
RENEWABLES NOW

Renewables in Cities 2021 Global Status Report

MASTER PRESENTATION

Cities Team
REN21 Secretariat

REN21

REN21: MAKING THE SHIFT TO RENEWABLE ENERGY HAPPEN – NOW!

The only **global community** of renewable energy actors from science, academia, NGOs, governments, and industry.

Our more than **2,000 community members** co-operate collecting information, changing norms and debating.

We build upon a **decentralised intelligence,** ensuring high responsiveness to an ever changing environment.

Our **annual publications** are probably the world's most comprehensive, crowdsourced reports on renewables.

RENEWABLES IN CITIES 2021 GLOBAL STATUS REPORT

2ND EDITION

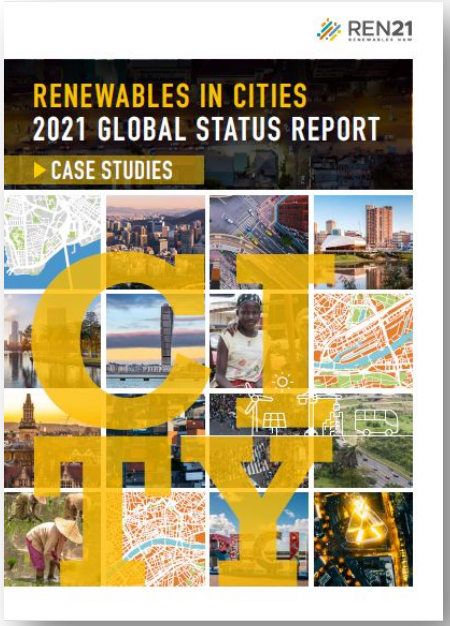
The report features:

1. Global Overview of Renewables in Cities
2. Urban Policy Landscape
3. Markets and Infrastructure
4. Financing and Investment in Cities
5. Citizen Participation
6. Feature: Renewable Energy in Sub-Saharan African Cities

In addition to the full report, you can also download the **Summary for Policy Makers**, a compilation of **city case studies**, the **press release** and **country fact sheets** at: https://www.ren21.net/cities

REC 2021 CASE STUDIES

18 EXTENDED CASE STUDIES HAVE BEEN INCLUDED IN THE REPORT



PURPOSE & KEY ELEMENTS OF THE REPORT

BRIDGING DATA GAPS TO STRENGTHEN CITIES' RECOGNITION IN GLOBAL DEBATES

- Overview of the status, trends and developments of renewables in cities, using the most up-to-date information and data available on policies, markets, investments and citizen action
- Focus on renewables in public, residential and commercial buildings as well as public and private urban transport
- Neutral, fact-based and collaborative approach
- More than 330 data contributors and peer reviewers and over 30 individual interviews from around the world
- Complementary to the *Renewables Global Status Report*
- Endorsed by an Advisory Committee of more than 20 organisations

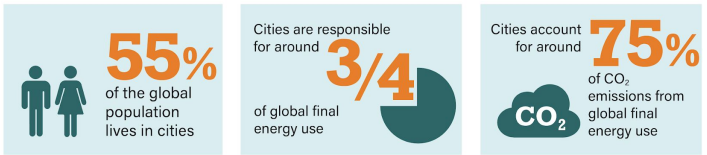
1. GLOBAL OVERVIEW OF RENEWABLES IN CITIES

55% OF THE WORLD'S POPULATION LIVES IN CITIES

THE GLOBAL STORY OF RENEWABLES IN CITIES

CITIES PLAY KEY ROLES IN THE ENERGY TRANSITION

- **Cities are uniquely positioned to curb energy use and related greenhouse gas emissions**, even though national governments have traditionally been the main entities tasked with governing energy supply
- **City governments can shift municipal operations to renewables and encourage uptake city-wide**, including via targets and policies
- **Local solutions are key to decarbonise sectors that have lagged in the energy transition**, but represent the bulk of global energy use: buildings and transport
- **Despite having limited regulatory and financial powers,** city governments have increasingly recognised the opportunities associated with renewables, especially amid the COVID-19 pandemic and with growing pressure from citizens
- **City-level policy portfolios are expanding beyond power to heating, cooling and transport**



Source: See endnote 1 for this chapter.

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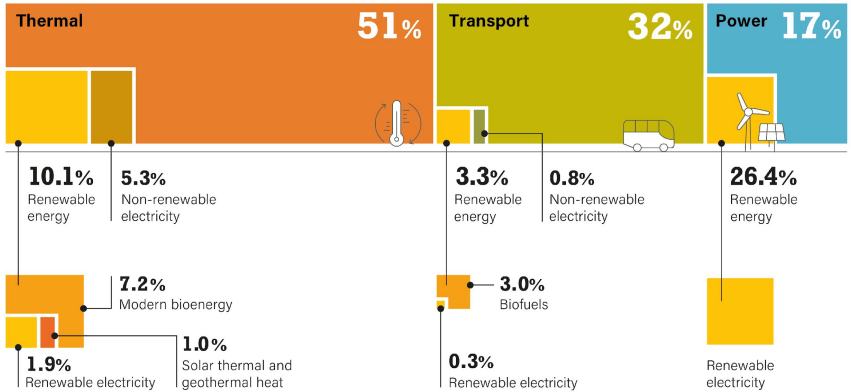
HEATING, COOLING & TRANSPORT REPRESENT 83% OF FINAL ENERGY DEMAND

THESE HIGH-POLLUTING SECTORS ARE LAGGING BEHIND IN THE ENERGY TRANSITION

Renewable Share of Total Final Energy Consumption, by Final Energy Use, 2017



Note: Data should not be compared with previous years because of revisions due to improved or adjusted methodology.

Source: Based on IEA data.

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Urban policies, decentralised renewable energy and other enabling technologies emerging in cities are key to decarbonise high-polluting sectors.

DRIVERS AND OPPORTUNITIES FOR RENEWABLES IN CITIES

Clean air and a healthy environment

Climate change mitigation and adaptation

Local economic development

Energy justice and democracy

Stable and secure energy supply

Poverty alleviation and improved energy access

Reducing expenses and managing costs

COVID-19 GLOBAL HEALTH AND ECONOMIC CRISIS

PUBLIC HEALTH AND WELL-BEING PUSHED UP THE POLICY AGENDA

- **Lockdowns to slow the spread of infections – concentrated in urban areas**
- **Major economic shocks and disruptions across sectors:** altered global energy use patterns and mobility habits – temporary reduction in emissions
  - Delays in renewable energy project development (e.g. supply chain disruptions, labour shortages, financing challenges)
  - Unprecedented drop in public transport ridership for fear of contagion
  - Focus on improving conditions for active transport in cities
- **Increased societal pressure on governments for COVID-19 "green recovery"**: plans and stimulus packages still being prepared, emphasizing local economic development and job creation, in some cases linked with renewables

OVER 1,300 CITIES HAVE A RENEWABLE ENERGY TARGET AND/OR POLICY

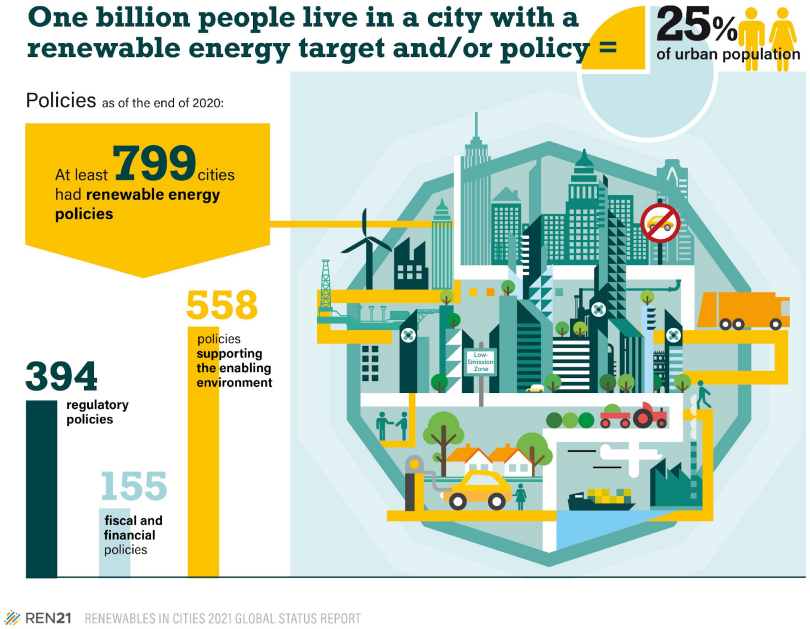
CITIES WORLDWIDE ARE RECOGNISING THE OPPORTUNITIES ASSOCIATED WITH RENEWABLES

	Number
Renewable energy targets	
Cities with renewable energy targets and/or policies	1,327
Cities with renewable energy targets	834
Cities with 100% renewable energy targets	617
Cities with renewable power targets	612
Cities with renewable heating and cooling targets	145
Cities with renewable transport targets (excluding e-mobility)	65
Cities with economy-wide renewable energy targets	266
Other targets and declarations	
Cities with emission reduction targets	> 10,500
Cities with net-zero emission targets	796
Cities with e-mobility targets	65
Cities with climate emergency declarations	1,852

