

The Future is Flexibility
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Cities: Untapped solutions to the energy transition

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C40 is a network of mayors of nearly 100 world-leading cities collaborating to deliver the urgent action needed right now to confront the climate crisis. Together, we can create a future where everyone, everywhere can thrive.



The C40 Cities network

Directly representing **582 million** residents

Influencing **896 million** people living and working in the wider city



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AFRICA: ABIDJAN – ACCRA – ADDIS ABABA – CAPE TOWN – DAKAR – DAR ES SALAAM – DURBAN (ETHEKWINI) – EKURHULENI – FREETOWN – JOHANNESBURG – LAGOS – NAIROBI – TSHWANE | **CENTRAL EAST ASIA:** BEIJING
CHENGDU – DALIAN – FUZHOU – GUANGZHOU – HANGZHOU – HONG KONG – NANJING – SHANGHAI – SHENZHEN – QINGDAO – WUHAN – ZHENJIANG | **EAST, SOUTHEAST ASIA & OCEANIA:** AUCKLAND – BANGKOK – HANOI
HO CHI MINH CITY – JAKARTA – KUALA LUMPUR – MELBOURNE – QUEZON CITY – SEOUL – SINGAPORE – SYDNEY – TOKYO – YOKOHAMA | **EUROPE:** AMSTERDAM – ATHENS – BARCELONA – BERLIN – COPENHAGEN – HEIDELBERG
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MEDELLÍN
MEXICO CITY – RIO DE JANEIRO – SALVADOR – SÃO PAULO – SANTIAGO – QUITO | **NORTH AMERICA:** AUSTIN – BOSTON – CHICAGO – HOUSTON – LOS ANGELES – MIAMI – MONTRÉAL – NEW ORLEANS – NEW YORK – PHILADELPHIA
PHOENIX – PORTLAND – SAN FRANCISCO – SEATTLE – TORONTO – VANCOUVER – WASHINGTON DC | **SOUTH & WEST ASIA:** AHMEDABAD – AMMAN – BENGALURU – CHENNAI – DELHI – DHAKA – DUBAI – KARACHI – KOLKATA – MUMBAI



Why do cities matter?

Cities occupy
2%
of the world's
landmass

Cities consume
around
75%
of the world's
energy

Cities
create over
70%
of energy-related
greenhouse gas
emissions

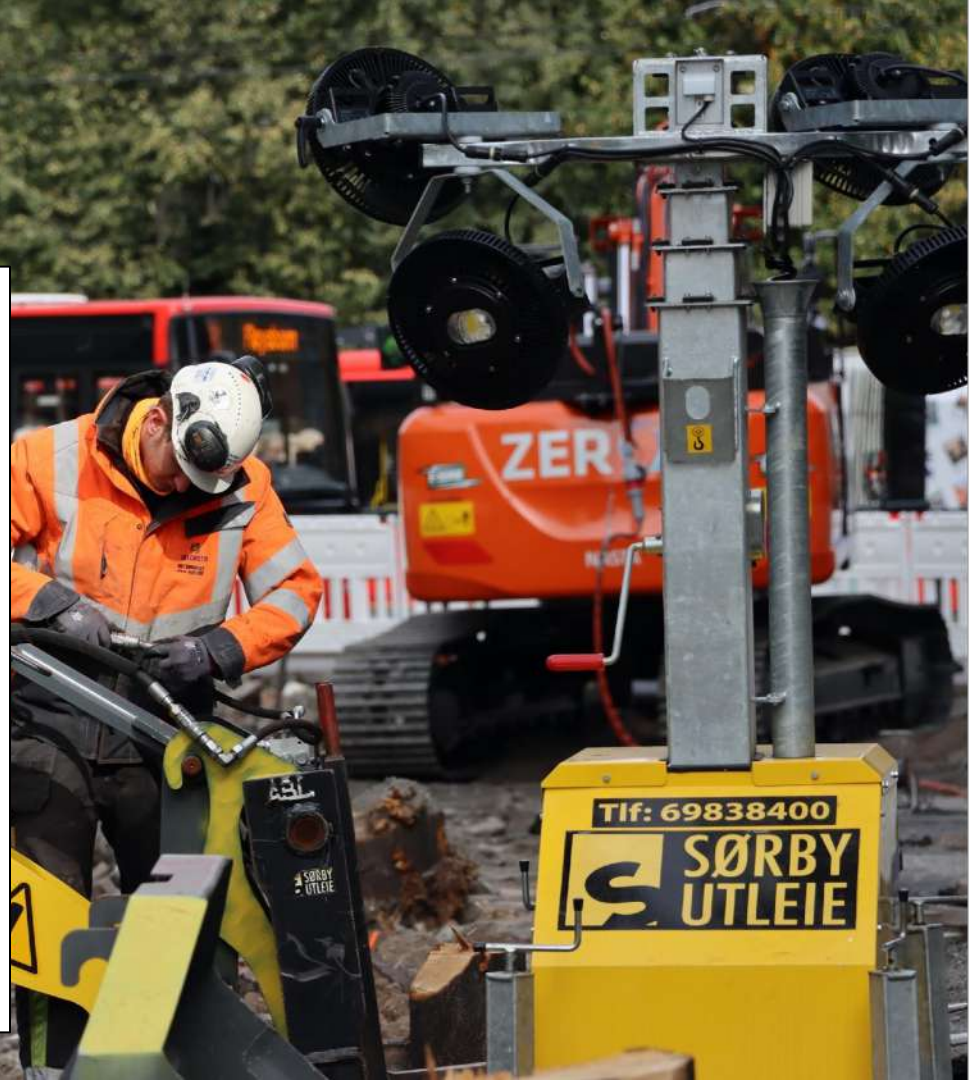
Cities
generate over
80%
of the
world's GDP

