

C40 CLEAN CONSTRUCTION ACCELERATOR

**How cities are driving
decarbonised and resilient
buildings and infrastructure**



Rwanda Institute for Conservation Agriculture MASS Design Group © Iwan Baan

2023 Report



ACKNOWLEDGEMENTS

This report was created in collaboration with officials in the C40 Clean Construction 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 Clean Construction Accelerator. For further information on the C40 Clean Construction Accelerator, please check out the [accelerator webpage](#).

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FOREWORD

With their ever-increasing populations, cities around the world are driving demand for the renovation and construction of homes, schools, hospitals, streets, water and energy infrastructure, and more. The construction sector fuels the climate and biodiversity crises and produces vast amounts of waste. Construction sites and construction activities also contribute to health issues for urban populations as they generate air, noise and soil pollution. Construction workers are on the frontline from airborne particles and asbestos exposure. The industry accounts for 56% of all occupational cancer cases in men.

The way we plan, design, build and maintain our cities' built environment currently generates significant emissions, while the choices we make regarding location, design and construction materials play a major role in increasing climate risks such as worsening flash floods or intensifying the urban heat island effect. Marginalised communities are disproportionately and negatively impacted.

By committing to the C40 Clean Construction Accelerator, our signatory cities are leading the way with the most ambitious actions to demand and drive the net zero, resilient buildings and infrastructure of the future.

By using the levers and powers available to them, signatory cities are meeting the commitments of the accelerator, aggregating their demand and driving a market shift. Leading actions include prioritising existing stocks to tackle the housing crisis and address vacant, underutilised and stranded assets; leading by example with public procurement; and ensuring that retrofitted and new buildings and infrastructure embed circular economy and climate resilient principles in their design, material and construction method choices.

The transformation needed requires engagement and collaboration from all stakeholders. Cities are actively working with diverse groups of actors – national government, other cities, businesses and industry, and civil society – to reduce embodied emissions in the built environment. This aligns with C40's objective to halve emissions of its member cities by 2030, while improving equity, building resilience, and creating the conditions for everyone, everywhere to thrive.

Congratulations to the reporting cities for their leadership, their commitment to bold action, and their dedication to reaching the collective goals of the accelerator and the Paris Agreement.

Mark Watts
Executive Director of C40

INTRODUCTION

Cities are home to 4.4 billion people globally, estimated to rise up to 7.4 billion by 2050. To meet the needs of this growing urban population, cities drive huge demand for the renovation and construction of homes, schools, hospitals, roads, and water and energy infrastructure.

The construction sector fuels the climate and biodiversity crises: today it is responsible for 23% of global carbon dioxide (CO₂) emissions, consumes 30% to 50% of all extracted resources, and produces vast amounts of waste. Construction materials are the main culprits, especially the two most used: cement emits 8% of global carbon dioxide (CO₂) emissions; and steel emits 7-9%, half of which is used in the built environment. Construction site activities also generate emissions and pollutants, predominantly from fossil fuel-powered machinery and equipment.

With 70% of the world's population living in reinforced concrete buildings, business as usual in the construction sector contributes to a world on track for 3°C or more of heating. Furthermore, many cities find themselves in the midst of a housing crisis, where the speed of construction cannot keep pace with the growing need for healthy and affordable housing.

Clean construction reduces greenhouse gas (GHG) emissions, fosters a climate-resilient and healthier built environment, improves social equity and local good green jobs, and reduces air, noise and soil pollution that disproportionately impacts the most marginalised communities.

Leading mayors are committed to the C40 Clean Construction Accelerator to ensure their cities develop the net zero and resilient buildings and infrastructure of the future.

Signatory cities of the C40 Clean Construction Accelerator commit to eight actions:

- 1 > Prioritise the better use, repurposing, and retrofitting of existing building stock and infrastructure**
- 2 > Lead by example with municipal procurement**
- 3 > Demand transparency and accountability**
- 4 > Work with businesses, industry, public institutions, residents, workers, social partners and other organisations to establish a joint roadmap and set interim targets towards the collective 2030 targets**
- 5 > Approve at least one net zero emission (operational and embodied) flagship project by 2025**
- 6 > Assess the impact our choice of materials and construction design will have on our cities' overall resilience to climate impacts**
- 7 > Work with and advocate for regional, national and supranational government**
- 8 > Publicly report every year**

Cities cannot transform built environment systems alone and commit to bring together the relevant stakeholders to urgently deliver results at the pace and scale needed to meet the 1.5°C ambition of the Paris Agreement.

By leading by example and driving a market shift, cities are meeting their share of responsibilities so that the whole value chain and sector can reach the following collective objectives by 2030:

- Reduce embodied emissions by at least 50% for all new buildings, major retrofits and all infrastructure projects.
- Require zero emission construction sites city-wide, where technology is available.

While many cities are actively working towards clean construction, not all cities can sign the ambitious clean construction accelerator, sometimes due to political context.

The accelerator was launched in November 2020 and currently has eight signatory cities, a number we aim to grow over the coming years. All cities that joined in 2020 (Budapest, Los Angeles, Mexico City and Oslo) and in 2021 (San Francisco) reported in 2023. The newest signatories London, Milan and New York have completed their action plans, available [here](#).



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PROGRESS OVERVIEW

By signing up to the C40 Clean Construction Accelerator, cities commit to drive the net zero emission, resource-efficient, resilient and healthy buildings and infrastructure of the future.

Budapest, Los Angeles, Mexico City, Oslo and San Francisco have varying degrees of power over buildings, infrastructure and the construction industry. While some cities can leverage building and planning codes, others tackle the built environment impacts by addressing housing, air quality, waste, and jobs creation. This report highlights progress being made by cities through a broad range of policy actions to transition towards clean construction.