Policies	
Cities with renewable energy policies	**799**
Cities with renewable power policies	363
Cities with renewable heating and cooling policies	144
Cities with renewable transport policies	331
Cities with renewable energy policies in buildings	153

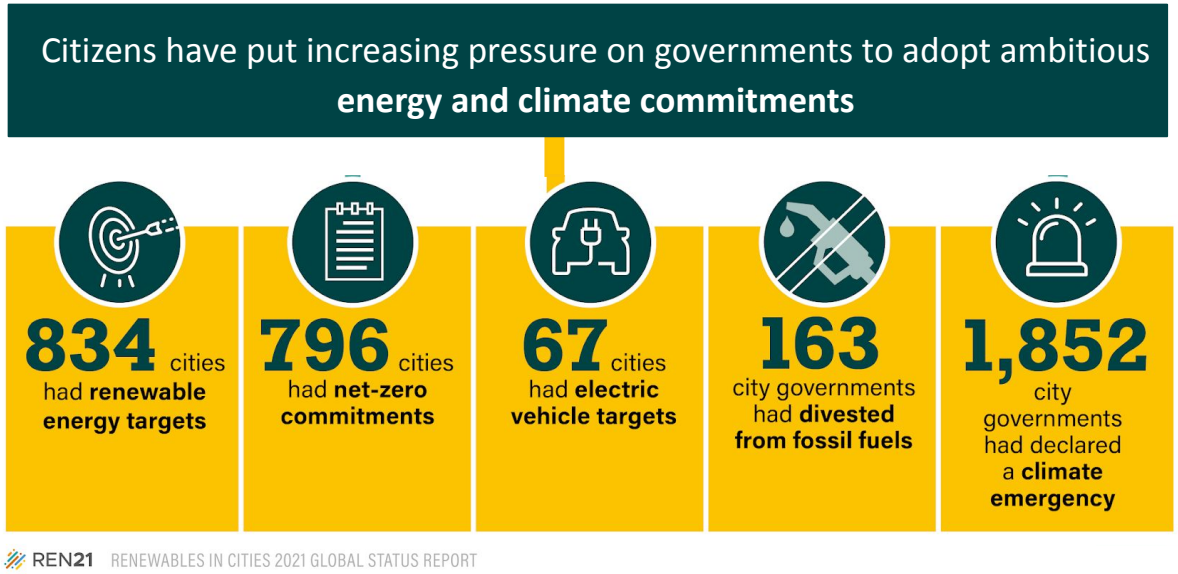
1 BILLION PEOPLE LIVE IN A CITY WITH A RENEWABLE TARGET OR POLICY

25% OF THE URBAN POPULATION



MANY CITIES HAVE AMBITIOUS ENERGY AND CLIMATE COMMITMENTS

CITY-LEVEL CLIMATE TARGETS INDIRECTLY SUPPORT RENEWABLES



MULTI-LEVEL GOVERNANCE OF URBAN ENERGY SYSTEMS

NO CITY IS AN ISLAND IN THE CONTEXT OF RENEWABLE ENERGY PROCUREMENT AND USE

- **Urban form and density, climate, geography as well as ownership and governance structures** – all influence a city's ability to advance renewables
- Cities' energy systems and infrastructure are **physically connected to national or regional systems**
- Cities are subject to **market rules and energy regulations** set at the national and state/provincial levels
- **National-level subsidies for fossil fuels** present a challenge to increasing the share of renewables

2. URBAN POLICY LANDSCAPE

OVER 1,300 CITIES HAVE RENEWABLE ENERGY TARGETS AND/OR POLICIES

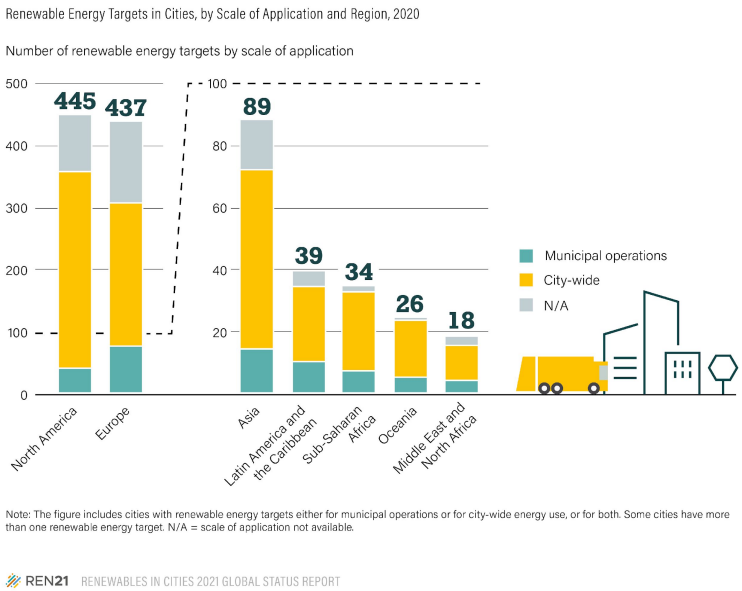
MORE THAN 830 CITIES IN 72 COUNTRIES HAVE RENEWABLE ENERGY TARGETS

OVER 80% OF RENEWABLE TARGETS ARE IN NORTH AMERICA AND EUROPE

By the end of 2020, at least 834 cities worldwide had a total of 1,088 renewable energy targets, some more ambitious than those set by higher levels of government.

CITIES PLAY A KEY REGULATORY ROLE IN THE ENERGY TRANSITION

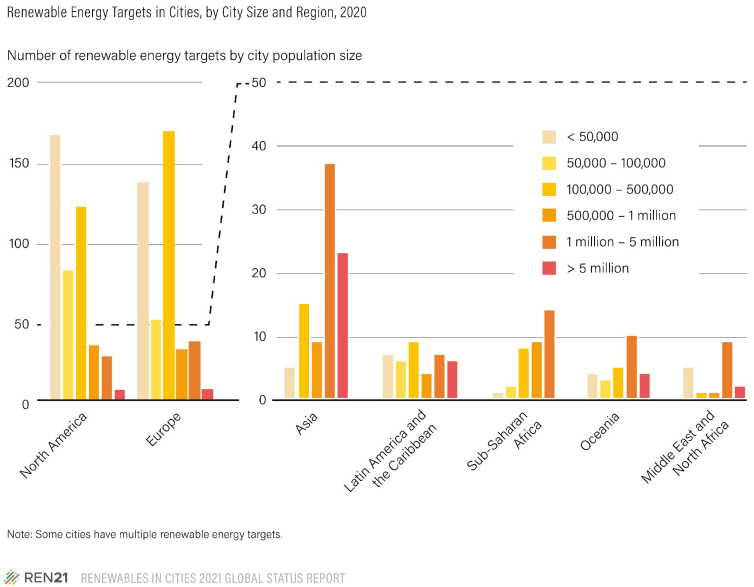
MORE THAN 558 MILLION PEOPLE LIVE IN A CITY WITH AT LEAST ONE TARGET FOR RENEWABLES



Most of the 1,088 renewable energy targets identified apply city-wide and are aimed at the **power sector.**

74% OF ALL RE TARGETS ARE IN SMALL AND MEDIUM-SIZED CITIES

SOME LARGER CITIES AND MEGACITIES ALSO HAVE TARGETS

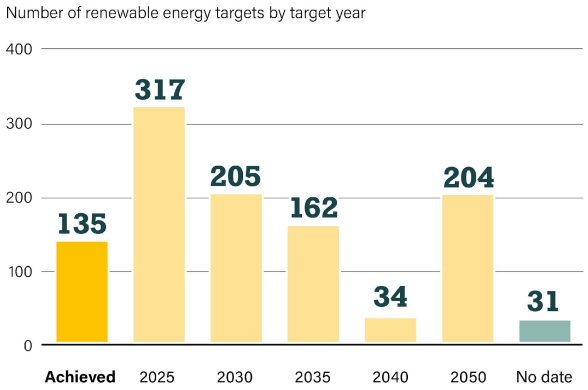


Cities with less than 500,000 people are home to 74% of all renewable energy targets.

