
## CANADA

In 2023, Montréal adopted a new decarbonisation roadmap to align with its revised target of achieving net zero carbon for all buildings by 2040. The roadmap covers all buildings – new and existing, public and private, large and small – and includes a cost analysis for building decarbonisation, heat pump recommendations, and an impact analysis for the construction sector.

An emissions disclosure by-law went into effect in 2021, requiring owners of large buildings to report emissions data. This data is being used to develop a rating system, which will support a new by-law that sets timelines to achieve specific performance ratings.

The city is also revising existing building regulations with new maximum window area ratios, new thermal resistance requirements for building envelopes, and a building-level Coefficient of Performance (COP) for all building equipment. Stringent envelope sealing requirements are being developed as these are currently lacking.

Montréal has commissioned a study to identify any barriers to implementing existing rules and regulations which are hindering progress towards the 2030 decarbonisation goal for municipal buildings. The city is currently working with boroughs to propose modifications as necessary. There is an ongoing effort to develop public district heating and cooling for areas with new development, with the aim to create a net zero carbon district heating and cooling plant.



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# NEWBURYPORT

(Non-C40 city)

## UNITED STATES

Newburyport passed two building emission reduction ordinances for municipal buildings in 2021. The first requires annual reporting on the condition and operational performance of city-owned buildings. The second requires greenhouse gas protocol reporting for significant city projects with a net zero goal and facility specific analysis of projected energy usage. One new building has been approved under the new ordinance and is now being built as a net zero fire station.

Newburyport has also completed two decarbonisation plans, one for municipal assets and the other citywide. The first covers all municipal facilities and vehicles, and the other extends to all other building and transport users in the city. The next step is to develop a solar rooftop proposal for all municipal buildings, to expand on the two projects already completed. All of this work is creating jobs for solar installers, green architects, net zero planners, and energy use intensity engineers and analysts.



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# NEW YORK CITY

## UNITED STATES

Local Law 97 (LL97) was introduced as part of New York City's Climate Mobilization Act in 2019, setting ambitious requirements for building decarbonisation. Buildings account for approximately two-thirds of the city's total emissions. LL97 aims to reduce emissions generated by large buildings by 40% by 2030 and to reach carbon neutrality by 2050, through increasingly stringent greenhouse gas (GHG) emissions limits. Recent analysis found that compliance is exceeding expectations, with only 11% of buildings predicted to fall short of compliance ahead of the 2024 deadline. New York City launched 'Getting 97 Done' in September 2023, a comprehensive mobilisation campaign to support building owners and residents achieve compliance in the remaining buildings and prepare for more aggressive limits in 2030.

The Energy Efficiency Grading (Local Law 33) requires that buildings obtain and display a Building Energy Efficiency Rating label in a prominent location near each public entrance. Local Law 88 and subsequent expansions require lighting upgrades to meet the current NYC Energy Conservation Code standards by 2025. For new buildings, in line with the NYC Climate Action Plan, the city adopts the New York State

Energy Research and Development Authority (NYSERDA) stretch code, which is stepped up periodically. Local Law 32 sets out how the NYC Energy Conservation code will be stepped up through 2025, with the goal of net zero carbon buildings by 2030. Additionally, Local Law 154 was introduced in 2021, which prohibits the on-site combustion of fuels that emit more than 25 kg carbon dioxide (CO<sub>2</sub>), resulting in all-electric new construction beginning in 2024 for certain building types.

New York's Leading the Charge programme was launched in October 2022 with a US\$ 4 billion budget to convert 100 public schools to all-electric heating by 2030. The programme is expected to reduce greenhouse gas emissions by nearly 11,000 tonnes annually, while removing nearly 10,000 kg of harmful particulates from the air. In addition, as of 2023, the city has installed 22 MW of solar photovoltaics (PVs) on city properties, with an additional 48 MW in the pipeline.

Launched in 2021, the NYC Carbon Challenge brings together partners from the private, public and non-profit sectors with the aim to reduce emissions by 360,000 tonnes and create 1,000 good green jobs.



## Julia Casagrande

*Deputy Director, Clean Energy, NYC Mayor's Office of Climate & Environmental Justice*

### > What is your role within the city, and what actions have you been involved in with your team that make you proud?

I am the Deputy Director for Clean Energy at the NYC Mayor's Office of Climate & Environmental Justice, and I have been working here on building and energy decarbonization policy for the past four years. I work with an incredibly smart and passionate team and we have the honor of implementing world-leading policies. To move our buildings to carbon neutrality, I've been involved with Local Law 154 – our all-electric new buildings law – and our Clean Construction Executive Order (EO 23), which directs city agencies to lead on incorporating clean construction strategies into their work. To have net-zero new buildings we have to consider both operational carbon and embodied carbon.