ENERGY AND BUILDINGS

The Energy and Buildings team supports C40 cities in **transitioning away from fossil fuels, carbon-intensive materials** and into **renewable energy and green buildings** solutions.

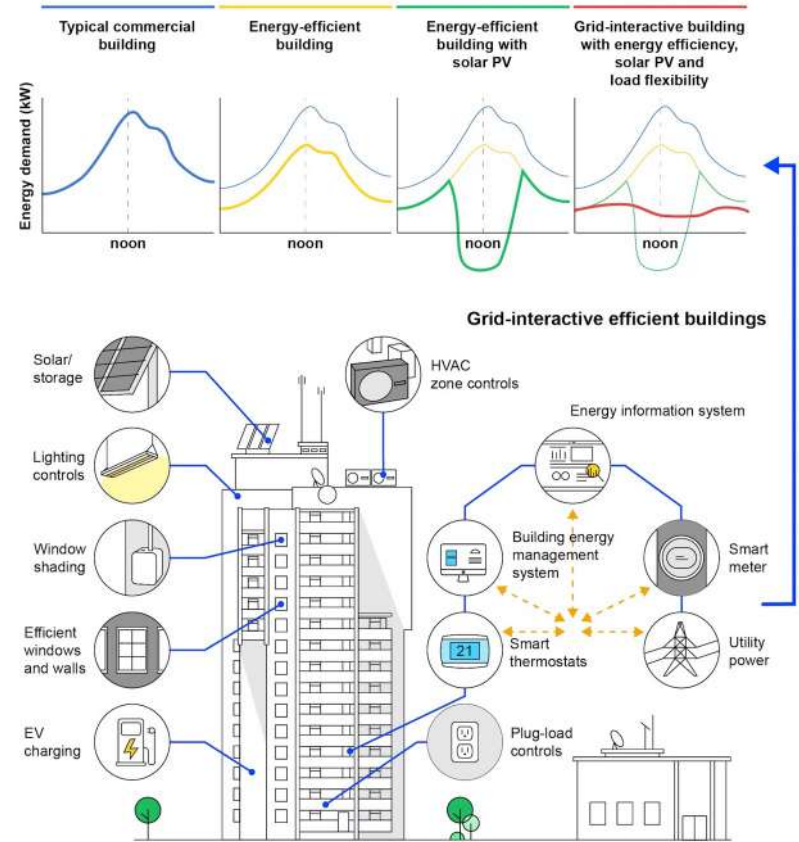
The buildings that we live and work in are responsible for an average of 35% of total urban emissions in C40 cities, and up to 70% in some cities on account of the energy used to power, heat or cool them.

. Given the long lifetime of buildings and the urgency of climate challenge, it is crucial that we **decarbonise buildings** in cities – by making them more **efficient** and supplying them with only **renewable energy** sources, while also introducing measures to address **embodied emissions**.



Why buildings?

