

Renewables in Cities 2019 Global Status Report

Launch Webinar

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26 Nov. 2019

REN21 – a policy network for a renewable energy future

Who we are



Knowledge



Global Status Report: yearly publication since 2005



Regional Reports



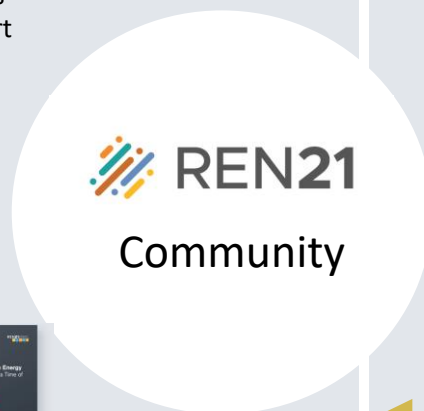
Renewables in Cities Global Status Report



Global Futures Reports



Thematic Reports



Debates



23-25 October 2019

Why the focus on cities?

Bring cities to the energy debate, the energy debate to cities

- Decentralised nature and scale of renewables → cities become key players in the energy transition
- Many cities are demonstrating increasing political ambition
- Cities are key to transitioning end-use sectors
- Renewable energy as an opportunity for cities



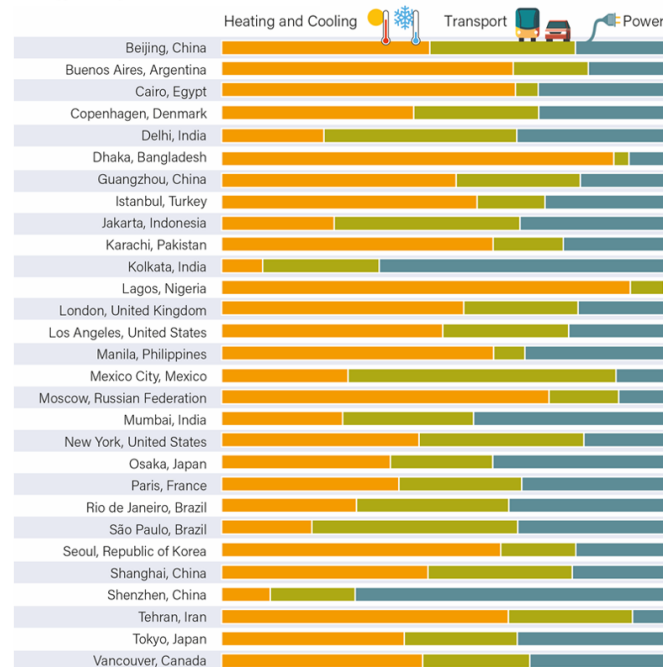
BUT: data is dispersed, not homogeneous, not consolidated

Data gaps

Making the invisible visible

- Data/Information exist, but are:
 - scarce, decentralised, not consolidated
 - often not coherent (e.g. energy/ electricity; municipal / city-wide)
- Municipal renewable energy targets and policies
- Share of renewables in municipal/city energy use
- Renewable generation capacity in cities
- Renewable energy investment in cities
- Community energy projects in cities

Energy Use by Sector in Selected Cities



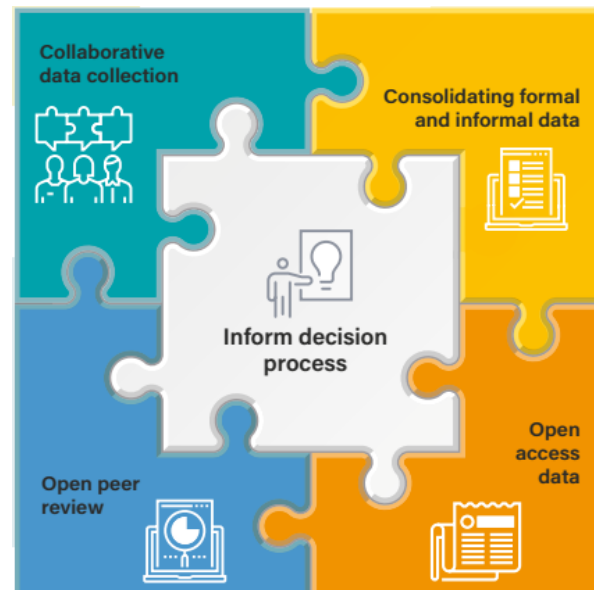
Note: Depending on the city, a significant amount of electricity may be included in the heating/cooling and transport sector. Data are for recent years in which reliable statistics were available. Comprehensive data on energy use at the city level are not widely available and are often outdated. Several cities also collect energy data according to end-use sectors (Buildings, industry, transport).

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REN21 Data and Reporting Culture

Collaborative data collection, building on an international expert community

- Developing collaborative data collection process
- Consolidating formal (official) and informal (unofficial/unconventional) data
- Complementing and validating data and information in an open peer-review process
- Using validated data and information to provide factbased evidence
- Making data and information openly available

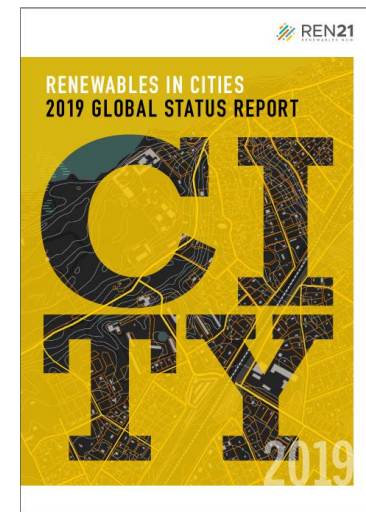


Renewables in Cities 2019 Global Status Report

First annual stocktake of renewable energy in cities

The report features:

1. Cities in the Renewable Energy Transition
2. Drivers for Renewable Energy in Cities
3. Urban Policy Landscape: Targets and Policies
4. Urban Renewable Energy Markets
5. Mobilising Finance and Enabling Business Models
6. Citizen Participation



380

experts contributed to the REC-GSR, working alongside an international authoring team and the REN21 Secretariat



61%

of contributors are new members of the REN21 Community, indicating the attractiveness of this focus on cities in the energy transition



More than

50

interviews were conducted with city or sector-specific experts from around the world

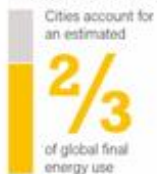
Cities in the Renewable Energy Transition

Cities in the world



Cities account for three-quarters of human-caused global carbon dioxide emissions.