TIMELINES FOR TARGET ACHIEVEMENT VARY WIDELY

MOST RENEWABLE ENERGY TARGETS AIM FOR 2025, 2030 OR 2050

Renewable Energy Targets in Cities, by Target Year, 2020



Note: Data for target years also include targets within the span of years prior to those specified (e.g., 2026-2029 for the 2030 target year).

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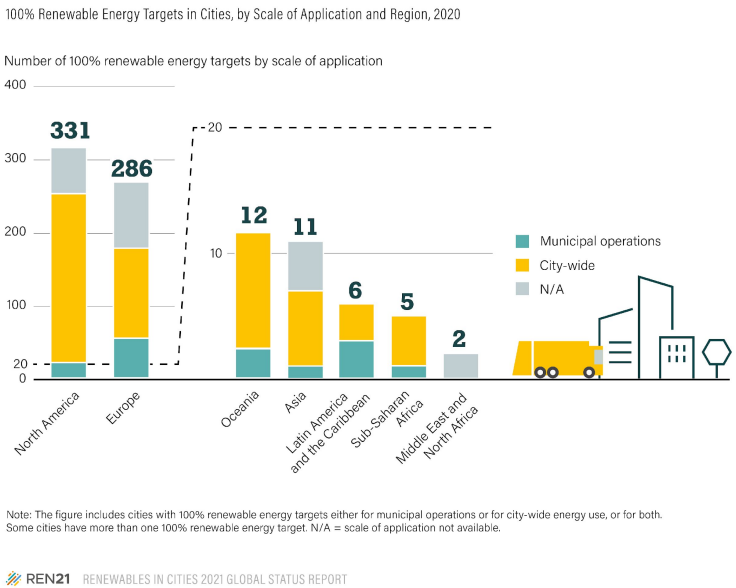
Some cities break down their targets into interim, shorter-term targets to facilitate the tracking of progress, and align their action plans accordingly.

MOVEMENT TOWARDS 100% RENEWABLES CONTINUES TO GAIN TRACTION

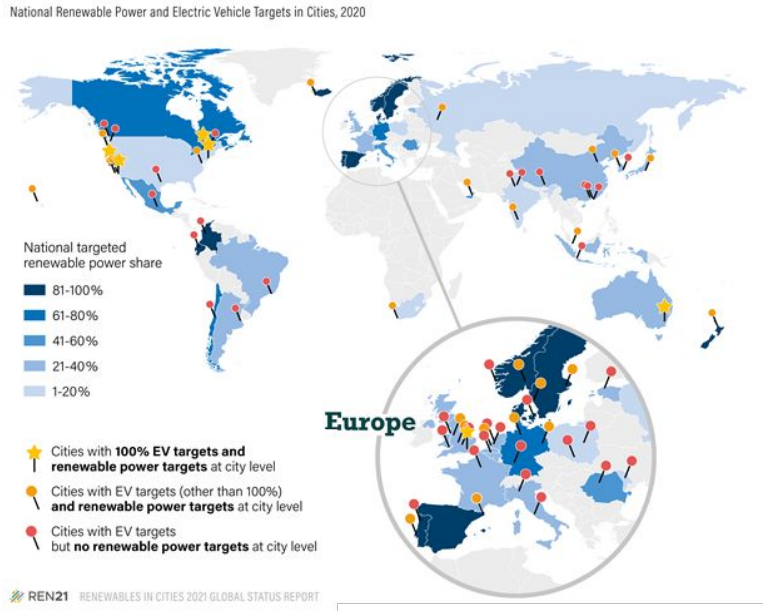
MOST 100% COMMITMENTS FOCUS EXCLUSIVELY ON THE ELECTRICITY SECTOR



By the end of 2020, at least 617 cities had set 100% renewable energy targets for either municipal operations or city-wide energy use, together totalling 653 targets.

AT LEAST 67 CITIES HAVE ELECTRIC VEHICLE TARGETS

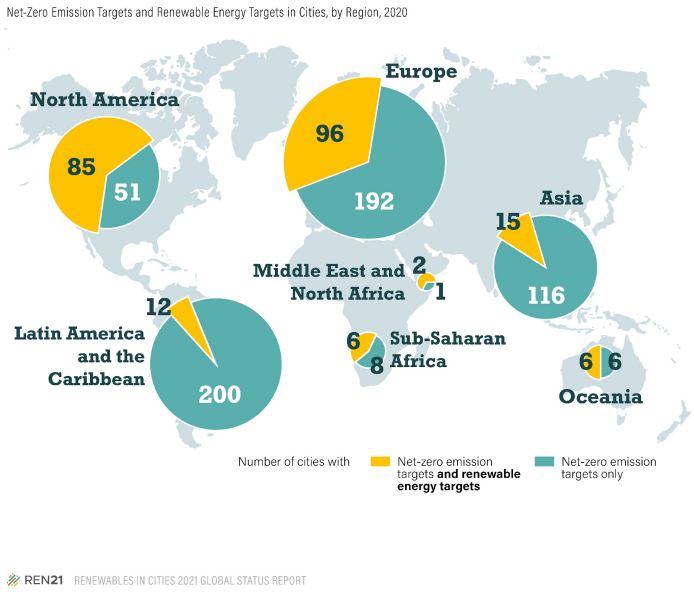
ONLY A FEW CITIES TAKE THE OPPORTUNITY TO LINK EVs WITH RENEWABLE ELECTRICITY



Only 46% of cities with EV targets also have a city-wide renewable electricity target. Most targets are concentrated in Europe.

CITY-LEVEL NET-ZERO TARGETS INCREASED 8x BETWEEN 2019 AND 2020

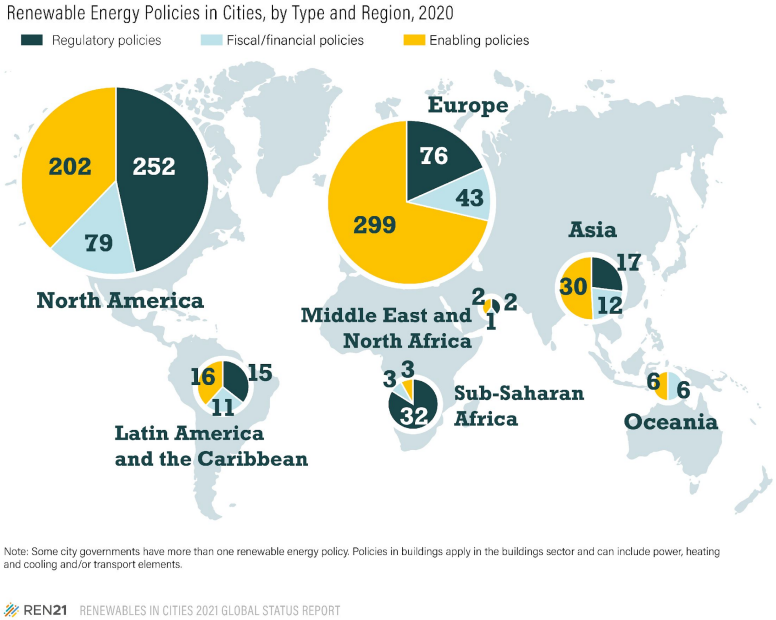
796 MUNICIPAL GOVERNMENTS IN 63 COUNTRIES HAD NET-ZERO TARGETS



222 municipal governments with net-zero targets had also passed renewable energy targets.