- We cannot meet our climate targets without addressing the buildings sector, and to make matters worse, the need for buildings and infrastructure is set to **intensify**.
- Buildings are part of the wider energy system, which has not been developed with renewable energy in mind.
- Energy & building decarbonisation need to go hand in hand
 - Efficient buildings need less energy to operate
 - Building electrification can provide additional flexibility to the system
 - Flexibility is needed because variable renewable energy and extensive electrification of energy demands like heat and transportation make managing the grid more complex than ever before.
 - Building retrofits brings wider co-benefits to the people that live in them



Source: IEA, [“There’s more to buildings than meets the eye. They hold a key to net zero emissions”](#)

Benefits of energy efficient building retrofits

- Reduces energy bills
- Reduces energy poverty
- Improve air quality and health outcomes for occupants
- Improve living conditions
- Improves energy security
- Creates a large number of local jobs quickly
- Reduces investment costs for renewables
- Improves grid resilience and reliability



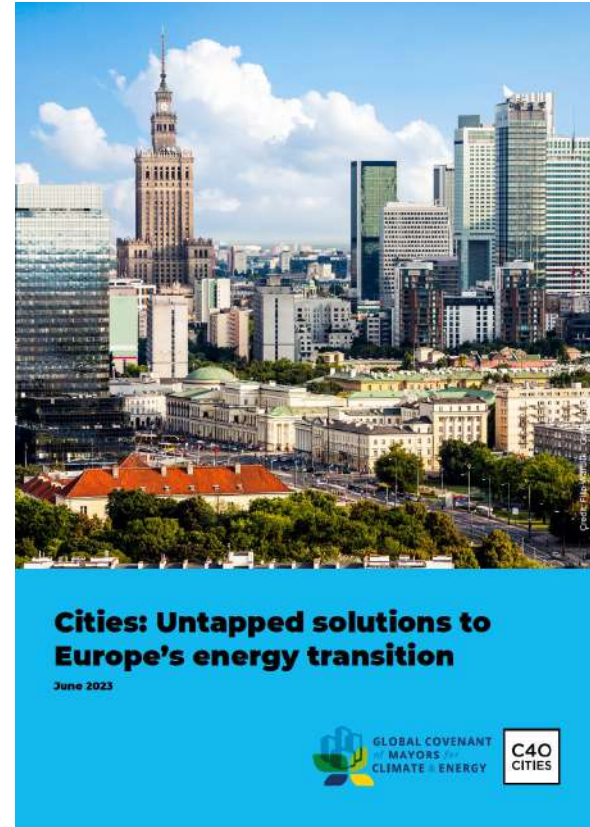
Europe: Energy Crisis Emergency Plan - The 3Rs

1. Lifting **all residents** from energy poverty.
2. Accelerating investments into making **all municipal buildings** and **social housing** properly insulated and run on renewable energy.
3. Ensuring that all residents can access **trusted energy advice** through services that strengthen community resilience.
4. Eliminating wasteful energy use through stimulating **behaviour change**.
5. Massively boosting energy **retrofit** rates, prioritising all worst-performing buildings.

6. Decreasing urban reliance on gas through accelerated deployment of **clean, affordable heating and cooling systems** and phase out direct fossil fuel use.
7. Unleashing the untapped potential for **decentralized power systems** and **demand-side flexibility** in our electricity systems.
8. Reducing oil demand through **affordable, sustainable urban mobility** options.
9. Ensuring **social dialogue** with unions.
10. Acting with a **collective voice** and pooling resources to tackle the emergency

Buildings have more potential

- C40's modelling of **net-zero building retrofits** (i.e. insulation, heat pumps & renewables) in Barcelona, Warsaw and London shows that European cities can **reduce buildings' energy consumption by up to 90%**.
- **Building retrofits will improve health.** The modelling shows that retrofitting all buildings over an initial period of five years for social housing and 34 years for all buildings will prevent 35,952 people in Warsaw getting sick due to mould and, in even larger western and northern European cities such as London this could exceed 385,302 people.
- **Retrofit creates good green jobs in cities.** Building retrofits tend to create local jobs and are relatively labour intensive.
- **Retrofit will decrease energy demand.** Retrofitting 3% of the building stock every year will contribute to reducing Europe's energy demand, in the short, medium and long term, as well as to contribute to the continent's swift decrease of Russian fossil gas imports.



