REN21 – a policy network for a renewable energy future

Who we are

Knowledge

Renewables in Cities
Global Status Report

Global Status Report: yearly publication since 2005

Regional Reports

Global Futures Reports

Thematic Reports

Debates

Community

23-25 October 2019

26 Nov 2019, Paris
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
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 fact-based 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.

50 interviews were conducted with city or sector-specific experts from around the world.
Cities in the Renewable Energy Transition
Cities in the world

Global CO₂
Cities account for three-quarters of human-caused global carbon dioxide emissions.

Population distribution in cities
- Population: 55% of the world’s population, or 4.2 billion people, lives in cities.
- Global CO₂ generation: 80% of global GDP is generated in cities.

Energy consumption
Cities account for an estimated 2/3 of global final energy use.

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

Megacities in the world
Cities with more than 10 million inhabitants.

Space
Cities cover 36,268,312 km², or 2.8% of global land area.

Urban infrastructure
- Buildings and construction: 36% final energy
- Energy-related CO₂ emissions: 40%
- 41,821 airports
- 4,936 ports
- 2 billion metric tonnes of solid waste generated per year
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
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

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 – 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 an renewable energy target

- In 2019, 35 cities commited to air pollution reduction targets and clean air policies
Cities’ Multiple Roles in the Energy Transition
Role in decarbonising municipal operations and city-wide energy use
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**
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
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
  - mandates and obligations
  - fiscal and financial mechanisms
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

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
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

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 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

Policy alignment is needed

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

25% Households
33% Transport
24% Industry and business
17% Electricity production and supply
41.7 billion USD Total
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**

<table>
<thead>
<tr>
<th>Full municipal ownership</th>
<th>Partial municipal ownership</th>
<th>Privately owned, but still structured as a municipal utility that the city can influence as a key &quot;city stakeholder&quot;</th>
<th>No ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% municipal ownership</td>
<td></td>
<td>No municipal energy utility; all customers buy their energy from a regional, national or other local supplier</td>
<td></td>
</tr>
</tbody>
</table>

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
- Freiburg (Germany)
- Boulder (Colorado, US); Metro Manila (Philippines)
- Denver (Colorado, US); Chicago (Illinois, US); Nairobi (Kenya); Tunis (Tunisia); London (UK)
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
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

26 Nov 2019, Paris
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

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

26 Nov 2019, Paris
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
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

Note: Data are from BloombergNEF. Sales add up to 425,000 electric buses, which presents a discrepancy from the 445,000 reported by the International Energy Agency.

Rest of World (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!

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QUESTIONS?
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