Energy consumption



One billion people living in urban slums

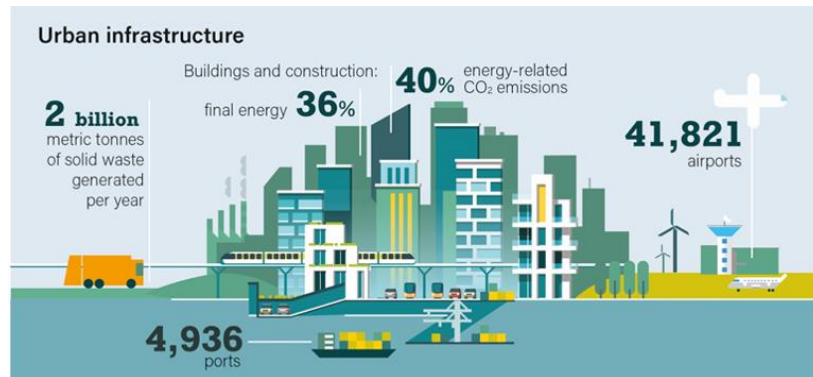
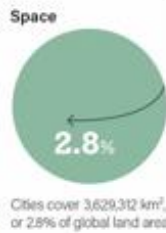


City definitions differ
 Japan: **50,000** inhabitants
 Norway: **200** inhabitants



Population
55% of the world's population, (or **4.2 billion** people) lives in cities

GDP
80% of global GDP is generated in cities

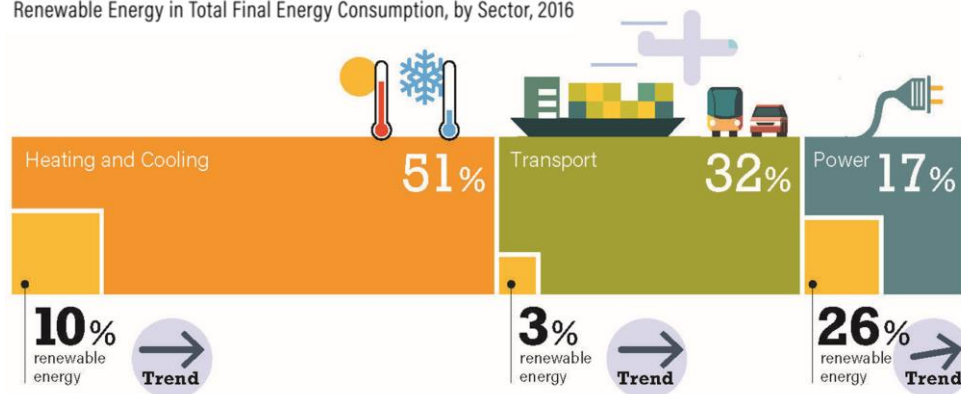


Beyond power

Over 80% of demand for heating, cooling and transport

- Globally, around 26% of electricity is renewable
- Renewables lagging behind in heating, cooling and transport
- **Heating and cooling**
 - approx. 50% buildings / 50% industry
 - local markets
- **Urban transport:** 40% of final energy in transport sector

Renewable Energy in Total Final Energy Consumption, by Sector, 2016



Note: Data should not be compared with previous editions of the Renewables Global Status Reports. Electricity also supplies final energy demand in the heating and cooling sector (71% in 2016), and transport sector (11% in 2016). Source: Based on OECD/IEA.

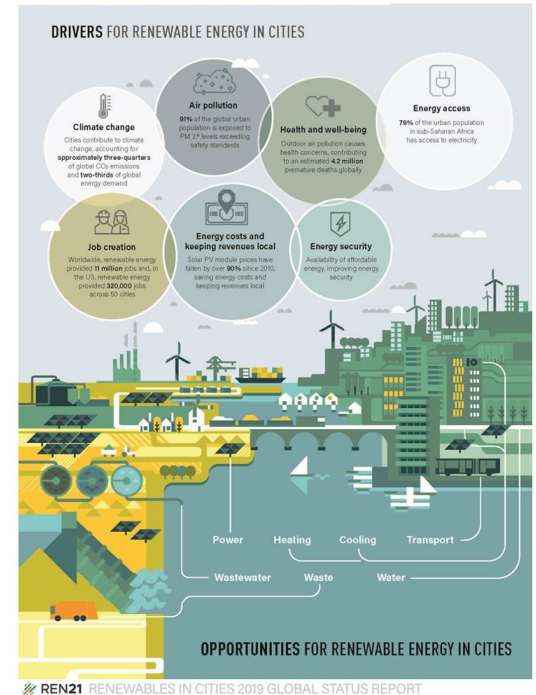
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Drivers for renewable energy

Cities pursue renewables to meet a range of objectives

- Climate change
- Ensuring healthy living environment - addressing air pollution
- Reducing municipal costs
- Economic development
- Local jobs
- Energy security
- Access to energy