### > What are you looking forward to achieving as we move toward the 2030 accelerator target for net zero carbon new buildings?

I am looking forward to incorporating embodied carbon into the net-zero carbon strategy. For operational carbon, we have a strong trajectory for constructing electrified new buildings while we push our electric grid toward renewable energy, with New York State commitments to 70% renewable electricity by 2030 and a 100% zero emissions grid by 2040.

On embodied carbon, the city recently has made commitments around citywide reductions, and we are taking action on the municipal side. We also signed on to the C40 Clean Construction Accelerator in 2023. I am excited to develop our embodied carbon reduction strategy in our private sector buildings and infrastructure in pursuit of our citywide commitments.

### > What impact has your work had on the quality of life of your city's residents, and what does this mean to you?

When I came into city government after working at an engineering consulting firm, I was focused on carbon and greenhouse gas emissions. I still am – but working within government, listening to community groups, and learning about environmental justice has opened my eyes to how we can reduce greenhouse gas emissions while we provide quality of life benefits for our city and how important it is to do both.

My work is often centered around delivering air quality benefits with decarbonization, and I'm happy to have contributed to our city's commitments on Leading the Charge. This includes, among other things, an electrification program for New York City schools that considers asthma and air quality in prioritizing which schools will be electrified first. Through this program we are realizing greenhouse gas reductions with the added benefit of reducing air pollution in areas that need it most.



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# PORTLAND

## UNITED STATES

As part of the Zero Cities Project, Portland developed a net zero carbon roadmap that outlines the city's approach to building decarbonisation until 2050. The project, which ran from 2018 – 2020, specifically focused on racial equity through community collaboration alongside technical analysis of potential carbon reduction strategies. Given that the State of Oregon controls local building codes, Portland does not have the power to establish its own net zero carbon regulations. However, the city continues to work with the Zero Energy Ready Oregon Coalition to advance state-level building code in alignment with net zero carbon trajectories.

The city plans to relaunch its energy benchmarking programme for commercial buildings in 2023, after a hiatus during the COVID-19 pandemic. An ordinance, also in the pipeline, will establish building performance standards for existing commercial and multifamily residential buildings and require net zero emissions by 2050.

All city-owned existing buildings were benchmarked in 2019. Portland's Green Building Policy covers city-owned new construction and is scheduled to be updated in 2024. The city is also considering participating in the Energy Trust of Oregon Path to Net Zero programme, which would assist in identifying incentives and resources to support the city's net zero carbon goals.



# SAN FRANCISCO

## UNITED STATES

San Francisco's Environment Code was updated this year to mandate electrification during municipal renovations and at time-of-replacement for existing fossil gas equipment. The city is currently conducting a gas equipment inventory to identify every piece of fossil fuel-burning equipment in its portfolio. Among other things, this inventory will enable use of the city's capital planning and budgeting process, and potentially other tools like strategic purchasing, to advance its municipal building decarbonisation goals.

In late 2022, the city released a grant solicitation for community-based organisations to conduct pilot electrification projects in environmental justice communities, such as heat pump installations in community centres or induction stove installations in restaurants, coupled with community education about the benefits of electrification.

The San Francisco Climate Action Plan also commits the city to developing a Climate Equity Hub, a one-stop-shop to support homeowners, renters, and workers during the transition to all-electric residential buildings. The Hub will be created as a public-private partnership, and the city expects to release a solicitation to select a non-profit partner to co-lead it. Stakeholder engagements have already been held to support the planning process.

The city has also established a Building Operations Task Force (BOTF), a working group made up of residents, tenant's rights organisations, utilities, design and construction professionals, and real estate stakeholders. The role of this group is to make recommendations to ensure policy and programme proposals are consistent with the execution of the 2021 San Francisco Climate Action Plan, centre racial equity, and advance a just energy transition. At present, the BOTF is advancing a proposal to expand the All-Electric New Construction Ordinance to apply to major renovations to existing buildings.



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# SAN JOSÉ

(Non-C40 city)

## UNITED STATES

Electrification of buildings is one of four focus areas of San José's Pathway to Carbon Neutrality, which lays out the city's plan to reach net zero by 2030.

All new construction in San José is electric following a fossil gas infrastructure prohibition passed in 2021. The Electrify San José: Framework for Existing Building Electrification was adopted in 2022. This includes strategies to raise awareness about the benefits of electrification and the health risks associated with fossil gas, ways to encourage growth of high quality building electrification jobs and achieve reductions in energy costs through electrification, and how to increase access to clean and reliable energy.