ALMOST 800 CITIES HAVE POLICIES SUPPORTING RENEWABLE ENERGY

394 REGULATORY POLICIES, 155 FISCAL AND FINANCIAL INCENTIVES AND 558 ENABLING POLICIES

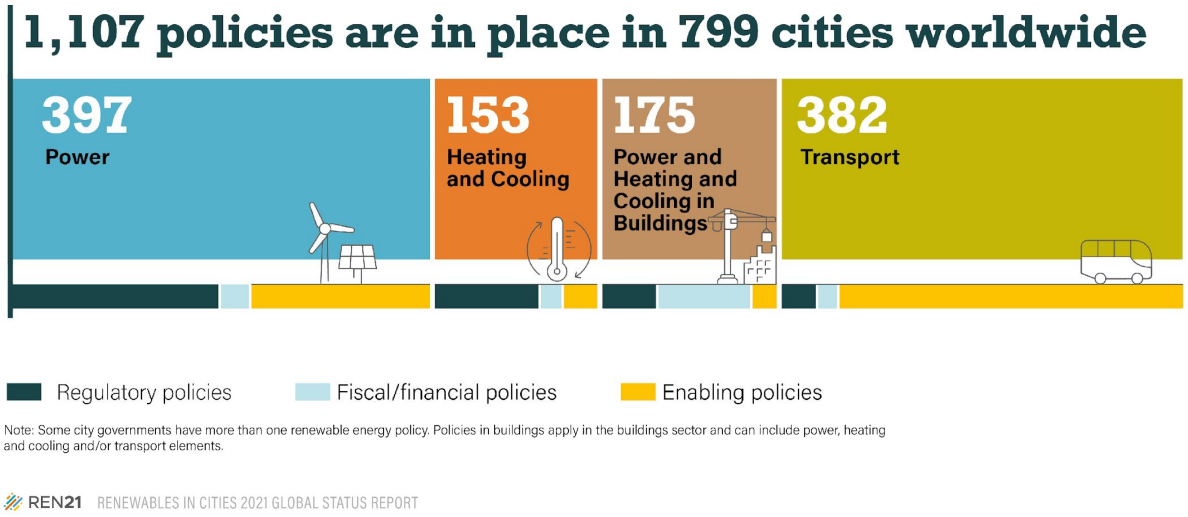


Most policies were aimed at the overall enabling environment for renewables.

OVER 1,100 POLICIES SUPPORT THE SCALE-UP OF RENEWABLES

CITY-LEVEL POLICY PORTFOLIOS HAVE EXPANDED BEYOND POWER

Renewable Energy Policies in Cities, by Type and Region, 2020



FOSSIL FUEL BANS AS ENABLING INSTRUMENTS FOR RENEWABLES

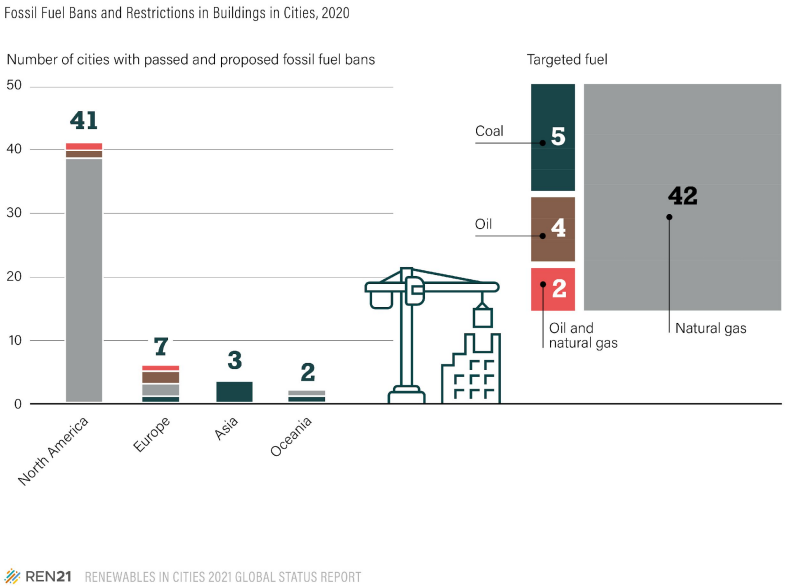
THE NUMBER OF CITY-LEVEL FOSSIL FUEL BANS JUMPED FIVE-FOLD IN 2020

- **There are 66 cities worldwide with proposed and/or passed fossil fuel bans for heating and cooling and/or transport**
  - In total these 66 cities have 67 bans as 1 city has both a ban for buildings and one for transport
  - Enforcement: 4 went into force before 2019, 4 went into force into 2019, and 35 went into force in 2020; for a total of 43 enforced in 2020. 20 will go into force in the future.
  - Date of enactment: 11 were voted before 2019, 37 were voted in 2019, and 13 were voted in 2020.

Bans or restrictions on the use of fossil fuels can positively affect the uptake of renewable energy across urban systems.

FOSSIL FUEL BANS ENCOURAGE RENEWABLES-BASED HEATING AND COOLING

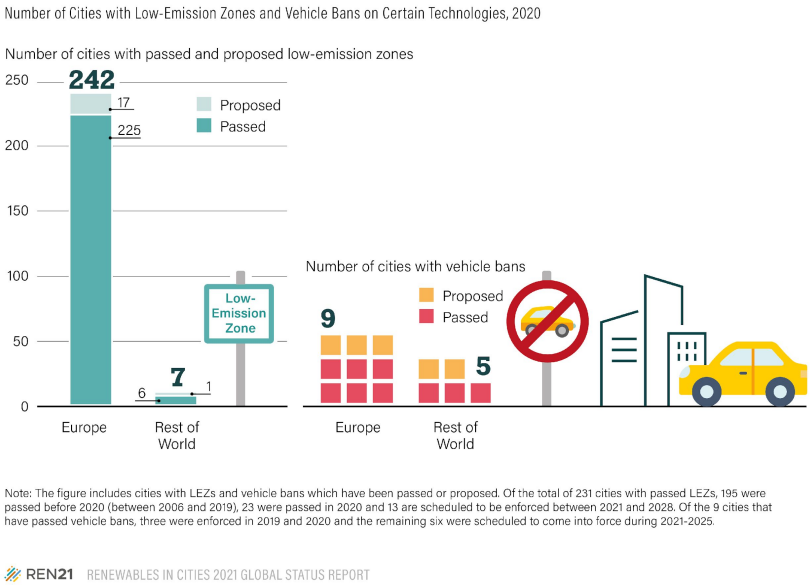
CALIFORNIAN CITIES ARE PIONEERING THE ADOPTION OF BANS ON THE USE OF FF IN BUILDINGS



At least **53 cities** spanning 10 countries had either proposed or passed a **ban/ restriction on the use of fossil fuels in buildings.**

GROWING MOMENTUM FOR RESTRICTIONS ON CERTAIN FUELS / VEHICLES

MOST LEZs AND BANS ON CERTAIN VEHICLES WERE ADOPTED IN EUROPEAN CITIES



LEZs were in place in 249 cities and restrictions/bans in 14 cities. These can help cities advance the use of electricity and renewable fuels in urban transport.

3. MARKETS AND INFRASTRUCTURE

CITIES ARE BOTH CONSUMERS AND PRODUCERS OF ENERGY

CITY GOVERNMENTS LEAD BY EXAMPLE ACROSS ALL SECTORS

INSTALLING OR PROCURING RENEWABLE ENERGY AND SUPPORTING UPTAKE CITY-WIDE

- **Scaling up renewable electricity**
  - On-site renewable energy generation capacity
  - Procurement and strategic partnerships with third-party providers to sign PPAs
  - Purchasing RECs and GOs
- **Decarbonising heat**
  - Advancing stand-alone solutions
  - Integrating renewables in district energy systems
- **Decarbonising urban transport**
  - Electrification of public fleets
  - Interest in renewable hydrogen
- **Expanding infrastructure**
  - Upgrading electricity distribution infrastructure
  - Expanding and commissioning district energy systems
  - Installing EV charging stations
- **Cities have sought to address challenges by:**
  - Influencing policy or regulation at higher levels of government
  - Partnering with utilities
  - Municipalising local utilities
  - Launching CCA programmes