Drivers and Opportunities for Urban Renewable Energy



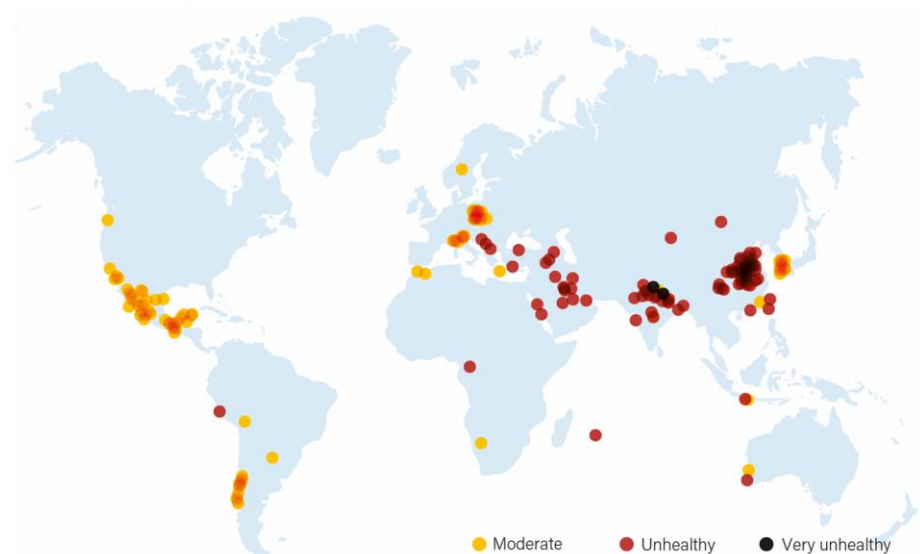
Cities have a direct responsibility for their residents

Air Pollution – risk to health and well-being

Outdoor air pollution drives renewable energy uptake in cities

- Outdoor air pollution contributes to appr. **4.2 million premature deaths**
- 9/10 people worldwide regularly exposed
- High economic cost:
 - OECD: USD 1.8 trillion
 - BRICS: USD 3 trillion
- High levels of air pollution in Asia; lack of monitoring station in cities in Africa

Air Pollution (PM_{2.5}) in Selected OECD and Non-OECD Cities



Note: OECD = Organisation for Economic Co-operation and Development; Data shown are air pollution levels in the 100 most polluted OECD cities and the 100 most polluted non-OECD cities.

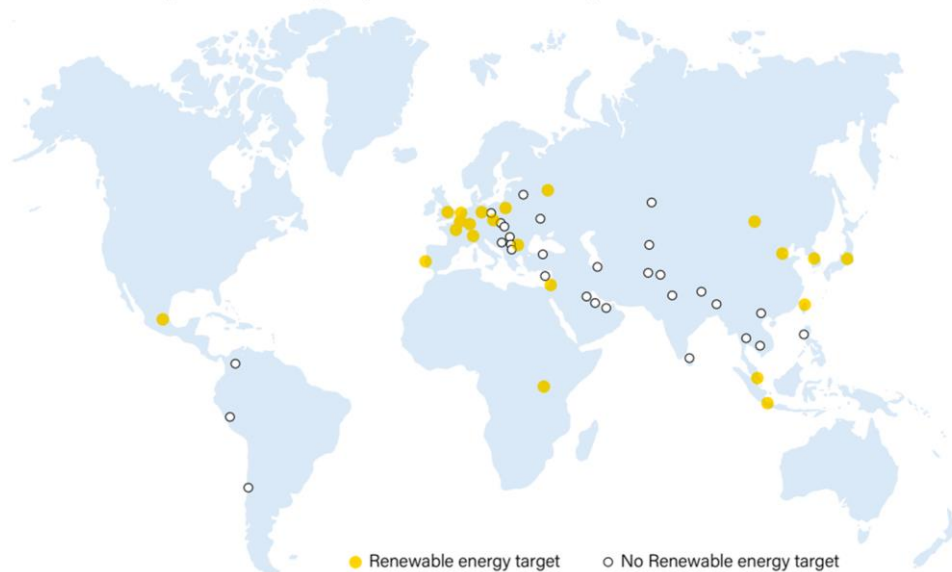
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Air Pollution – a driver for renewable energy

Outdoor air pollution drives renewable energy uptake in cities

- Almost **half of the world's most polluted capital cities** have a renewable energy target
- In 2019, **35 cities** committed to **air pollution reduction targets** and clean air policies

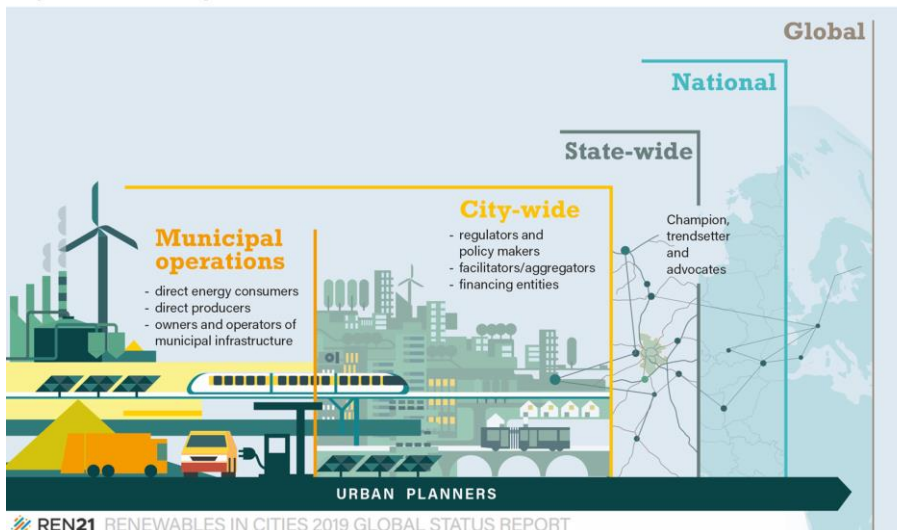
Overview of Existing Renewable Energy Targets in the Most-Polluted Capital Cities, As of Mid-2019



Cities' Multiple Roles in the Energy Transition

Role in decarbonising municipal operations and city-wide energy use

City Roles in Advancing Renewables Across Different Levels of Governance



	Municipal	City wide	State/ Provincial	National
Target setters	■ ■ ■	■ ■ ■	■ ■	■
Energy consumers	■ ■ ■	■ ■	■ ■	■
Energy producers	■ ■ ■	■ ■	■ ■	■
Owners & operators of infrastructure	■ ■ ■	■ ■ ■	■ ■	■
Regulators & policy makers	■ ■ ■	■ ■ ■	■ ■	■
Facilitators/aggregators	■ ■ ■	■ ■ ■	■ ■	■
Financing entities	■ ■ ■	■ ■ ■	■ ■	■
Urban planners	■ ■ ■	■ ■ ■	■ ■	■
Champions, trendsetters and advocates	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■