C40 and 24/7 CFE

C40 is delivering a new program - with dedicated funding - to accelerate delivery of **24/7 CFE projects in cities**

C40 White paper

- Explores the roles of cities in this transition
- Promotes new thinking about how energy systems are managed
- Explores demand side flexibility and supply side measures needed to deliver 24/7 CFE

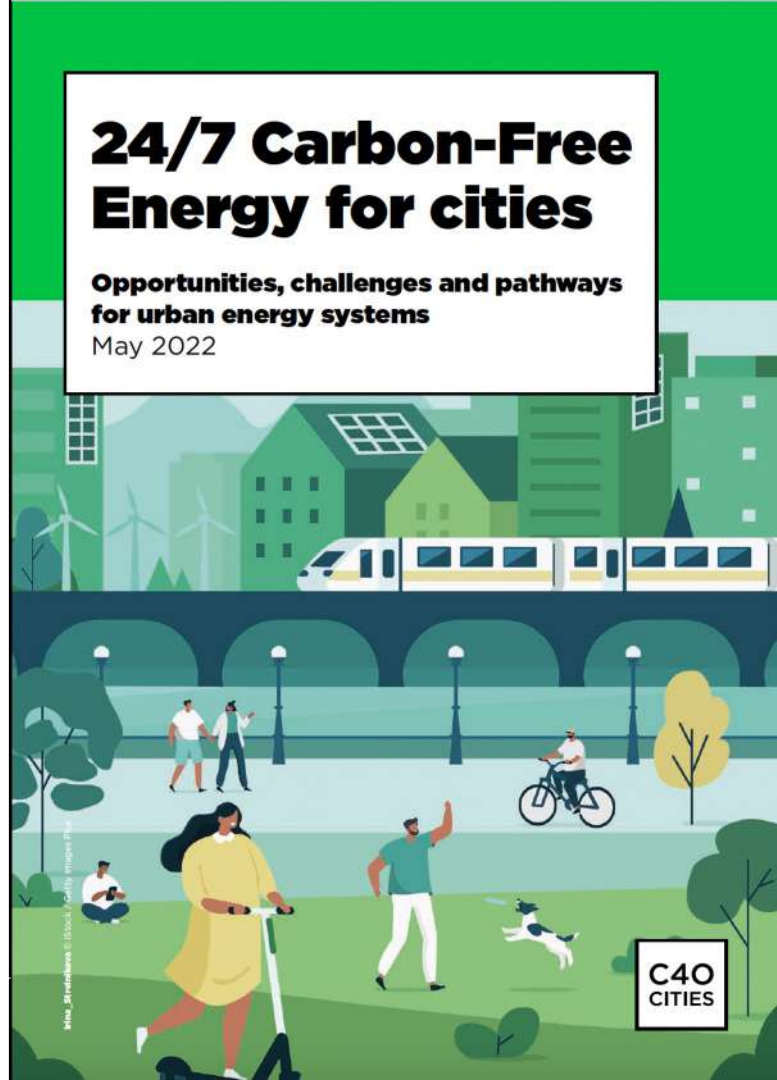
Proof of concept pilots

- Cities used as testbeds for the 24/7 CFE approach
- Use findings of the white paper in real case studies

24/7 Carbon-Free Energy for cities

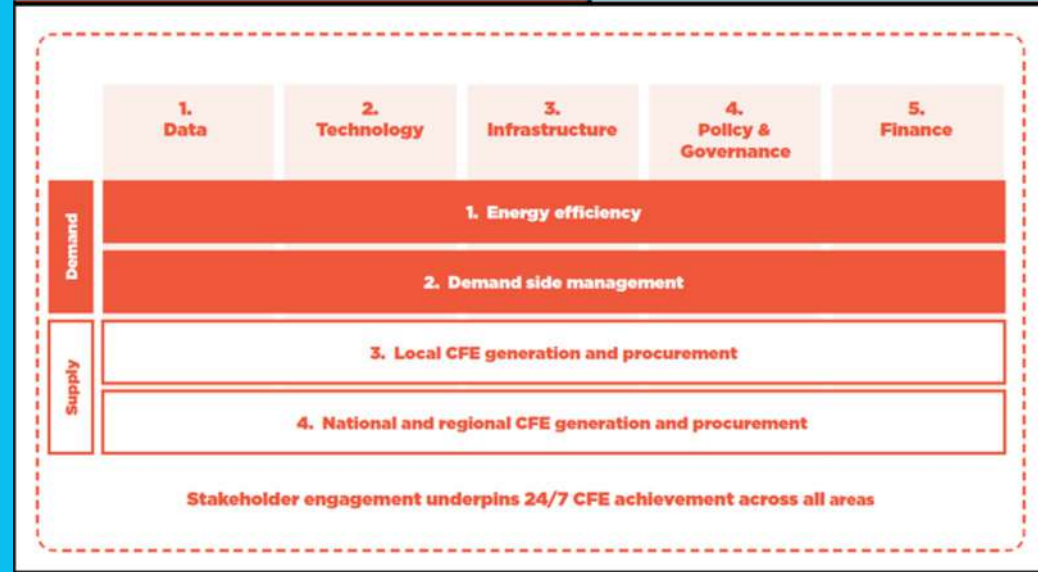
Opportunities, challenges and pathways for urban energy systems

May 2022



A 24/7 CFE approach
for cities...