Cities are prioritising their existing stock in line with commitment 1, simultaneously tackling vacant and underutilised assets, mitigating their housing crisis and avoiding the emissions, pollution and waste associated with new construction. Los Angeles has facilitated the conversion of more than 1,200 older, economically distressed, or historic buildings to homes in the downtown area, reducing vacant space and preserving downtown's architectural and cultural past through planning and zoning rules. Through a proposed citywide draft ordinance, the city plans to expand the scope of the ordinance to reuse these spaces for affordable housing. In addition, Budapest is piloting the renovation of an abandoned school building into social housing. Other city actions include guidance documents, education programmes for industry stakeholders and economic incentives such as tax rebates.

A growing number of cities are using their procurement powers, requiring low carbon materials and demanding zero- or low-emission machinery, in line with commitment 2, to decarbonise the assets they own. Oslo requires at least two environmental product declarations (EPDs) for each of the ten largest categories of building materials for municipal projects.

In line with commitment 3, cities are shifting the market with accountability by piloting data collection requirements and setting embodied carbon reduction targets. San Francisco has established an initial 10% embodied emissions reduction target per municipal project between 2024–2026. Once the embodied carbon policy has been tested on municipal projects and refined as necessary, it will be extended citywide by 2025.

Cities are actively collaborating with different stakeholders – ranging from national governments, other cities, business, industry, and civil society – to reduce embodied emissions in the built environment, acting on commitments 4 and 7. In 2023, Oslo opened a secondary material's marketplace with a strategic industry partner to build a business model for reused building materials. Mexico City is participating in C40's 'Building greener cities: green job opportunities in clean construction' research to engage with a range of stakeholders and identify the jobs and investment implications of a transition to clean construction.

Lack of resources and knowledge gaps were some of the major challenges identified by reporting cities. Additionally, many cities find themselves at odds with low ambition or unstable national governments. However, cities are overcoming these challenges through inclusive collaboration with various stakeholders and offering educational programmes to raise awareness.

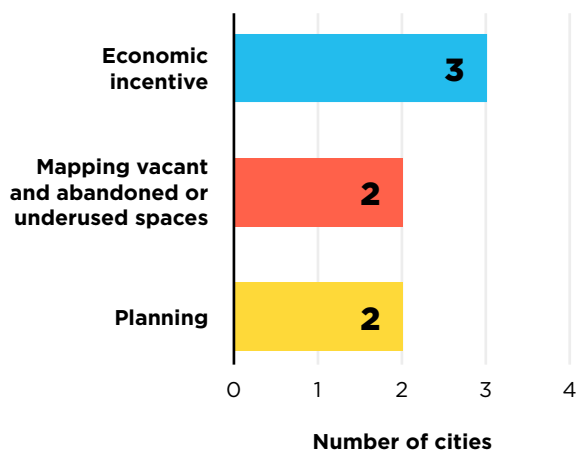
In this report, we will explore some of the best practices and ambitious actions being taken by the signatory cities, and the ways they are overcoming any barriers that they are facing.

DATA ANALYSIS

Since the launch of the C40 Clean Construction Accelerator, signatory cities have been progressively developing and implementing policies and initiatives in line with the commitments. This section highlights some of the key data insights drawn from the reporting process last year.

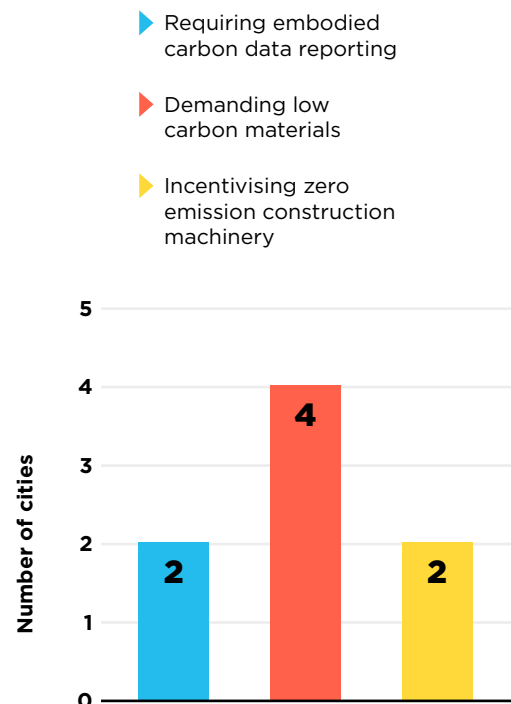
► Cities taking actions on prioritising existing assets

All 5 signatory cities have taken action to prioritise existing assets, in line with commitment 1. This chart shows the breakdown of the type of actions along with the number of cities taking that particular action. More than 50% of signatory cities are using economic incentives which include permit streamlining, granting exemptions and tax incentives to the private sector. Lastly, a couple of cities that are working on mapping vacant and abandoned spaces with the purpose of bringing them to use and another two cities are utilising planning policies as a tool to consider the reuse of existing building stock and related infrastructure.