■ ■ ■ Direct city influence ■ ■ "Secondary" city influence ■ Marginal city influence



Urban Policy Landscape: Targets and Policies

Cities have ambitious targets, not only in the power sector

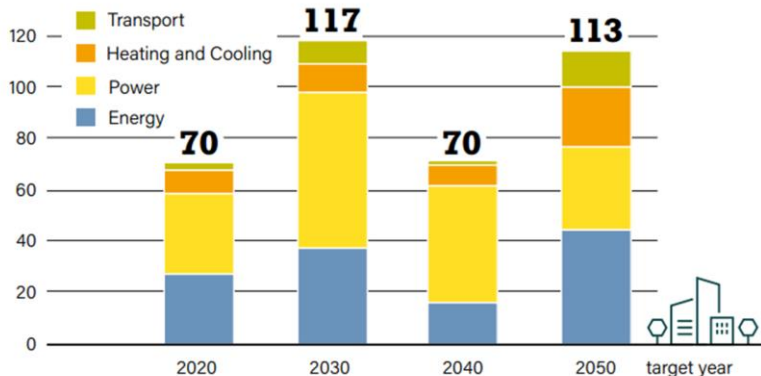
Target and vision setting for municipal operations and city-wide energy

Ambition tends to be:

- **Higher:** cities target larger shares of renewables than national counterparts
- **Broader:** cities also set targets in heating, cooling and transport sectors
- **250 cities** worldwide have adopted some form of **100%** renewables target

100% Renewable Energy Targets in Cities, As of Mid-2019

Number of 100% targets
(10 year period aggregate)



370 targets in over
250 cities

14 both
53 municipal
operations
target

303
city-wide
targets

Note: By mid-2019, 370 targets in over 250 cities have been identified. In addition, several 100% target exist in villages as well as provinces around the world. Data included in this figure were compiled by REN21, ICLEI and The Global 100% Renewable Energy Platform with material provided by a variety of stakeholders, including CDP, CAN, C40, IRENA, Sierra Club, Renewable Cities (2018); and may not be comprehensive.

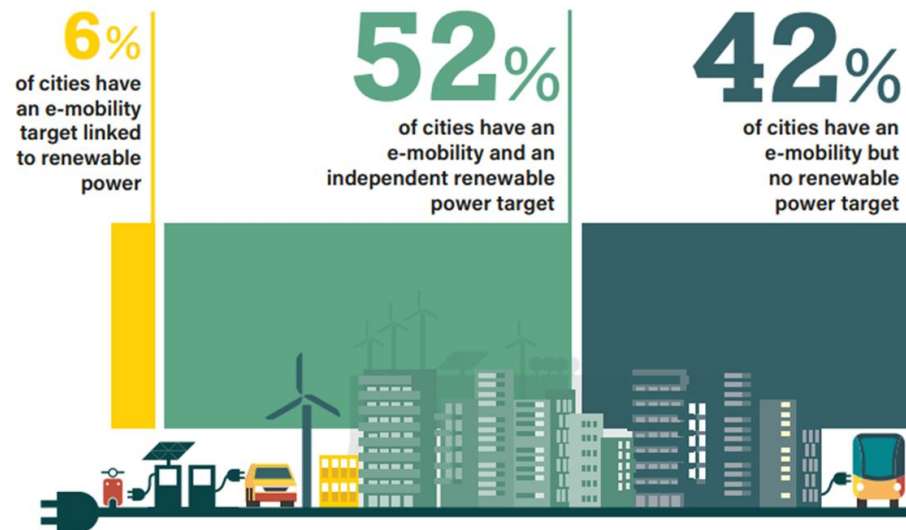
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E-mobility targets and renewable energy

Cities are adopting e-mobility targets but only few link directly to renewables

- More than 50 cities have urban e-mobility targets
- less than **6%** with integrated e-mobility and renewable energy targets
- Importance of ensuring integration of e-mobility and renewable power

Cities with E-mobility Targets and Renewable Energy Targets




City policy to advance renewable energy in cities

Cities have multiple policy options to advance renewable energy in cities

City policies can be divided into two main categories:

- Policies targeting **municipality's operations**
- City-wide energy use policies
 - mandates and obligations
 - fiscal and financial mechanisms



		Electricity Sector	Heating and Cooling Sector	Transport Sector
Municipal Operations	City Procurement	<ul style="list-style-type: none"> • Direct city investment in renewable power capacity on public buildings (for example, rooftop solar PV) • Buying renewable electricity from, for example, the existing utility, local residents and businesses (such as through special tariff structures for customer-sited generation) and third-party suppliers 	<ul style="list-style-type: none"> • Direct city investment in renewable heating and cooling technologies and infrastructure (for example, solar thermal for city buildings, or renewably driven district thermal networks) • Buying renewable heat from existing district networks • Aggregating the city's heat demand to enable the construction of new district networks 	<ul style="list-style-type: none"> • Direct city investment in the production of biofuels, renewable electricity or electro-fuels • Direct city investment in renewable transport (for example, renewably powered transit, biodiesel buses, renewably powered hydrogen vehicles or trains, etc.) • Procuring key enabling technologies for renewable transport, such as EVs and hydrogen vehicles
	City-wide	<ul style="list-style-type: none"> • Mandates to purchase electricity from renewable options, or to install renewable energy systems for new and/or existing buildings • Aggregating the city's electricity demand and seeking new suppliers (for example, through community choice aggregation) 	<ul style="list-style-type: none"> • Mandates to purchase heating and cooling from renewable options, or to install renewable energy systems for new and/or existing buildings • Adopting net zero emission/energy standards 	<ul style="list-style-type: none"> • City fleet mandates to buy only electric cars or, for example, biodiesel/biofuel buses • Mandates for specific sectors (for example, logistics companies) to use biofuels or to use EVs to enable renewables • Mandates to install EV charging infrastructure in new and/or existing construction (for example, shopping centres) to enable renewables
Fiscal and Financial Mechanisms		<ul style="list-style-type: none"> • Property Assessed Clean Energy (PACE) financing • Rebate programmes • Low-interest loans • Revolving loan funds • Etc. 	<ul style="list-style-type: none"> • Property Assessed Clean Energy (PACE) financing • Rebate programmes • Low-interest loans • Revolving loan funds • Etc. 	<ul style="list-style-type: none"> • Eliminating or reducing fees (for parking, ferries, road tolls, electricity, etc.) for certain vehicles, including EVs • Attractive rate structures for smart charging to improve the integration of renewables • Congestion zones with preferential rules for EVs and renewably powered vehicles