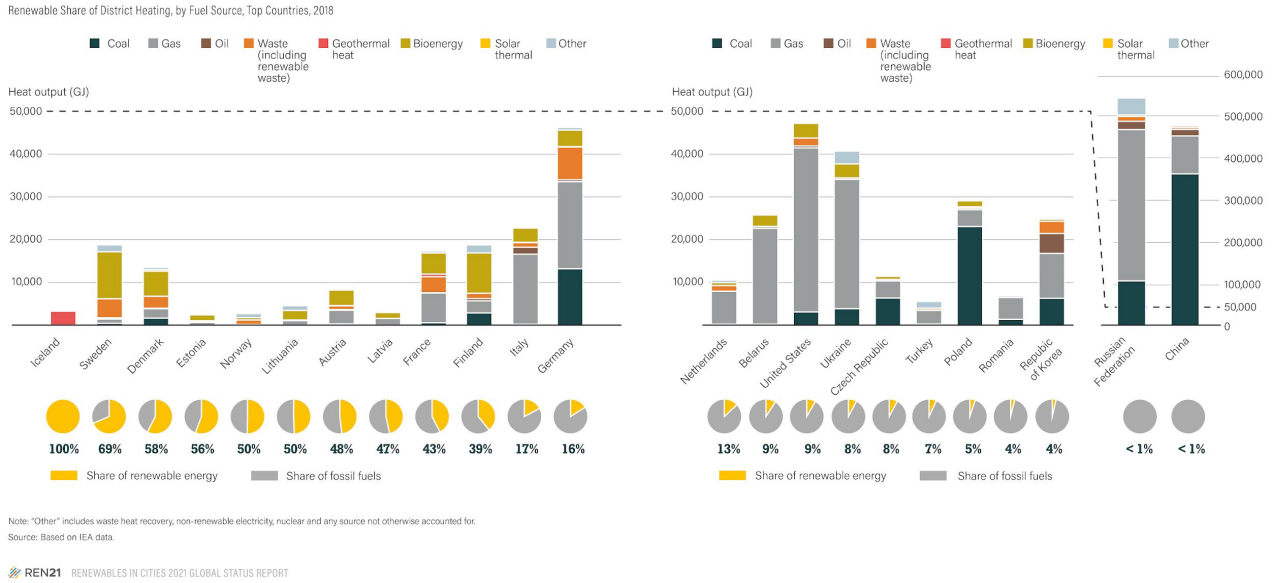
DECARBONISATION OF HEATING & COOLING HAS LAGGED BEHIND

RENEWABLE THERMAL SOURCES ARE GARNERING INCREASING INTEREST IN CITIES

- **Stand-alone systems** (solar thermal systems and modern biomass stoves and boilers, heat pumps)
  - Heat pumps met 5% of the global heating demand for commercial and residential buildings in 2019
- **Municipal investment in the heating and cooling sector has often focused on district heating networks**
- **District energy systems**
  - Supplied 6% of global heat consumption in 2018
  - Globally, district heating and cooling networks rely on an estimated 8% share of renewable energy

TOP DHC PRODUCERS CONTINUE TO RELY MOSTLY ON FOSSIL FUELS

BUT SOME CITIES ARE PURSUING EFFORTS TO SCALE UP RENEWABLES, ESPECIALLY IN EUROPE



Iceland, Sweden and Denmark have the highest share of renewables in district heating. Bioenergy remains the most widely used renewable source of district heating.

UPTAKE OF RENEWABLES IN THE TRANSPORT SECTOR REMAINS LOW

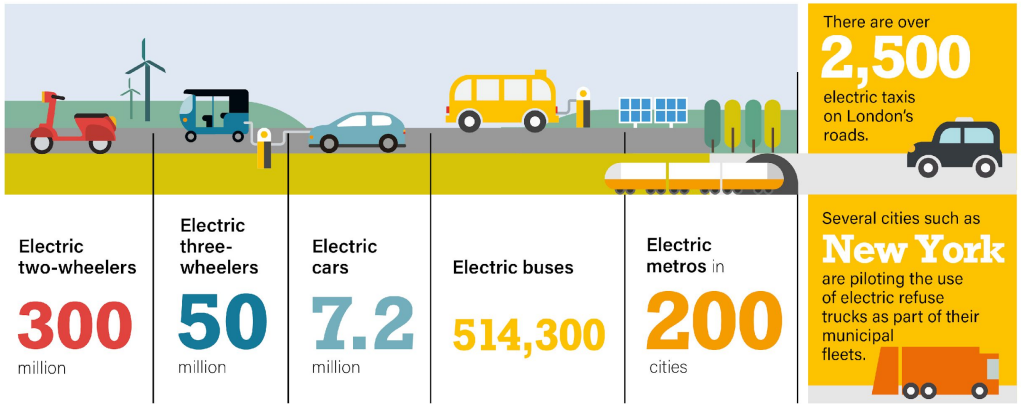
ELECTRIFICATION TREND PICKED UP MOMENTUM IN 2019-20

- **Urban transport contributed an estimated 37% of transport-related CO_2 emissions**
  - 32% from urban passenger transport and 5% from urban freight
- **Renewable energy accounted for 3.7%** of energy demand in transport in 2018
- **Electrification of transport has been expanding rapidly**, although many cities continue to support the production and use of biofuels
- **Growing interest in using renewable electricity to produce hydrogen** for use in urban transport

E-MOBILITY IS EXPANDING TO ALL URBAN TRANSPORT MODES

EV GROWTH OFFERS POTENTIAL TO INCREASE THE USE OF RENEWABLES IN TRANSPORT

Global Electric Vehicle Markets in Cities, 2019



Source: Based on IEA data.

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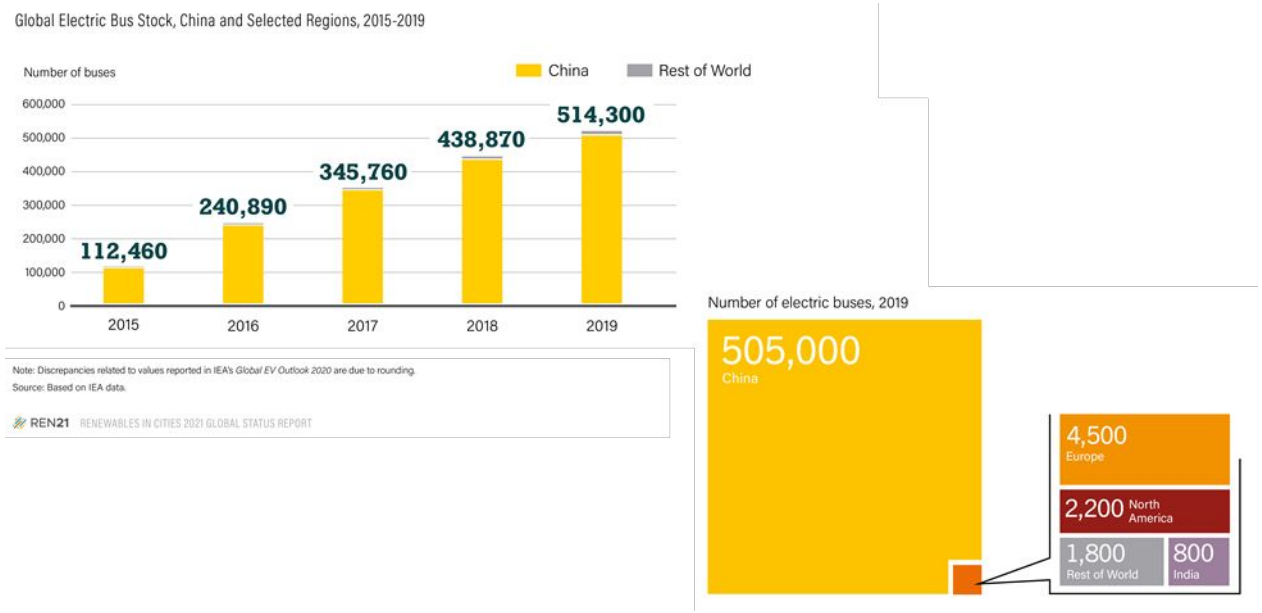
The electrification of different urban transport modes around the world brings opportunities for increasing the share of **renewables in transport.**

INCREASING NUMBER OF E-BUSES PROCURED IN CITIES OUTSIDE OF CHINA

46% GROWTH RATE OF ELECTRIC BUSES BETWEEN 2015-19



The deployment of e-buses is increasing in cities in Europe and North America, as well as elsewhere.