The city has an electrification and workforce development programme for existing buildings set to launch. The target is to complete residential electrification retrofits for at least 250 homeowners while training a minimum of 50 contractors. The programme will also help to identify and streamline financing assistance through grant, incentive and low- or no-interest options.

Two new energy efficiency programmes have also been launched. The San José Home Appliance Program provides discounts on

energy efficient electric appliances, and free smart meters and smart plugs for eligible single family households. The San José Energy Efficient Business Program provides technical assistance and discounts for heating, ventilation, and air conditioning (HVAC) and water heating and refrigeration systems for small businesses and schools.

Major renovations of city buildings are required to include elimination of existing fossil gas infrastructure where feasible. Two city buildings have already met net zero carbon requirements and two more have switched to 100% renewable energy in the past year. The next step is to investigate replacing the gas central utility plant – the single largest municipal consumer of fossil gas – with all-electric equipment. Analysis and stakeholder engagement is also underway for a proposed 'replace on burnout' ordinance, which would require fossil gas space and water heaters to be replaced with electric alternatives when upgraded.

To further decarbonise building energy use, San José Clean Energy (SJCE), the city's Community Choice Aggregator, is offering 99% carbon-free energy. The utility's next integrated Resource Plan is expected to include a roadmap for 100% carbon-free energy by 2030.



# SANTA MONICA

(Non-C40 city)

## UNITED STATES

Buildings account for 26% of emissions in Santa Monica. The city's Climate Action and Adaptation Plan set a goal to adopt carbon neutral construction codes. Towards this aim, Santa Monica's Zero Emission Building (ZEB) Code went into effect at the start of 2023. The ZEB Code prohibits fossil gas use in all new buildings, expanding upon the previous City Reach Code (2019) that encouraged all-electric buildings. Most buildings (96%) receive 100% clean energy through the Clean Power Alliance, meaning that switching buildings to all-electric is a powerful tool to advance towards net zero carbon buildings by 2030.

In 2022, Santa Monica participated in the California Equitable Home Electrification Program, an eight month workshop facilitated by the Rocky Mountain Institute (RMI) which

supported the development of Santa Monica's Existing Building Electrification Roadmap. Released in early 2023, the roadmap sets an end goal for the city to electrify all existing buildings by 2045. Santa Monica is also currently developing Building Performance Standards (BPS) to address emissions from larger multifamily and commercial buildings.

Funding has been secured to continue the Electrify Santa Monica rebate programme which provides incentives for residents to switch out gas appliances for all-electric. The city is also searching for additional funding to implement a multifamily heat pump direct installation programme. The city is working with the Southern California Regional Energy Network (SoCalREN) to identify and audit municipal buildings ready for energy efficiency upgrades.



## Nico Predock

*Sustainability Analyst, City of Santa Monica*

### > What is your role within the city, and what actions have you been involved in with your team that make you proud?

I am a sustainability analyst in the City of Santa Monica's Office of Sustainability and the Environment. I lead work related to existing building decarbonization and coastal adaptation/resilience. I have been leading efforts related to Building Performance Standards (BPS) and have hosted a series of successful workshops with a broad range of community stakeholders to develop an equitable and effective BPS policy. I have also been working to implement a second beach dune project in Santa Monica which is scheduled to be installed this winter.

### > What are you looking forward to achieving as we move toward the 2030 accelerator target for net zero carbon new buildings?

I look forward to implementing impactful building decarbonization policies that will significantly reduce emissions from existing buildings in Santa Monica. To tackle emissions from existing buildings, we are working on two separate policies: Building Performance Standards will regulate greenhouse gas (GHG) emissions and energy efficiency in large residential and commercial buildings in the city (>50k square feet). The city is also working to implement an Existing Building Reach code that will target Santa Monica's smaller residential and commercial buildings.

### > Do you have an example of something you learned from another city official (either in your own city or another city) that inspired you or changed the way you approach your work?

In local government work, the impact of our efforts can often feel very isolated to our own jurisdiction. Others have told me that it is important to recognize the domino effect progressive local policy work can have on influencing other cities/jurisdictions to push forward on their own climate policies.



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# SEATTLE

## UNITED STATES

Seattle adopted a new Building Emissions Standard policy in December 2023. The policy is expected to reduce building emissions by 27% by 2050 and will require existing buildings over 20,000 square feet to meet increasing greenhouse gas reductions targets over time. A Municipal Electrification Strategy has also been completed in alignment with Seattle's 2020 Green New Deal Executive Order.