Policies targeting municipal operations

Advancing renewable energy in municipal operations

- Procuring renewable energy for consumption of municipal operations
- Scaling-up renewable generation on public buildings (e.g. Solar PV, solar thermal)
- Integrating renewable energy in district energy networks and switching municipal fleets to biofuels and electric vehicles (EVs)
- Using municipal waste and wastewater to generate biogas, biomethane



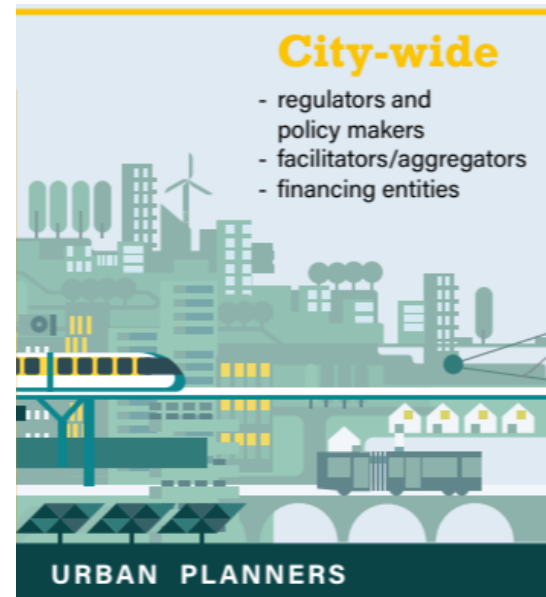
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Cities leading by example, shifting to renewables in municipal operations

Beyond municipal operations

Cities are using regulatory policies to advance renewable energy city-wide

- Regulators and policy-makers: creating environment for **city-wide** renewable uptake in power, heating and cooling
 - building codes requiring zero-emissions
 - solar power mandates
- Facilitating renewable deployment for other actors in urban environment (businesses, citizens, communities, places of worships, urban delivery companies)
 - raising awareness about benefits of renewable energy
 - sharing knowledge and creating dialogue



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Beyond the city

Cities are champions for renewable energy at the global scale

- Champions, trend setters and advocates at the national level
 - pushing for higher ambition
 - proving the viability of renewables
- Inspiring and learning from other cities worldwide and city networks



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Pioneer cities push for higher ambition at national level and inspire peer cities

Multi-level governance

Cities need the support from national governments to realise renewable energy

- City power and authority over energy issues
 - is often limited, in particular in Asia, Latin America and Middle East
 - cities cannot achieve sustainability alone
- Conflicting/unsupportive national policies
 - restrictive building codes, vehicle regulation
 - national fossil-fuel subsidies



Cities often face
challenges
in rapidly scaling up
renewables.

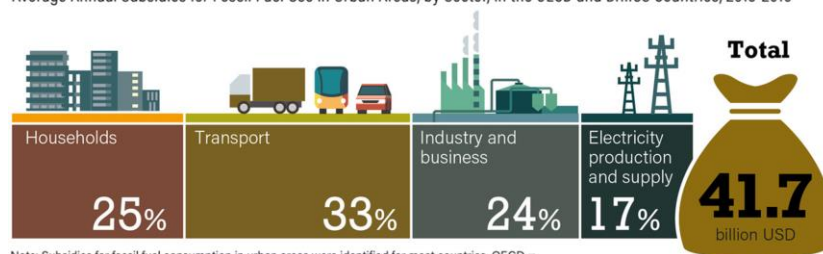
Cities cannot advance renewable energy transition in isolation

National subsidies for urban fossil fuel consumption

National subsidies impede acceleration of renewable energy development

- Hidden externalities of fossil fuel = much higher total
- Annual subsidies in urban areas
 - transport: USD 13.8 billion
 - households: USD 10.6 billion
 - industry and business: USD 10.3 billion
- Electricity production and supply: USD 7 billion

Average Annual Subsidies for Fossil Fuel Use in Urban Areas, by Sector, in the OECD and BRIICS Countries, 2015-2016



Note: Subsidies for fossil fuel consumption in urban areas were identified for most countries. OECD = Organisation for Economic Cooperation and Development; BRIICS = Brazil, Russian Federation, India, Indonesia, China and South Africa. A further USD 27.7 million in subsidies in urban areas of the selected countries goes to fossil fuel use in social and public services (too small to be included in figure).

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Policy alignment is needed

Municipal Ownership of Utilities

Ownership over local energy supply enables cities to shape the pace and scale of renewables adoption

- Municipal utilities are common in Europe, Japan, the Philippines, South Africa and the United States
- National utilities are predominant in most other regions of the world
- Beyond energy supply and distribution, municipal utilities often include other services (water, waste management, emergencies, etc).