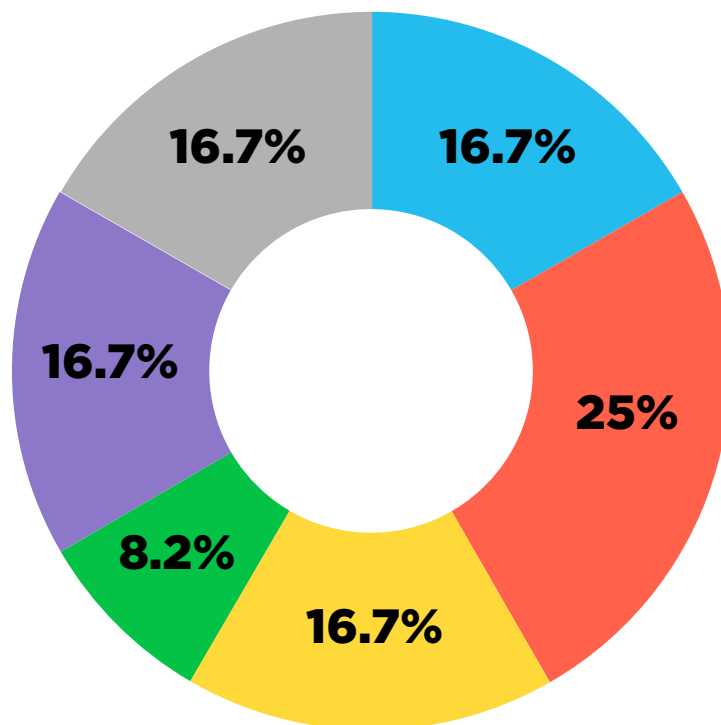
► Cities using municipal procurement on the following clean construction actions

The graph shows different clean construction actions that the cities are implementing within their procurement powers and in turn shifting the market. A majority of the cities are demanding the use of low carbon materials. 40% of cities are requiring embodied carbon data reporting for their assets as well as incentivising the use of zero emission machinery in their portfolio of work.



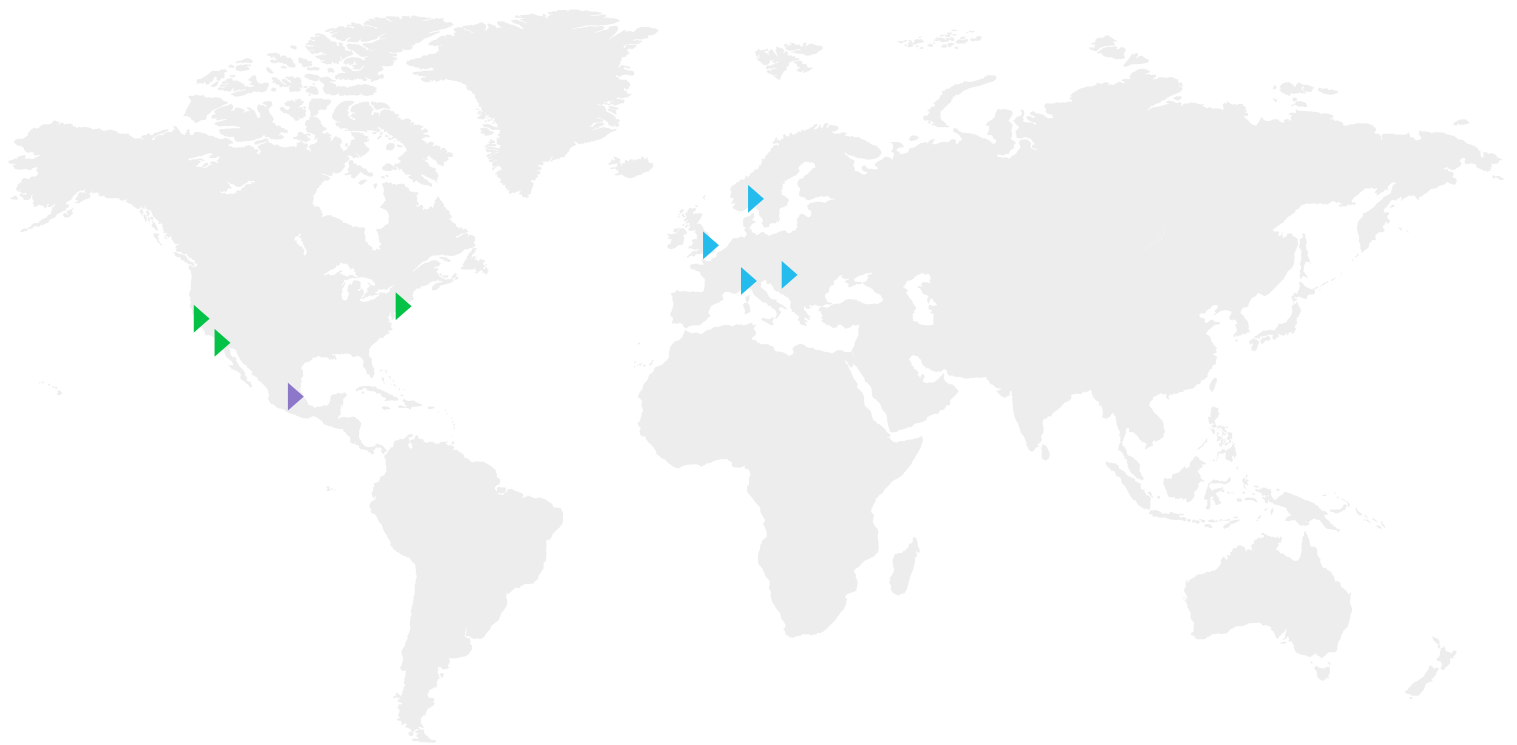
► Challenges faced by the cities

Signatory cities are facing many common challenges to meet the accelerator commitments, both within and outside their boundaries. Challenges within their boundary range from; costly and lengthy life cycle assessment documentation process to set informed targets, lack of financial resources and internal personnel capacity and competing city priorities. Cities also noted lack of awareness around a whole lifecycle approach within municipalities and across the construction value chain, unsupportive national legislation and lack of market availability of low-carbon materials and electric machinery.