A paradigm shift in how cities think about electricity systems



24/7 CFE White Paper Recommendations



- 1 **Improve energy supply and demand data management and analysis** to better understand energy efficiency, demand side management potential and CFE generation profiles.



- 2 **Prioritise energy efficiency measures to reduce city-owned consumption** as a first, no-regret step towards matching electricity supply and demand profiles.



- 3 **Electrify end-uses where possible** e.g. in the transport sector to enable increased supply flexibility and increase options for shifting load across multiple end-uses to smooth demand profiles.



- 4 **Increase grid flexibility and identify load-shifting opportunities** which can increase the number of hours of the year met with CFE supply, without disrupting city economic activity.



- 5 **Create a positive environment for private sector investment** in electricity sector decarbonisation initiatives that drive progress towards 24/7 CFE and benefit low income and marginalised groups, strengthening diversity and inclusivity in the energy sector.



- 6 **Develop structures for stakeholder collaboration and private sector engagement** to accelerate the deployment of carbon-free energy across local power grids to meet the needs of city-owned and city-wide consumers.

The importance of flexibility in this transition

- By coordinating millions of consumer energy asset deployments, such as heat pumps, they can create significant flexible capacity which can be called on for meeting energy system needs that would otherwise require gas or coal fired power plants.
- This capacity can replace sources of flexibility which are currently provided by fossil fuels.
- Cities can reach their Net Zero targets faster, by relieving the network constraints that prevent faster deployment of the technologies necessary for decarbonisation.

Cities are doers !

- **Barcelona:** Aims to renovate **15,000 apartments** over the next three years and has already undertaken energy assessments and installed energy efficiency measures in homes experiencing energy poverty, reducing the cost of their utility bills by 19% and saving homes EUR 225 (USD 219) per year on electricity bills.
- **Milan:** Through upgrades made to multi-family homes as part of a 2020 pilot project, **greenhouse gas emissions are being cut by a third and energy costs by almost a quarter.**
- **London:** The GLA has a large-scale energy efficiency programme helping to retrofit low-income houses. The programme has to date received a budget **of £40 million (USD 48 million)** from the mayor and the national government.
- **Warsaw:** Warsaw is undertaking energy audits in targeted low-income homes in support of the city's wider approach to phasing out coal, reducing energy poverty and implementing a just transition. The city starts with the renovation **of 200 houses** to increase their energy efficiency and make at least 160 of those houses coal- free.
- **Amsterdam** is investing **8.5 million** to upgrade the homes of vulnerable residents in 2023. An additional €3.5 million will be allocated to support the city's homeowners' associations and the city also provides free guidance to residents on how to make homes more energy-efficient. They aim to reach 24,000 households in 6 months and has a plan to become a natural gas-free city by 2040, 10 years ahead of the national goal.

C40 pilots - analysis on 24/7 CFE concepts

- Demand side flexibility
- Analysis of which technologies to flex & city-wide potential
- Develop real world pilot

London

- Clean energy grid mix
- Electrification of transport analysis
- Implementation roadmap

Paris

- Hourly municipal energy procurement
- Technology mix analysis
- Implementation roadmap

Copenhagen

Cities need an upgraded role

- While Relief is crucial in the short-term, it is not enough to tackle climate change's structural challenges nor provides **long-term policy solutions**.
- To achieve their climate targets and move away from short-term solutions, Europe must prioritize **reducing energy consumption** and emissions in the building sector through energy-efficient building design, renewable energy sources and retrofitting.
- The **deep retrofits of our cities' building stock** offers instead a readily policy avenue with multiple benefits.
- It would boost renewable installations i.e. **via heat pumps and solar panels**, lower energy bills for the most vulnerable and stimulate the creation of good green jobs at the local level.
- However, **cities and mayors need a much greater role**. In terms of policy consistency and ownership, the EU would greatly benefit from consulting directly with cities and pushing member states to include them in the decision-making process.



Thank you

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