TABLE 3. Municipal Ownership of Utilities

Full municipal ownership			No ownership
100% municipal ownership	Partial municipal ownership	Privately owned , but still structured as a municipal utility that the city can influence as a key “city stakeholder”	No municipal energy utility ; all customers buy their energy from a regional, national or other local supplier
Examples: Barcelona (Spain); Munich (Germany); Nottingham (UK); Olongapo (Philippines); and 1,843 utilities in the United States including in Austin (Texas), Burlington (Vermont), Oak Ridge (Tennessee) and	Examples: Freiburg (Germany)	Examples: Boulder (Colorado, US); Metro Manila (Philippines)	Examples: Denver (Colorado, US); Chicago (Illinois, US); Nairobi (Kenya); Tunis (Tunisia); London (UK)

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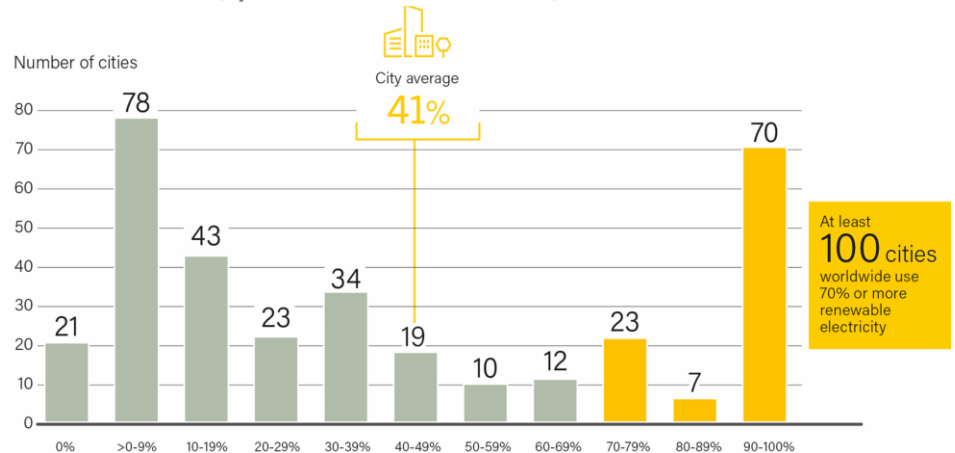
Urban Renewable Energy Markets

Renewable power in cities

Cities are increasingly shifting to renewable power use

- City governments and other actors are shifting to renewables for power consumption
 - applications: street/indoor lighting, appliances, cooking, etc
 - contracting their renewable electricity supply via PPAs
- More than 100 cities use at least 70% of renewable power (2017)
- Renewable power consumption in cities also depends on regional/national power mix

Renewable Power in Cities, by Number of Cities and Renewable Share, 2017



Note: The figure shows shares of renewables in the electricity consumption of 340 cities that self-reported to CDP. REN21 RENEWABLES IN CITIES 2019 GLOBAL STATUS REPORT

City average is calculated based on the 340 cities shown.

Beyond renewables in power consumption

Renewables as an opportunity to become decentralised electricity producers

- Cumulative distributed solar PV installation totalled 213 GW (2018)
- Municipal governments have become active in distributed renewable energy generation
 - public buildings: schools, administrative buildings, etc
 - drivers: reducing costs, showing leadership, increasing local awareness
- Adapted to resource availability and potentials: main renewable energy technologies are currently rooftop/building-integrated solar PV but concentrated solar PV, geothermal, hydropower, ocean power, bioenergy are used
- Other urban actors are also producing renewables: citizens, businesses, places of worship, etc

Municipal governments have a key role to stimulate local renewable power generation

Street lighting

Solar-powered street lighting helps to reduce municipal energy costs

- Municipal public lighting can account for up to 40% of municipal electricity budget
- Sales in solar powered street lighting reached 3.8 million cumulatively in 2017: almost half in Asia and the Pacific
- Energy efficiency: large potential for future savings in developing and emerging economies

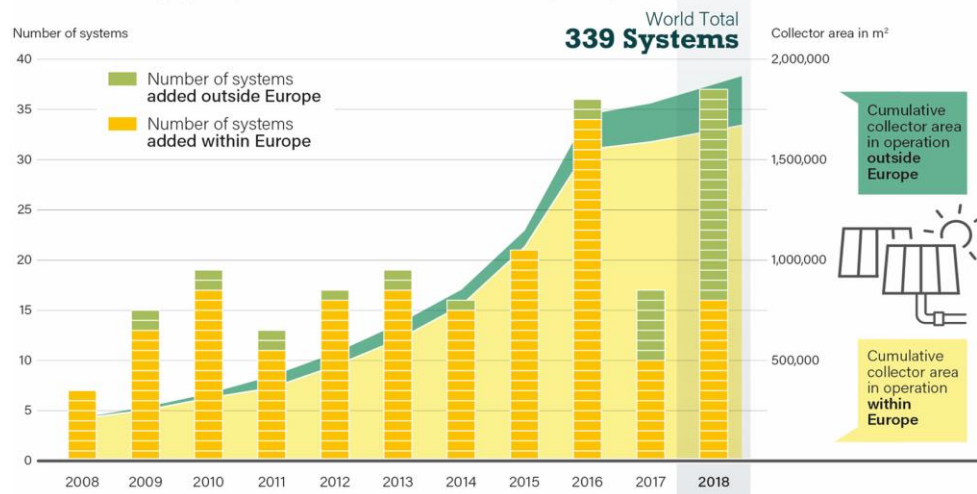


Renewable heating and cooling in cities

Role: target and vision setting, for municipal operations and city-wide energy

- **Stand-alone system:** typically on building facades and rooftops
- **District heating and cooling networks** mostly in Europe, China and North America
 - **Biomass** sources account for around 95% of renewable energy
 - **Geothermal** is increasing
 - **Solar thermal:** 339 large-scale systems, the majority within Europe

Solar District Heating Systems, Global Annual Additions and Total Area in Operation, 2008-2018



Note: Includes large-scale solar thermal installations for residential, commercial and public buildings.
Data are for solar water collectors and concentrating collectors.