- Costly and lengthy LCA documentation process in their procurement
- Competing city priorities
- Lack of financial resources and internal capacity
- Lack of national legislation and encouragement
- Lack of awareness among various relevant stakeholders
- Lack of market availability

SIGNATORIES



▶ **Budapest**

▶ **London**

▶ **Los Angeles**

▶ **Mexico City**

▶ **Milan**

▶ **New York City**

▶ **Oslo**

▶ **San Francisco**



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CITY PROGRESS SUMMARIES

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



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BUDAPEST

(Non-C40 city)

HUNGARY

Budapest has a major historical building stock. Through renovation and retrofitting efforts, the city aims to identify and revive derelict buildings. It concluded its green procurement study in 2023 and is in the process of revising its municipal green procurement methodology to include low-carbon materials.

Prioritising existing assets

- The Historical Urban Fabric Renewal Handbook identifies the building stock that needs to be protected and sets requirements for renovation. The upcoming task for the city is to provide immediate recommendations adapted to the current legal environment in accordance with the handbook.
- The city is mapping unused building stock to create a catalogue for the municipality to identify which buildings will be retrofitted.

In accordance with the Sustainable Energy and Climate Action Plan of Budapest, the retrofitting of buildings in the capital is a continuous and rigorous task that is being constantly tackled.

Lead by municipal procurement and shift the market by embedding clean construction actions into planning policies and codes

- Budapest has concluded an extensive green public procurement study. This covers life cycle analysis and life cycle cost calculation, articulation of emission reduction potentials of chosen materials and processes as well as suggestions to update municipal procurement processes. The city is revising the municipal green procurement methodology and anticipates it will be ready to use as a standard for procurement process by 2025.

Materials and construction design choices for climate resilience

- Budapest has published several [guidelines](#) and handbooks on green infrastructure development, green roofs and façades, permeable road coverings, tree planting, water-sensitive planning and urban inner-yard rehabilitation.
- With the support of European funding, nature-based solutions are being studied and piloted in certain locations to investigate their effect on the city's water management system.



Work with stakeholders to collectively reach 2030 goals

- As a follow up to the green procurement study, a stakeholder meeting was organised to spread awareness on this topic with representatives from the national government, private sector including construction, consulting companies, universities, city officials from different departments, and built environment and mobility-related municipal companies. The municipality is in the process of rewriting procurement policies to make environmentally conscious decisions related to municipal procurement.
- The city engages with residents as part of the [Net Zero Cities Budapest CARES project](#) funded by Horizon 2020, providing a one-stop-shop for residents who can access financial incentives to renovate their homes and information on smart technical retrofit solutions. The project, started in 2023 and implemented over two years, will address the decades-long backlog of residential energy retrofit investments, including low carbon insulation material choices, in line with green procurement studies.

Net zero emission pilot project

Budapest builds on the knowledge it gained from [ATELIER](#), an EU Horizon project about positive energy districts, to renovate an old school building and keep its core structure. Moreover, Budapest intends to strengthen its social housing services by adding new functions to existing but underutilised building stock. Within [ASCEND](#), another Horizon Europe project on positive energy districts, an abandoned school building on Megyeri street is being renovated for social housing purposes according to positive energy aspects.

The goal is to pilot net-zero buildings, with appropriate building retrofitting technologies and material selection through green procurement specifications.



LOS ANGELES

UNITED STATES

Los Angeles is advancing clean construction in the city by extending its Adaptive Reuse policy to test feasibility for affordable housing. Under Mayor Karen Bass' leadership, the city is exploring several embodied carbon reduction strategies in collaboration with industry partners. For instance, through its Municipal Building Decarbonisation Work Plan in 2024, Los Angeles is exploring an ambitious plan to decarbonise over 1,000 existing buildings.

Prioritising existing assets

- The Los Angeles' Adaptive Reuse Ordinance (ARO) facilitates the conversion of older, economically distressed, or historically significant buildings to apartments, live/work units or visitor-serving facilities in Downtown Los Angeles (DTLA). Thereby, reducing vacant space as well as preserving downtown's architectural and cultural past and encouraging the mixed-use development. The adaptive reuse ordinance has brought more than 12,000 homes to DTLA.
- Since signing the C40 Clean Construction Accelerator in 2020, the City of Los Angeles expanded the scope of the ARO. In May 2023, Los Angeles City Planning released a Draft Citywide Adaptive Reuse Ordinance, as a key component of the Citywide Housing Incentive Program (CHIP). The citywide ordinance will continue to incentivise the conversion of existing buildings to housing units by granting exemptions and streamlining planning

approval to developers for such projects. An economic analysis to analyse the potential feasibility of additional affordable housing mandates is expected to be completed by Spring 2024. A revised draft ordinance will be released in early 2024 and proceed through the formal adoption process starting this spring.

Lead by municipal procurement and shift the market by embedding clean construction actions into planning policies and codes

- The City of Los Angeles was the first local government to adopt the Buy Clean California Act in 2021 for its municipal infrastructure projects. This set a maximum global warming potential (GWP) limit for building construction materials including steel, flat glass, and insulation. In addition to the state's eligible materials, in 2023, the city has taken the extra step of adding concrete to the list.
- Mayor Bass' Office is participating in the World Economic Forum (WEF) City Sprint to explore policy recommendations on embodied carbon reduction strategies. These potential strategies include an Executive Order for Clean Construction, a Low-Carbon Code, an Innovation Hub for Clean Construction, and a City-Wide Circular Economy Strategy. These categories will be designed into action in the form of real projects, initiatives and policies and may be applicable to both municipal and private-sector buildings.



Materials and construction design choices for climate resilience

- The City of Los Angeles continues to work on the update to its comprehensive Hazard Mitigation Plan, its guiding document to reduce risk and increase resilience to climate impacts. The plan is intended to integrate with local planning, building codes, and zone regulations. It identifies construction methods to minimise damage, identifies hazard-prone areas and takes necessary measures in the

design, repair and maintenance of buildings and infrastructure. The 2024 Hazard Mitigation Plan will also include Cool Neighborhood projects which will incorporate Passive Cooling Guidelines, which can be applied to buildings and building materials. The plan is anticipated to be completed in the first quarter of 2024.