The city also continues to promote the transition from heating oil to clean technologies such as heat pumps. The number of homes heated with oil has dropped from 18,000 in 2017 to 10,000 in 2022, and the city estimates that oil will be phased out completely by 2030.

Seattle's Green Buildings Permit incentives, which award additional height, floor area, or expedited permits to buildings that meet green building criteria, are expected to be updated this

year. Seattle is also committed to transitioning existing affordable housing buildings from fossil fuels to clean energy technologies, reducing energy use and energy burden and supporting healthier living environments. The Office of Housing provides no-cost building audits and upgrades for low-income households, including heat pumps, heat pump water heaters, weatherproofing, and repairs.

The city is launching a buildings accelerator programme to provide additional technical support including light coaching and training, with a priority to support under-resourced buildings such as non-profits, schools and Black, Indigenous and people of colour (BIPOC) owned buildings. Seattle is investing US\$ 1 million into Clean Energy Career Training programmes across six workforce development organisations that will help provide training for new technologies such as heat pumps.



# TORONTO

## CANADA

Toronto's TransformTO Net Zero Strategy, adopted in December 2021, brought the city's net zero target forward from 2050 to 2040. The Toronto Green Standard has been adjusted accordingly with accelerated performance measures. The latest version requires all new developments to meet the 'high performance' level starting in 2025, and the 'near zero emissions' level starting in 2028. From 2022, all new city-owned buildings are required to demonstrate a greenhouse gas intensity of zero, and by 2040 all existing city buildings must reach net zero carbon.

The city continues its implementation of the Net Zero Existing Buildings Strategy NZC 2040 roadmap, including technical modelling for proposed pathways to accelerate action towards 2040.

Toronto adopted an Energy and Water Reporting by-law in December 2023, requiring large buildings (over 50,000 square feet) to begin reporting annual energy and water use starting in 2024 and smaller buildings (over 10,000 square feet) starting in 2025. This data will be used to inform future building performance standards. An emissions-based labelling programme is also being developed for low-rise residential buildings. This will begin as a voluntary initiative

in 2024 as a first step towards a mandatory requirement. Toronto's Deep Retrofit Challenge programme was launched in 2022 and supports eight deep retrofit projects, with the goal to encourage wider market adoption.

A Net Zero Carbon Plan for city buildings is in place, and as of 2023 any new equipment installed in city facilities must contribute to net zero – such as the replacement of existing fossil gas boilers with electric or renewable alternatives. Accounting for and reducing embodied carbon has also become a key focus for the city. Embodied carbon caps have been developed for the high performance tiers of the Toronto Green Standard, which are mandatory for city buildings.

Climate action has already strengthened Toronto's economy, and employment in green industries is growing twice as fast as overall employment. Analysis from the Canadian Institute for Climate Choices estimates that aggressive climate action in alignment with net zero by 2040 will create 1.2 million more person-hours of employment than business as usual between 2020 and 2050. Alongside transport, building decarbonisation will be one of the two driving sectors.



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# VANCOUVER

## CANADA

Vancouver passed an Annual Greenhouse Gas and Energy Limits by-law in 2022, which requires annual energy and carbon reporting and limits on greenhouse gas intensity and heat energy use for large existing buildings. An implementation guide for the by-law is anticipated for early 2024.

The city's building by-law for new construction is also currently under revision to align with the highest tier of British Columbia's new Zero Carbon Step Code. The revision will make all new construction nearly zero emissions. Mandatory embodied carbon reporting (whole building life cycle assessment) was also introduced in October 2023 for large buildings.

As of 2023, all new permanent air conditioning installations for existing detached homes must provide low carbon heating and cooling, and renovations valued over CA\$ 250,000 (US\$ 184,000) are required to electrify existing space heating and hot water systems to the same standards as for new construction.

All new city-owned buildings are required to meet Passive House standards as well as run on 100% clean electricity or low-carbon fuels and demonstrate a 40% reduction in embodied carbon. Existing city buildings are currently being retrofitted through targeted electrification projects, and all fossil fuel space and water heating systems are replaced with low-carbon alternatives once they reach end of life.

Vancouver has a Zero Emissions Economic Transition Action Plan as a component of its Climate Emergency Action Plan, geared at supporting businesses and workers to participate in a just transition. The Vancouver Economic Commission (VEC) estimates an 87% overall increase in green jobs since 2010, with a 146% increase in the green buildings sector specifically. The VEC has also held roundtable discussions with Black, Indigenous and people of colour (BIPOC) sustainability practitioners to better understand how to create more space for a diverse workforce in climate action, and has developed and supported equitable hiring programmes, policies and research to support diverse candidates entering priority sectors and occupations.