DISTRIBUTION INFRASTRUCTURE CAN REPRESENT A CHALLENGE

UPGRADING TRANSMISSION AND DISTRIBUTION ASSETS CAN HELP CITIES ACHIEVE RE GOALS

- **ELECTRICITY – Cities have sought to address specific challenges by:**
  - Building new or upgrading existing transmission and distribution assets to reinforce the capacity to transfer electricity
  - Installing greater storage capacity (via pumped hydropower, batteries or hydrogen conversion)
- **FUELS:**
  - **Biofuel blends** are transported from refineries to distribution terminals and sold at existing petrol filling stations which are widespread
  - **Hydrogen** is distributed by pipeline, high-pressure tube trailers and liquefied hydrogen tankers; most hydrogen refueling stations are located in cities, only an estimated 24% globally sell renewable hydrogen

FEW EV CAPITALS BENEFIT FROM HIGH SHARES OF RENEWABLE ELECTRICITY

WIDESPREAD CHARGING INFRASTRUCTURE IS KEY TO CONTINUED GROWTH OF E-MOBILITY

- **Of the estimated 7.3 million EV chargers worldwide in 2019, most were concentrated in urban areas of China**
  - 90% were private, light-duty vehicle slow chargers
- Several municipal governments as well as private actors in cities in Australia, Europe, the United States and Latin America have made an **explicit connection between EV charging and renewables**

EV charging infrastructure **plays an important role in increasing the use of renewables** in urban transport

City (State, Country)	No. of public chargers per million population	Share of renewables in city's electricity mix*
Asia		
Shenzhen (China)	4,800	28%
Beijing (China)	1,920	
Shanghai (China)	1,690	
Europe		
Oslo (Norway)	3,000	98%
Amsterdam (Netherlands)	2,750	18%
Stockholm (Sweden)	717	69%*
London (UK)	405	37%
Paris (France)	307	22%
North America		
San Jose (California, US)	1,200	48%*
Los Angeles (California, US)	590	32%*

4. FINANCING AND INVESTMENT IN CITIES

THE FINANCIAL POWER OF A CITY IS DECISIVE IN ITS ABILITY TO ADVANCE RENEWABLES

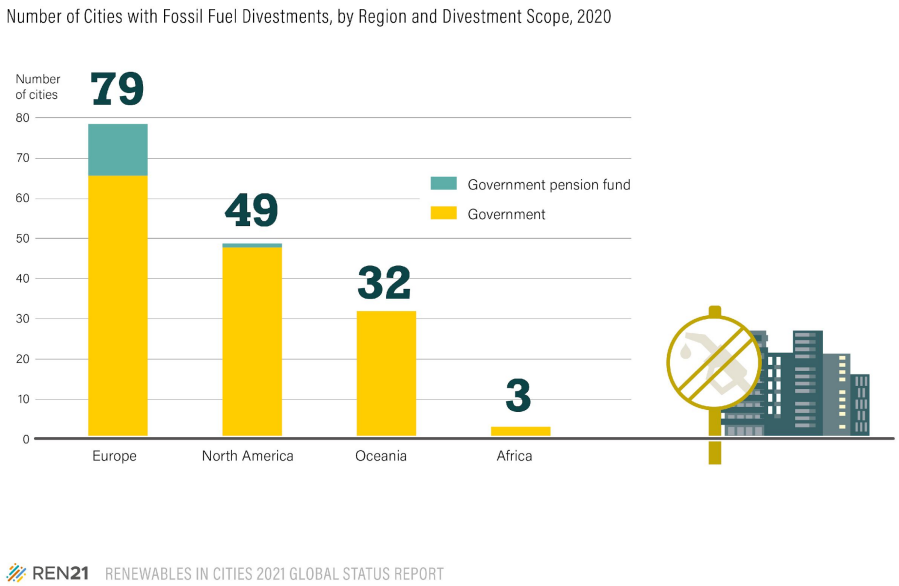
RENEWABLE ENERGY FINANCING AND INVESTMENT ON UPWARD TREND

SUSTAINED GROWTH DESPITE COVID-19 AND PERSISTENT FOSSIL FUEL SUBSIDIES

- **Global investment in new renewable energy capacity totalled USD 282.2 billion in 2019, up 1% over 2018**. In the first half of 2020, it rose 5% (compared to the same period in 2019)
- **Municipal governments and other urban actors have three main options for financing renewable energy projects:**
  - Using own available capital or assets
  - Raising funds through (municipal or green) bonds or making use of funds provided by other levels of government or external actors (e.g., local or domestic banks and development banks)
  - Leveraging external funds by participating in arrangements such as public-private partnerships or power purchase agreements

163 CITY GOVERNMENTS DIVESTED FROM FOSSIL FUELS

OVER 1,300 INSTITUTIONS HAVE SOLD OFF THEIR FINANCIAL INTERESTS IN FOSSIL FUEL COMPANIES



Municipal governments, alongside other actors, may indirectly support renewable energy by **divesting from fossil fuels and reinvesting in renewable energy** companies.

FINANCING AND INVESTMENT IN RENEWABLES-BASED URBAN SYSTEMS

MUST BE TAILORED TO EACH SECTOR

- **In the power sector:**
  Urban actors have generally invested in small-scale and on-site renewable energy generation projects, mostly solar PV
- **In the heating and cooling sector:**
  Municipal investment has often focused on district heating networks
- **In the transport sector:**
  City-level investment typically has been aimed at projects related to mass public transit and zero-emission vehicles

CITY-SPECIFIC CHALLENGES IN MOBILISING INVESTMENT IN RENEWABLES

RENEWABLE ENERGY PROJECTS FACE INHERENT INVESTMENT RISKS

- **Limited budgetary flexibility and multiple competing claims on resources**
- **Soft lock-ins, including limits to institutional capacity and institutional inertia**
- **Lack of organisational capacity, knowledge of funding opportunities and/or equity and debt instruments**
- **Barriers to co-funding arrangements or limitations to borrowing power**
- Additional challenges for cities in developing countries:
  - Inadequate tax base to finance the cost of basic infrastructure
  - Low credit ratings, making it difficult for city governments to take out bonds and loans and attract private investment

Cities often depend on national governments for financing, which can be inadequate, unpredictable or declining

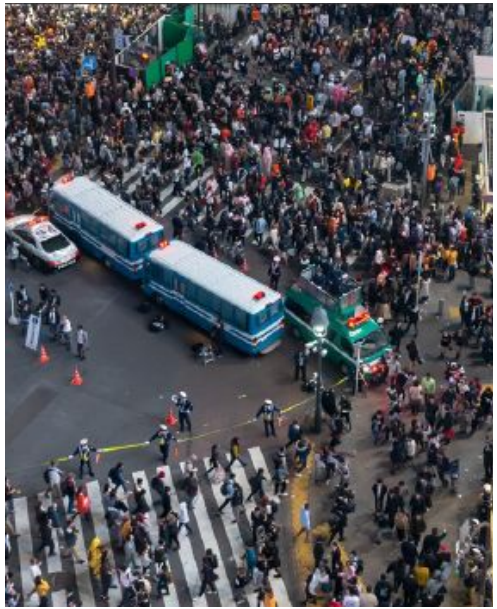
5. CITIZEN PARTICIPATION

CITIZENS PUT PRESSURE ON GOVERNMENTS TO COMMIT TO RENEWABLE ENERGY

CITIZEN PARTICIPATION MODELS IN CITIES

OPTIONS FOR CITIZENS TO GET INVOLVED IN THE DEVELOPMENT OF URBAN RENEWABLE ENERGY

- **Consumer choice**: choosing to purchase energy from a provider that offers renewable electricity or heat, through:
  - Green tariff programmes
  - Pay-as-you-go services
  - Peer-to-peer energy trading programmes
- Becoming individual **prosumers** by producing their own energy
- Getting together to form **community energy projects**
- **Participatory governance**: engage in energy and climate decision-making processes (incl. planning and budgeting)
- **Making their voices heard through bottom-up initiatives and campaigns in favour of renewables**