- As of April 2023, Los Angeles has completed 12 neighbourhood urban cooling projects, including installing 95 lane-miles of cool pavement coating and planting more than 1,200 shade trees. Another 80-100 lane miles of cool pavement are planned for fiscal year 2023-24.

Work with stakeholders to collectively reach 2030 goals

- The collaboration with the World Economic Forum (WEF) City Sprint project will involve stakeholders from various private sectors including architecture, engineering, real estate, energy and utilities for future policy developments on embodied carbon.
- The Los Angeles Department of Building and Safety (LADBS), is part of a coalition of building professional organisations including Carbon Leadership Forum, the US Green Building Council, and the American Institute of Architects, which is collaborating with the state building code professionals to advance on Life Cycle Assessment (LCA) and embodied carbon-related policies.

Net zero emission pilot project

Los Angeles has directed efforts to address operational and embodied emissions through the development of its existing Municipal Building Decarbonization Work Plan 2024. The city is developing a multi-year plan that will identify and prioritise projects for net zero completion and plans to decarbonise over 1000 existing buildings by 2035.



MEXICO CITY

MÉXICO

Mexico City has focused on circularity in construction through reconversion projects and the use of construction and demolition waste (RCD). The city is also taking some innovative measures to tackle various disasters.

Prioritising existing assets

- The [2022 Guidelines for the Reconversion of Offices in Residential Buildings](#) consists of granting tax benefits to office owners for approved reconversion projects, which consist of the transformation and/or adaptation of an underused or vacant office property into a residential building.
- The [Sustainable Building Certification Program \(PECS\)](#), updated in 2020 and established by the Ministry of the Environment of the Federal District, is the specific voluntary certification standard. PECS considers sustainability criteria in the operation of buildings, such as an annual maintenance programme of the building and its different components, increasing the building's lifespan.

Lead by municipal procurement and shift the market by embedding clean construction actions into planning policies and codes

- Updated in 2022, Mexico City's environmental standard [NACDMX-007-RNAT-2019](#) establishes the specifications for the management of construction and demolition waste, through

which the city requires the use of recycled material in public works. In 2022, over 92% of the total generated construction and demolition waste (CDW) was used, a huge increase compared to 2021, where only 16% of the total CDW generated was used.

- Under the [Programa Ambiental y de Cambio Climático de la Ciudad de México 2019-2024](#), Mexico City's [efficient recycling centre](#) received first place in the Green Awards 2023 for demonstrating the successful implementation of a circular economy model. Through this project, research and development was carried out to process construction and demolition waste to be reused, revalued, recycled, and transformed into constructive and landscape elements with technological innovations.

Materials and construction design choices for climate resilience

- PECS offers tax incentives to the developers that contribute to the climate action programme from both the public and private sectors. This includes the construction of green infrastructure and sustainable, resilient buildings, for example using solutions such as green roofs. Certified companies can obtain tax incentives of up to 40% reduction in payroll tax or up to 20% reduction in property tax payments.

- There is a growing culture of preventive maintenance programmes against disasters such as earthquakes in Mexico City. This is being achieved through corrective and preventive maintenance works in all mayor's offices.
- Mexico City's green infrastructure special programme contains a range of climate resilient actions for flood control and tackling the urban heat island effect through increasing green areas as well as restoring modified natural spaces that provide environmental services for the benefit of the population. Examples of these actions include infiltration gardens, pollinator gardens with native plant species, wetland restoration and green corridors.



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Work with stakeholders to collectively reach 2030 goals

- There are six construction and demolition waste recycling plants operating in Mexico City which convert non-structural elements into recycled aggregate with the participation of the private sector. An example of a public-private partnership is the comprehensive recycling centre PLANTA CIREC located in the Miguel Hidalgo district.
- The Comprehensive Waste Management Programme 2021-2025 establishes collective goals that prevent the generation and ensure adequate management of construction and demolition waste in the city with the participation of the private sector.
- Mexico City participates in technical groups with the National Association of State Environmental Authorities to take actions on climate breakdown, waste, and the circular economy among others, to help achieve the city's climate goals.
- Mexico City is participating in C40's 'Building greener cities: green job opportunities in clean construction' research pilot project that will identify how the adoption of clean construction practices can change local labour markets and the cost associated with civil construction in the city.

Net zero emission pilot project

Cuitláhuac Park, completed in 2022, is a part of the Sembrando Parques or Planting Parks programme and was constructed using 85% recycled materials from a former waste dump. The park features benches with recycled hydraulic concrete and new wetlands, which have increased local flora and fauna, improved water and air quality, and reduced the risk of flooding.



Estefania Arriaga Ramos

Head of the Departmental Unit of Sustainable Waste Management, Mexico City

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

I am Head of the Departmental Unit of Sustainable Waste Management at the Environment Secretariat of Mexico City. We have coordinated the project "Analysis of the potential to reduce GHG emissions derived from construction and demolition waste, as well as the effectiveness of measures to increase its use in CDMX." Within the framework of the Strategic Alliances for the Implementation of the Paris Agreement (SPIPA) programme, an analysis of the potential to reduce emissions derived from Construction and Demolition Waste (CDW) has been commissioned.

We have promoted the construction waste collection program with the mayors to guarantee adequate management of household waste and waste from clandestine dumps.

And we coordinate another project to create a market prototype for construction and demolition waste that allows promoting the exchange of these materials, under a circular economy scheme and the traceability of these products.

> What inspires you in the work you do to improve clean construction work particularly related to CDW in your city in order to achieve the commitments of the C40 Clean Construction Accelerator?