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In Europe, 6,000 district heating systems supplied around 12% of EU heat demand

Net zero buildings and districts

- Buildings: > half of city emissions
- Building codes
- Net Zero Buildings
 - C40 Cities Net Zero Carbon Buildings Declaration
 - World Green Building Council Net Zero Carbon Buildings Commitment
- Net Zero Energy Districts
 - Palava (Mumbai, India)
 - Hazelwood Green (Pittsburgh, United States)

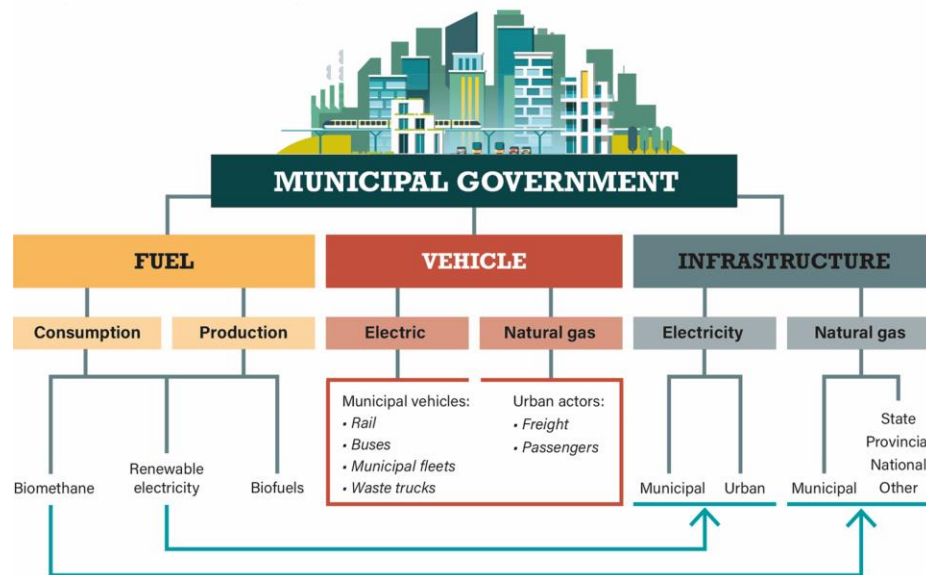


Renewable energy in urban transport

Role to shift to renewable fuel, vehicle and infrastructure

- **Fuel:** shift consumption to renewable fuels and produce renewable fuels
- **Vehicles:** shift to vehicles that allow the integration of renewables, e.g. electric vehicles and natural gas vehicles
- **Infrastructure** for electric vehicles and natural gas

Entry Points for Renewable Energy in Urban Transport



Urban markets: Electric vehicles in cities

Electrification of urban transport beyond metros and light rails

- Promoting biofuels is historically the main method to increase the share of renewables in transport (Ethanol, Biodiesel)
- Biofuels account for 3% of total energy consumption in the transport sector (0.3% for renewable electricity)
- Urban transport is opening up to general electrification
 - until recently: electricity use in urban transport was limited to light rail, urban trains and metros
 - now: plug-in hybrids, fully electric passenger cars and other forms of e-mobility become common
- Globally, the use of renewable electricity in transport **increased 11% in 2018**

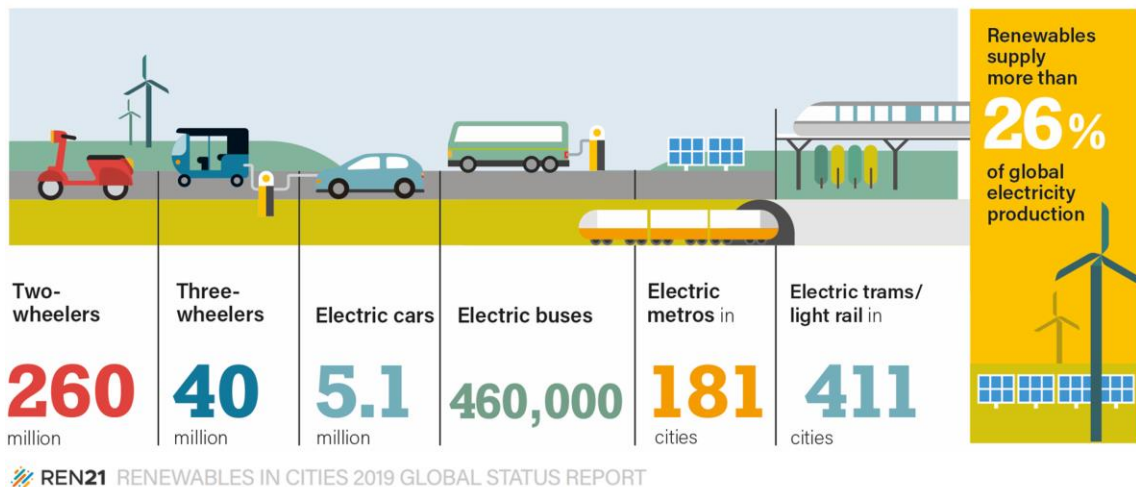


Renewable fuels in cities

Electrification of urban transport beyond metros and light rails

- Transport electrification is expanding rapidly
 - increased 11% globally in 2018
- Emergence of new forms of e-mobility