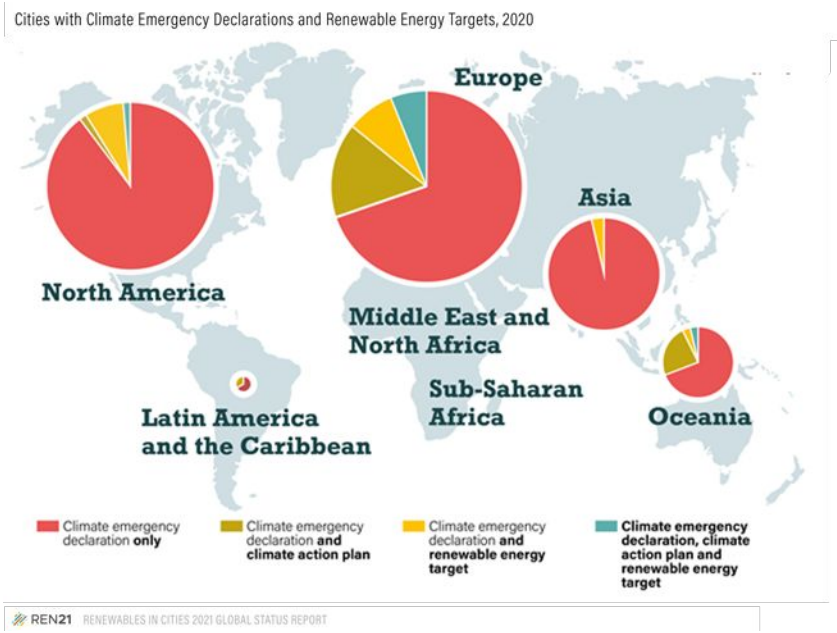
(RE-)MUNICIPALISATION OF ENERGY INFRASTRUCTURE

IMPORTANT TOOL TO ADVANCE RENEWABLES IN CITIES WITH SUPPORT OF RESIDENTS

- In the last decade, (re-)municipalisation campaigns have pushed more cities to take control of local power suppliers and grids
- Globally, (re-)municipalisation of energy infrastructure peaked in 2016, but the upward trend has continued
- At least 1,408 cases of (re-)municipalisation of critical infrastructure were recorded as of late 2020, including **369 energy-related cases**:
  - 80% of these cases were in Germany, followed by Spain (18), the United Kingdom (13) and the United States (11)

1,852 CITIES IN 29 COUNTRIES HAVE DECLARED CLIMATE EMERGENCIES

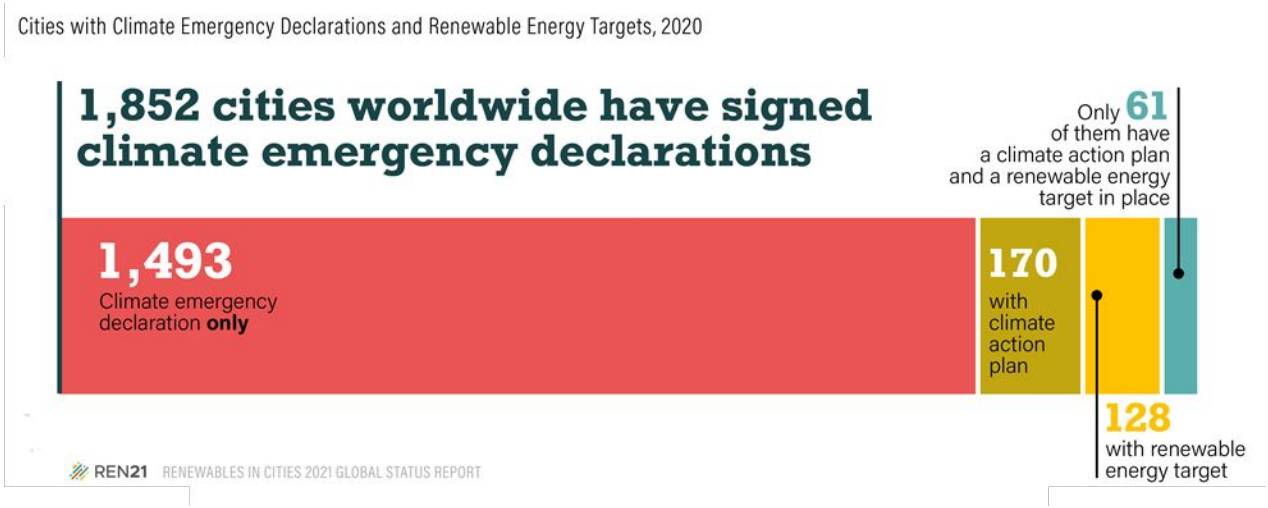
CITIZENS PRESSURE GOVERNMENTS TO ACT ON CLIMATE CHANGE AND COMMIT TO RENEWABLES



Municipal governments in Europe dominate these efforts, with a total of 826 city-level emergency declarations.

ONLY 10% OF CITIES WITH CLIMATE EMERGENCIES ALSO HAVE RE TARGETS

DECLARATIONS HAVE LED MANY PROJECTS TO BE HALTED BASED ON THEIR CLIMATE PERFORMANCE



Only 231 municipal governments had submitted a climate action plan alongside their declaration.

6. FEATURE:
RENEWABLE ENERGY IN SUB-SAHARAN AFRICAN CITIES

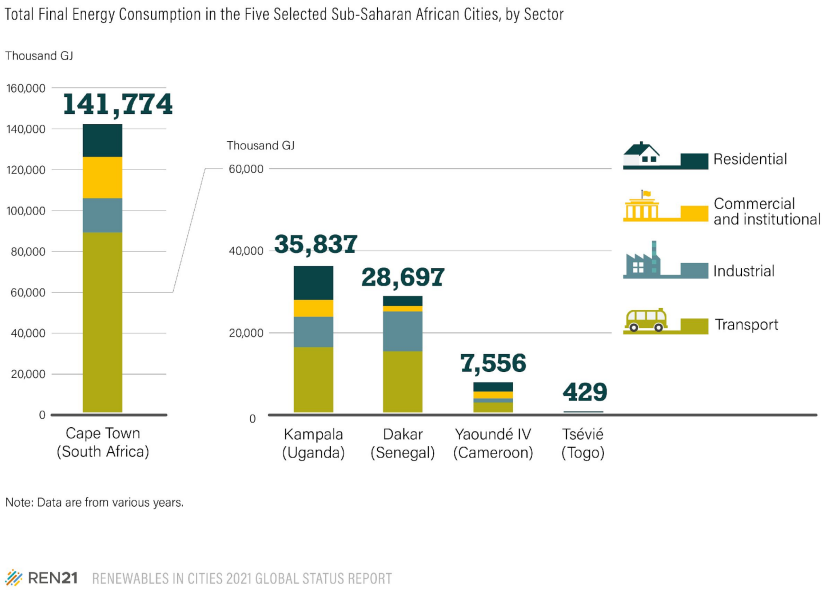
SSA CITIES SUPPORT RENEWABLES IN VARIOUS WAYS

BY JOINING CITY NETWORKS AND FACILITATING COLLABORATIVE PROJECTS SUCH AS PPPs

- **Due to rapid population growth and urbanisation as well as rising energy demand, SSA cities increasingly recognise the potential of renewables to improve energy access and reduce energy poverty**
- **Some city governments have entered into public-private partnerships** to advance e-mobility (sometimes linked to renewable electricity) in cities where transport is responsible for a large share of energy consumption and emissions
- **Persistent constraints** to local renewable action include:
  - Weak fiscal decentralisation
  - Limited municipal mandates across key sectors
  - Limited human capacity to execute municipal functions
  - Scarcity of primary data

TRANSPORT IS RESPONSIBLE FOR MOST GHG EMISSIONS IN 5 SSA CITIES

DUE TO ITS RELIANCE ON FOSSIL FUELS, TRANSPORT REPRESENTS THE LARGEST SHARE OF TFEC

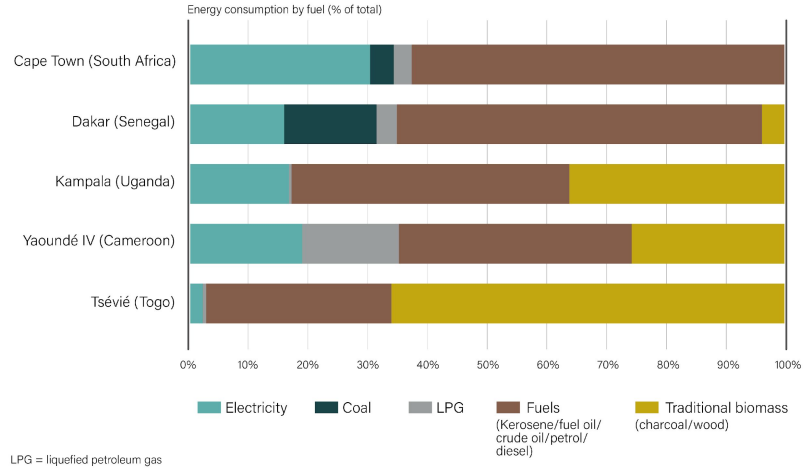


Rapid urban growth has been a key driver of energy consumption in SSA, albeit energy consumption in SSA remains among the lowest in the world.