Mexico City has always been a reference for other cities, states or countries on waste management, so any action taken has a great impact not only on the city but on its surroundings. The management of construction and demolition waste is an important issue that is not so visible, because economic development is preferred over environmental benefits, therefore, being able to achieve the commitments of the CCA will help us significantly reduce the amount of waste that goes to landfills, and provide valuable construction materials.

Additionally, clean construction practices can minimise the environmental impact of construction and contribute to the creation of more sustainable cities. These are valuable goals that can inspire people to work in this field.

> What have you learned from another city official (either in your own city or another city) that has changed the way you approach your work?

I could not point to a single official, because along my way I have met various people who have had a very important lesson for me, but thanks to Mrs. Laura Reyes I have managed to have a more anthropocentric vision of waste management and be able to achieve agreements and objectives with key actors to achieve a more sustainable city.





OSLO

NORWAY

Oslo is the lead city for C40's Clean Construction Programme. The city uses its municipal procurement powers to shift the market towards zero emission construction sites and low carbon materials. The city also collaborates with stakeholders outside its city boundaries to aggregate market demand for zero emission machinery.

Prioritising existing assets

- Oslo's Agency for Planning and Building Services has issued [guidance](#) on assessing circularity criteria in the planning process. The guidance asks project developers to consider reuse of existing building stock and related infrastructure, to avoid demolition, and to consider combinations of new and existing buildings.

Lead by municipal procurement and shift the market by embedding clean construction actions into planning policies and codes

- In 2019, Oslo set a minimum requirement for construction machinery and transport of bulk materials and waste to and from construction sites, rewarding [zero emission technology](#). In accordance with the [Climate Strategy for Oslo Towards 2030](#), the city introduced requirements for fossil fuel-free construction sites in new zoning plans in 2020. All machines and equipment used on the construction site will be zero emissions by 2025 using zero or

low emissions vehicles (i.e. battery electric or hydrogen) or biogas. Oslo's climate agency has estimated that these measures can reduce emissions by approximately 3,300 tonnes of carbon dioxide equivalent (CO₂e) by 2030.

- For municipal building projects, the city has developed a [standard](#) which requires the provision of at least two environmental product declarations (EPDs) for each of the ten largest categories of building materials, as well as emissions accounting for different phases of the project. This measure encourages the prioritisation of low carbon, including bio-based and recycled materials.
- Oslo's revised [Climate budget 2024](#) emphasises the implementation and strengthening of existing instruments for reducing greenhouse gas (GHG) emissions. Some important clean construction initiatives include requirements for greenhouse gas calculations in construction projects, emission-free construction sites and low carbon and circular materials through municipal land use plans. These requirements may result in a financial burden for small organisations during the transition phase to emission-free solutions. To help them cope, the municipality is working to establish subsidy programmes to reduce the costs of transition.
- The municipal building developer and owner, Oslobygg, has set a target to reduce embodied carbon by 30% compared to the reference developed by the [FutureBuilt programme](#).



- The newly revised national technical criteria for buildings in 2023, requires assessing and reporting on buildings' embodied carbon emissions. The requirement is valid for new construction and major remodelling of buildings and includes both municipal and private projects in Norway.

Materials and construction design choices for climate resilience

- In 2020, Oslo conducted a vulnerability analysis with the aim of strengthening the knowledge base for a more adapted and resilient city. Based on the analysis the city is in a continuous process of incorporating climate adaptation solutions in land-use planning.
- In 2014, Oslo adopted a strategy to manage surface water runoff. An updated action plan was established in 2019 to expand the city's green areas, building rain beds and open waterways to reduce the risk of flooding. In May 2023, a new strategy for green roofs and façades was approved with the action plan currently under development.
- The climate guidance from the Agency for Planning and Building Services requires construction materials to be resilient to the impacts of the climate crisis, for example increased rainfall and temperature rise.

Additionally, Oslo has guidance and strategies that score 'blue-green factor' in new projects, to ensure and maintain desired levels of nature and water, such as green roofs and façades or ponds.

Work with stakeholders to collectively reach 2030 goals

- Oslo's 'Business for Climate' project promotes climate solutions for the private sector and facilitates close dialogue with the business community, including on how the city and business community can collaborate to meet the targets in Oslo's climate strategy 2030.
- The city is also partaking in a project by Pådriv, a strategic industry partner for establishing a marketplace for the reuse of construction materials. The marketplace opened in March 2023, with the aim to build a business model for reused building materials.
- Oslo participates in several collaborative national and international networks to drive climate action and raise ambition, such as engaging in Big Buyers Working Together, a European Commission initiative to harness European cities' procurement power.
- Oslo is seeking broader legislative mandates from the national government to set stricter requirements in their public procurement. The change will come into effect in January 2024 and will require that the contracting authorities must weigh a minimum of 30% of the total award criteria in climate and environmental considerations, contributing in turn to a wider market change in Norway.
- As of 2023, Oslo's participation in the C40 'Just and Viable Transition to a Regenerative Built Environment' project exemplifies its commitment to linking clean construction with equitable climate financing and a just transition.

Net zero emission pilot project

Oslo opened a zero-emission construction site in 2019, through the upgrade of Olav Vs Street in the city centre. All construction machinery at this site was electric. Since then, the City of Oslo has had several zero emission sites (Klosterenga, Bygata Øst Furuset, Skilpaddeparken). Read more about Klosterenga [here](#).



Ingrid Bjerke Hauan

*Climate and Energy Adviser
The Climate Agency, City of Oslo*

> 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 climate and energy adviser in the Climate Agency in the City of Oslo. An important part of the agency's role is to be a knowledge base on climate and energy matters for the other entities and agencies in the City of Oslo, but we also have a mandate to push for change and innovations that will help accelerate the shift toward a zero emission city. Being a part of this change and seeing actual results from the City of Oslo's endeavours makes me very proud.