Global Electric Vehicle Markets, 2018

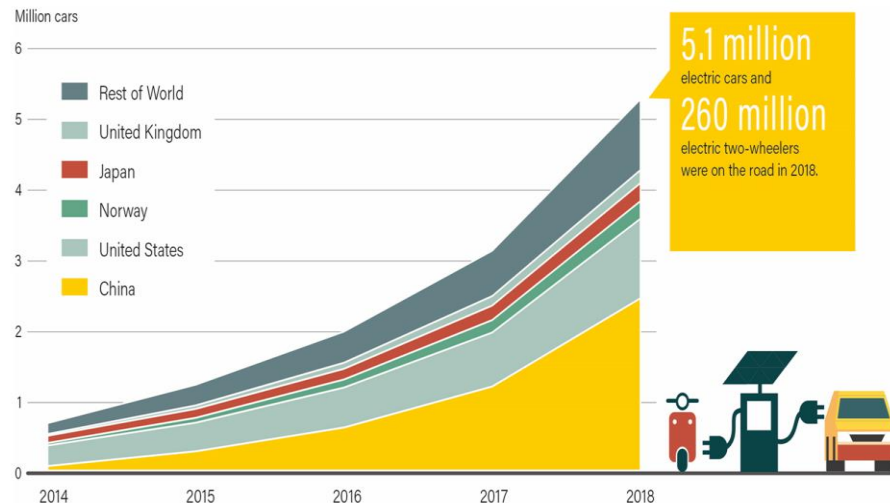


Electric Vehicles in Cities

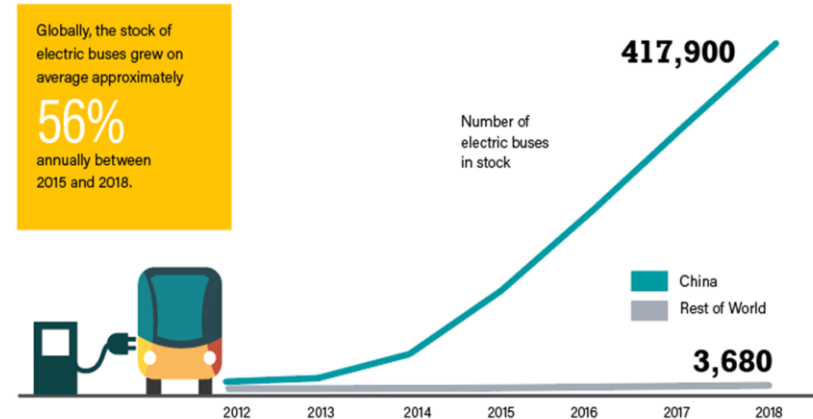
40% of all EVs are clustered in 20 cities
(3% of global population)

Most of the world's electric buses
are deployed in China

Electric Car Global Stock, Top 5 Countries and Rest of World, 2014-2018



Electric Bus Global Stock, China and Rest of World, 2012-2018



Note: Data are from BloombergNEF. Sales add up to 425,000 electric buses, which presents a discrepancy from the 460,000 reported by the International Energy Agency.
RoW = Rest of World

Mobilising Finance and Enabling Business Models

Finance needed

Cities use financing sources and models based on stakeholder collaboration and partnerships

- To finance renewable and infrastructure projects cities can use own funds but:
 - access depends on capacity to allocate budgets and broaden revenue sources
 - many cities are not perceived as creditworthy
- Improving municipal governments access to finance is a top priority
- Municipalities only responsible for small share of total finance in cities – big role of the private sector

Challenges: lack of own funds and access to external funds

Financing mechanisms

Cities use financing sources and models based on stakeholder collaboration and partnerships

- **Bonds** (municipal, green bonds): cities can access long-term financing at stable prices
- **Public-private partnerships (and other PPIs)**: provide an alternative means of financing for municipal governments when there is no guarantee that the private sector will invest
- **Land-value capture**: harvesting property value to finance new infrastructure projects
- **Dedicated funds**: multilateral development banks or green banks

Challenges: lack of own funds and access to external funds

Innovative business models to attract finance

Creating the conditions for citizens, local businesses and other actors to invest

- Renewable energy purchase agreements: most common in the electricity sector in the form of power purchase agreements (PPA)
- Energy service companies
- Leasing: for solar PV but also electric buses
- Electric vehicle sharing: more than 236 car sharing operators, active in more than 3,000 cities
- Pay-as-you-go (PAYG)
- Peer-to-peer energy sharing



Citizen Participation

Citizen engagement key for the energy transition

Citizens can actively shape the renewable energy infrastructure of their cities

- **Consumer choice**

- choosing among suppliers and switching to green
- opting for RE tariffs (electricity/heating)

- **Prosumers**

- households/businesses generating renewable energy
- facilitated by policies and business models such as solar leasing

- **Community renewable energy projects:** not only a rural phenomenon but have also emerged in cities



Municipal support and cooperation with residents

Municipal governments can gain public trust for renewables and drive ambition

- **Supporting community initiatives**
 - providing incentives (Fiscal, financial, RE projects quotas)
 - using the potential of ICT progress (apps, interactive databases)
- **Re-municipalisation/public ownership:** citizens initiatives are often the starting point
- **Participatory governance** is important to gain public trust
 - opposition to renewable energy projects can be a barrier (“Not In My Backyard”)
 - participatory planning and governance are tools to include citizens in decisionmaking

Public support in cities is important to drive the energy transition outside city boundaries

In conclusion

Cities and renewable energy – taking advantage of each other

- Renewable energy in cities
 - nature of renewable energy empowers cities to become key players in the energy transition
 - renewables offer cities the opportunity to achieve a wide range of objectives: air pollution, economic growth, etc.
- Cities in renewable energy
 - key in driving transition towards renewable energy
 - various roles: target setters, energy consumers & producers, policy makers and regulators, facilitator, etc.
 - advancing renewable energy in all end-use sectors



From an energy consumer to a change-agent of the energy transition

In conclusion

How to take advantage of the opportunities

- Strengthen data on renewable energy in cities
 - inform decision makers
 - change “historic” perception
 - bridge ‘cities’ and energy debates
 - track advancement
- Align policies across the national, sub-national and local level
- Empower cities
 - increase awareness about their role in the energy transition
 - governance: legal authority and financial resources



Better data to inform decision makers in all relevant sectors

Contribute to the *Renewables in Cities 2020 Global Status Report*

Become part of a community to advance renewable energy in cities

Contact us to get involved!

re_cities@ren21.net

www.ren21.net/cities

Do you want to be involved?

In early 2020, REN21 will conduct a survey in preparation for the 2020 edition. This survey will collect input to further develop this new report series. If you would like to contribute to the process, please sign up here or e-mail us at re_cities@ren21.net.

SUBMIT

QUESTIONS?

RE_cities@ren21.net