# WASHINGTON, D.C.

## UNITED STATES

The Clean Energy DC Building Code Amendment Act took effect in 2022, requiring Washington, D.C. to adopt an all-electric net-zero energy code no later than December 31, 2026. In the interim, the city is advancing a 2023 Energy Conservation Code update, focused on deep energy efficiency and other local amendments ramping up to the net zero requirement.

The Clean Energy DC Omnibus Amendment Act requires 100% of electricity sold in the District to come from renewable sources by 2032, ramping up from the current 38.75% in 2023. Building on the energy benchmarking programme, which has covered large private and District Government buildings since 2013, the first compliance cycle for the Building Energy Performance Standards (BEPS) ends in December 2026. By that point, buildings that did not meet the 2021 BEPS must demonstrate a 20% reduction in overall energy consumption reported. The next step is to roll out benchmarking and BEPS to smaller buildings (down to 10,000 square feet), for which the District is preparing to provide technical assistance.

DC's Affordable Housing Retrofit Accelerator provides comprehensive technical and financial assistance to affordable housing needing to

meet BEPS in response to needs voiced by affordable housing stakeholders. In 2023, this programme delivered American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) level 2 energy audits for 61 affordable housing buildings at no cost. The programme has also begun installing subsidised energy efficiency measures and is looking to continue implementation through a variety of federal and local funding sources. An additional US\$ 9.1 million has been sourced to fund retrofits for public housing not eligible for the accelerator – including on-site renewable energy installations and cutting-edge heat pump systems.

The District offers several programmes to support good, green jobs, including the Sustainable Energy Utility's 'Train Green' and externship programmes, the DC Infrastructure Academy, and Solar Works DC's solar installation employment programme. The District's Green Building Advisory Council has also proposed policy solutions to measure and manage embodied carbon through municipal procurement standards and building code requirements. A grant to support deconstruction and material reuse was issued in 2022 and renewed through 2024.

# BARRIERS TO ACHIEVE THE COMMITMENTS

The progress reported by signatories to the C40 Net Zero Carbon Accelerator has been made in the face of significant challenges. Although local contexts differ, cities have many challenges in common across typologies and regions. These will serve to direct C40 support in the near future to help cities reach their climate ambitions.

Many cities report capacity and budget limitations as a key barrier to their ongoing work, especially in weakened economies or where costs are rising owing to inflation. This is especially true of cities facing ‘multi-crises’ – the layered impacts of ongoing recovery from the COVID-19 pandemic, rising housing costs and energy shortages, among other challenges. Several cities are also facing skills shortages in both the private and public sectors to support their net zero carbon policies and programmes.

Limited regulatory powers and misalignment with national government legislation hinder the implementation of some of the ambitious policies and codes cities would like to achieve. Some cities struggle with a lack of continuity as administrations change and outdated regulations and frameworks need updating.

Another challenge that cities face is getting residents and the private sector on board, especially where budget limitations make it difficult to offer financial incentives to accelerate implementation. Cities are actively working to understand the impacts of potential policy and programmes on marginalised communities and how best to provide support.

Many cities lack the quality data needed to monitor and evaluate the impacts of their actions and to target effective energy efficiency programmes. There is therefore a need to invest in measurement systems and capacity to support monitoring and evaluation, and to find ways to obtain data for non-city buildings. Part of this work includes harmonisation of definitions for net zero carbon buildings, without which it is difficult to assess progress.

Finally, some pioneering cities are uncovering difficulties in jumping the final hurdle from near-zero to net zero carbon, either needing to phase out small amounts of fossil fuels for peak energy loads or working carefully with offsets.

# CONCLUSION

Peer learning is a central part of C40's model, and member cities often highlight the value of working with and alongside others towards their climate ambitions. C40 will continue to provide a range of webinars, workshops, and knowledge products to help both C40 Net Zero Carbon Buildings Accelerator signatories and members of the C40 building decarbonisation networks keep up to date with best practices and applications of new technologies. This support augments C40's technical assistance programmes, which assist cities with development of building decarbonisation policies and programmes, training for city staff, identification of financing options, and development of feasibility studies and business cases.

This year, cities have reported a particular interest in learning about coalition building to establish alignment between different levels of government on building and grid decarbonisation efforts. Other topics of interest include development of data management systems and criteria for evaluating net zero carbon buildings, and tools for assessing equity and inclusion impacts of policies and programmes, including the creation of good, green jobs.

Building on the progress already reported over the five years since the launch of the C40 Net Zero Carbon Buildings Accelerator, we are confident that signatories will continue to lead the way in creating the inclusive, decarbonised and resilient cities of the future.