> What inspires you in the work you do to transition towards zero emission construction sites and shifting to low carbon materials in your city in order to achieve the commitments of the C40 Clean Construction Accelerator?

For me, the greatest motivation comes from seeing the willingness and courage to change from all actors in the building and construction industry. Even though the outlook for global climate targets on the whole is quite bleak, and the task of transitioning into a zero emission society can be overwhelming, the progress that has already been made, and the abundance of solutions available compared to only a few years ago, inspires me every day.

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

When it comes to clean construction, and zero emission construction in particular, the general public's interest is perhaps not the greatest. So when we receive feedback and reports from either construction workers or neighbours to our construction sites, highlighting the other benefits of using electric machinery, such as less noise, less local pollution, or the absence of exhaust gases, we know we are on the right track. I also believe that from a "licence to operate" perspective, as zero emission construction becomes more common, residents will come to expect the absence of noise and pollution from construction sites and react negatively to the use of diesel. Hopefully, this will force any reluctant sceptics to convert to zero emission, if only to avoid complaints.



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SAN FRANCISCO

UNITED STATES

San Francisco's Climate Action Plan (CAP) sets an ambitious target to tackle consumption based emissions with a focus on building materials and construction activities, and to achieve a 40% reduction in embodied carbon by 2030. In line with its CAP, the San Francisco Environment Code contains various chapters on buildings and the construction sector such as municipal green building requirements, clean construction requirements in public works and construction and demolition debris recovery.

Prioritising existing assets

- San Francisco's Economic Recovery Task Force Report, published in October 2020, includes a recommendation for adaptive reuse to promote reactivation for a vibrant San Francisco post-covid. This is complemented by the 2021 CAP's Responsible Production & Consumption (RPC) supporting action to develop a suite of incentives, policies, and/or guidelines for adaptive reuse of existing buildings by 2025. The city is also beginning to engage with city government stakeholders to increase education and awareness about adaptive reuse for municipal and all other projects.

- In June 2023, the city's Office of Economic and Workforce Development released a request for interest on adaptive reuse of downtown commercial buildings with an aim to accelerate or enhance building conversions from commercial to non-commercial uses through regulatory modifications, financial incentives, or other means in the coming years.

Lead by municipal procurement and shift the market by embedding clean construction actions into planning policies and codes

- Per the CAP chapter called 'Responsible Production and Consumption', between 2024-26, the city will phase in policies to reduce embodied carbon by more than 10% per project by addressing at least three product categories or building assembly types.
- The city is doing foundational research to examine how to establish a maximum allowance for embodied emissions based on occupancy or construction type. Once the embodied carbon policy has been tested on municipal projects and refined as necessary, these will be extended citywide for private developments to maximise reductions by 2025.

- In August 2023, the [2022 California Green Building Standards Code](#) was amended to require commercial buildings larger than 100,000 sq ft and school projects larger than 50,000 sq ft to reduce embodied carbon emissions by one of these three options: reusing at least 45% of an existing structure; demonstrating a 10% reduction from a baseline (using a Whole Building Life Cycle Analysis); or by specifying low embodied carbon products based on [environmental product declarations](#). These changes will go into effect statewide on 1 July 2024.



- The city has started to incorporate education and awareness outreach materials in collaboration with the Carbon Leadership Forum, which are included in the [Embodied Carbon Reduction Strategies Checklist](#), required for municipal construction projects and available for all projects.
- In April 2023, the City of San Francisco updated the municipal green building policy in [Chapter 7 of the Environment Code](#). Project teams must apply life cycle analysis to achieve at least 10% reduction in embodied carbon in at least three product categories or building assembly types, applying Leadership in Energy and Environmental Design (LEED).
- Chapter 7 also shifted from a minimum overall diversion requirement of 65% to requiring 100% diversion of certain materials by source separating for reuse or recycling. Impacted materials include concrete, metal, clean solid wood, clean and unpainted drywall, and carpet and carpet padding. This involves thorough auditing and compliance monitoring.
- The city is in the phase of developing a new chapter for an ordinance on construction and demolition debris, focused on material reduction and reuse. This will be drafted and adopted by 2025.
- The Port of San Francisco's [Waterfront Resilience Program \(WRP\)](#) is developing draft sustainable procurement guidelines and exploring requirements for project life cycle assessments, material GWP limits and minimum waste diversion for the WRP's sea level rise adaptation and earthquake retrofit projects. The WRP has engaged with industry to help inform the guidelines and is targeting implementation in 2024.

Materials and construction design choices for climate resilience

- San Francisco has recently conducted a wide range of research and stakeholder engagement to develop a more circular supply chain for building products in the Bay Area. If successful, these efforts will improve the region's climate resilience by creating new opportunities to source products locally, thus decreasing San Francisco's reliance on global supply chains that can be affected by climate change impacts or other disruptions.
- The Port of San Francisco WRP is also working on adapting the San Francisco waterfront to rising sea levels and is conducting research to ensure construction material selection enhances the city's climate and environmental goals. The WRP has implemented a [Living Seawall pilot](#) project to assess the ability to support native species growth, and is exploring concrete alternatives for waterfront applications that maximise durability while limiting carbon footprint.

Work with stakeholders to collectively reach 2030 goals

- To collaborate with stakeholders on policy that facilitates building sector circularity, San Francisco also convened two groups, the Deconstruction Technical Advisory Group and the Reuse Policy Roundtable.