RENEWABLES ACCOUNT FOR ONLY 8% OF ENERGY DEMAND REGION-WIDE

SSA CITIES RELY HEAVILY ON FOSSIL FUELS AND TRADITIONAL BIOMASS

Shares of Energy Use by Carrier in the Five Selected Sub-Saharan African Cities



LPG = liquefied petroleum gas

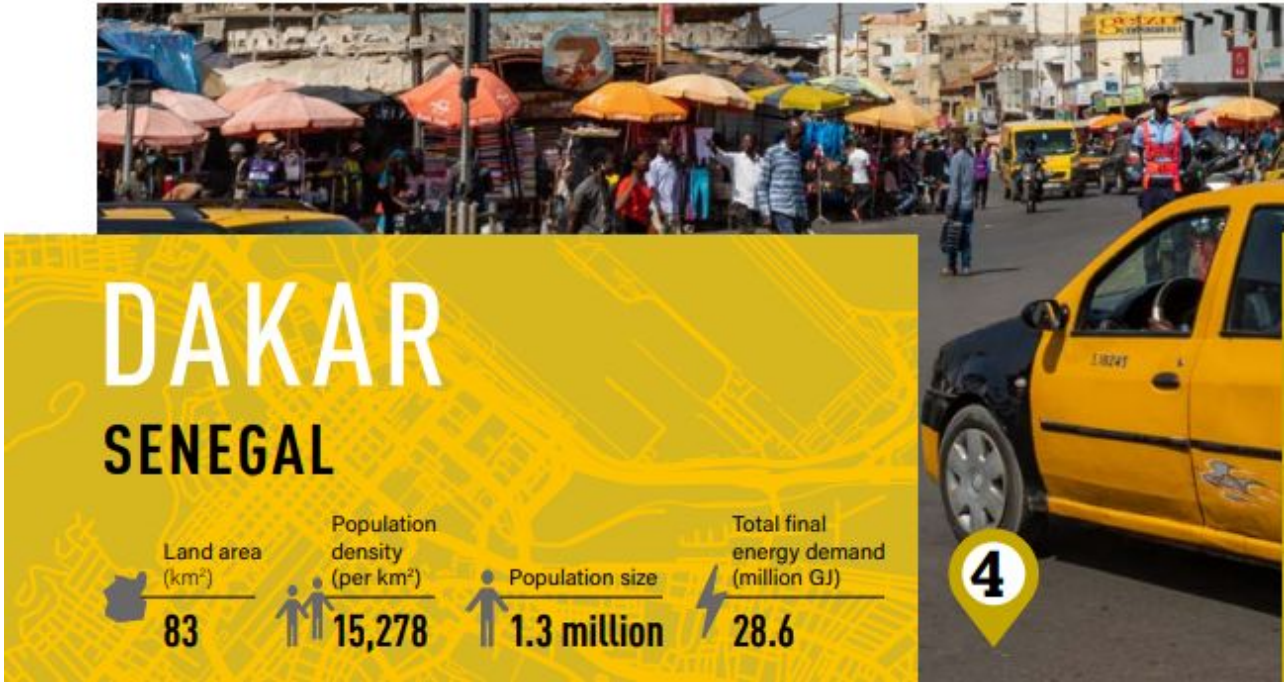
Note: Data are from various years.

REN21 RENEWABLES IN CITIES 2021 GLOBAL STATUS REPORT

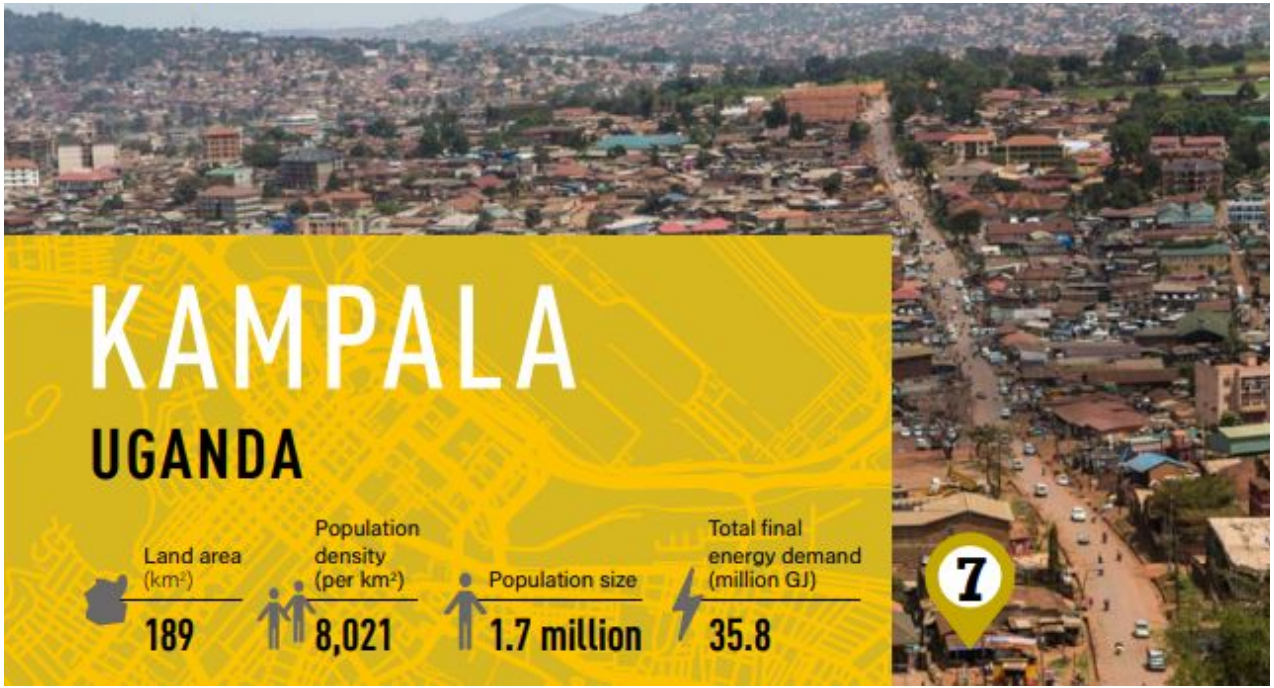
Due to the inefficient use of fossil fuels, the **transport sector accounts for the highest share of greenhouse gas emissions** in the five SSA cities.

ACTIVE LEADERSHIP ROLE IN RENEWABLE ENERGY DEPLOYMENT

REINFORCING NATIONAL OBJECTIVES THROUGH MUNICIPAL POLICIES



LEVERAGING PUBLIC-PRIVATE PARTNERSHIPS TO DECARBONISE TRANSPORT



MUNICIPAL PROGRAMME TO BOOST ENERGY ACCESS AND DEVELOPMENT

BUILDING ON THE COVENANT OF MAYORS IN SUB-SAHARAN AFRICA

BETTER DATA TO BETTER ENGAGE CITIES IN THE ENERGY DEBATE

LACK OF DATA MAKES IT DIFFICULT TO DETERMINE OBJECTIVES AND BASELINES

- **Persistent data gaps and limitations, specifically regarding:**
  - Shares of renewables in municipal and city-wide energy use
  - Renewable energy targets and policies for different sectors
  - Generation capacity for renewable electricity, heating and cooling, and transport fuels in cities
  - Renewable energy investment in cities
  - Community energy projects in cities
- **Imprecise terminology can limit usefulness**
- **Language barriers exist to facilitate more comprehensive data collection**

REN21's TRANSPARENT DATA AND REPORTING CULTURE

NEUTRAL DATA AND KNOWLEDGE BROKER

REC data collection includes the following elements:

1. Global tracking database
2. Open city questionnaire
3. Regional contributors
4. Open peer review
5. Expert interviews
6. Desk Research
7. Data sharing agreements

- All data provided by contributors, whether written or verbal, are validated by primary sources, which are published alongside the full report
- **Download the data pack at https://www.ren21.net/reports/cities**

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