- The Deconstruction Technical Advisory Group convened twelve Bay Area construction stakeholders including municipal officials, reuse retailers, deconstruction contractors and labour representatives to understand implementation and compliance mechanisms for a potential future local deconstruction policy.
- The Reuse Policy Roundtable gathered municipal representatives from about twenty jurisdictions across the United States to conceptualise a flexible model policy approach for requiring the incorporation of reclaimed and surplus products into construction projects. San Francisco worked with climate technology company Rheaply to pilot an online marketplace for reclaimed and surplus building materials for the Bay Area which was completed in August 2023.
- Outcomes from these groups are supported to inform regional embodied carbon initiatives including the California Green Building Standards Code 2026 and will be incorporated into a policy proposal for building material recovery and redistribution for San Francisco.
- Earlier in 2023, the city submitted comments to the U.S. Environmental Protection Agency (EPA) Request For Information to support new [Inflation Reduction Act](#) programmes to lower embodied GHG emissions and support with the development of infrastructure and resources to facilitate a shift to circular construction.

Net zero emission pilot project

The [Kelsey Civic Center](#) in San Francisco is one of the winning projects from the first [Reinventing Cities competition](#), a call for urban projects to drive carbon neutral and resilient urban regeneration in cities across the globe, which seeks to implement the most innovative ideas to transform underutilised sites. The project will be a vibrant urban community offering 112 homes for San Franciscans of all abilities, incomes, and backgrounds. Zero carbon project features include wood and low carbon concrete construction materials.

BARRIERS TO ACHIEVE THE COMMITMENTS

The interconnected climate and economic crises, housing and cost of living crises, shifting political priorities, along with often changeable national government regimes, all pose a number of interlocking challenges for cities. This requires innovative thinking for clean construction actions to be prioritised and implemented, as well as being equitable and inclusive.

Developing a data-driven baseline to set informed targets through life cycle assessment (LCA) can be perceived as a lengthy and costly process. Yet several cities are taking steady steps by testing it out on municipal projects first, to then make necessary adjustments and extend to all public and private projects. Oslo has acquired licences for an LCA software to be used by their contractors/consultants for municipal-led projects.

There is a lack of awareness around a whole lifecycle approach within municipalities and across the city value chain. Educational resources and workforce development programmes will be necessary to support cities and stakeholders in the transition towards clean construction. Cities are developing studies on green procurement, adaptive reuse and regional material reuse to educate city departments and the private sector, and get local support. Through guidance, handbooks and checklists, cities are setting a path to transition towards sustainable construction. In some instances, cities are offering [C40's Clean Construction E-learning course](#) to different departments in the

city, as well as the private sector to accelerate the adoption of clean construction actions and commitments.

Another common challenge is the lack of resources – especially lack of capacity, expertise and financial resources across city departments. Reporting cities are taking advantage of regional funding opportunities and collaborating with stakeholders outside their city boundaries. The accelerator gives cities a chance to highlight the projects and policy initiatives they are working on. This could facilitate the creation of new partnerships and present new funding opportunities.

National or subnational building codes can occasionally aid the transition towards clean construction. For instance, the [2022 California Green Building Standards Code](#) puts down strict regulations for buildings above a certain floor area to reduce embodied emissions. However, most cities are at odds with the national government, and face a lack of national legislation and encouragement. Changing political regimes also make it difficult for cities to gain the necessary stable support to implement, enforce and advance on an action. Through the C40 Clean Construction Accelerator, signatory cities commit to champion the cause and advocate for regional, national and supranational action. By showing their leadership and demonstrating the positive impact of their measures, cities are making the argument for broader political and business support.

Clean construction actions can sometimes be conflicting with other city priorities. For instance, adaptive reuse, deconstruction and circular initiatives can be perceived as complicated and lengthy, and a delay to building new (and often carbon intensive) developments for affordable housing. Cities are finding innovative solutions to dispel misconceptions and provide sustainable and affordable homes, by streamlining and expediting permits, grant exemptions for reusing historic and/or deteriorated sites, or converting underutilised buildings for residential or affordable housing.

Lastly, managing demand and supply and ensuring supply chain viability for low carbon products, such as bio-based and recycled construction materials or zero emission construction machinery can prove to be challenging for cities. Cities are starting to overcome this challenge by tirelessly working beyond their boundaries through forming working groups and coalitions involving civil and private and being actively involved in national codes work to aggregate demand.



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CONCLUSION

To develop the net zero emission and climate-resilient buildings and infrastructure of the future for everyone, everywhere, mayors around the world are committing to the C40 Clean Construction Accelerator.

With each passing year, cities are taking more and more ambitious and collaborative actions. Cities are increasingly driving forward adaptive reuse, retrofitting and reconversing offices into homes. They are leading by example with pilots and procurement of zero emissions construction machinery and low carbon materials. They are using planning and zoning policies, requiring life cycle assessment (LCA) reporting and setting embodied carbon targets and baselines. To tackle ongoing and future climate risks, cities are promoting green infrastructure and exploring material alternatives that are both low carbon and resilient. This has helped to create healthier communities, reduce emissions of greenhouse gases, deliver jobs and protect the most marginalised residents from the impacts of the climate crisis.

Cities are actively overcoming several political and economic challenges and tackling resource and knowledge gaps by using their convening power and collaborating with various stakeholders. They are offering education programmes and free software licences both within and outside their city boundaries to raise awareness and provide the necessary tools to advance towards clean construction. As challenges remain, C40 will continue to support cities in their efforts to meet the C40 Clean Construction Accelerator ambitions. Through the C40 Clean Construction Programme, cities have access to support which includes the [C40 Clean Construction e-learning course](#) to build capacity and awareness; workshops, webinars, and city industry dialogues to exchange knowledge and ideas between peers and provide a safe space for dialogue and collaboration; as well as tailored technical assistance, pilot projects and knowledge production.

We are confident that with collaborative efforts from cities and continued support from C40, signatories will continue to tackle barriers to effectively meet the commitments of the accelerator and lead the way in creating inclusive, decarbonised and climate-resilient cities of the future.

