URBAN POLICY LANDSCAPE

Around
260 cities
set new targets or passed new policies in 2020.

Municipal governments around the world have been moving renewable energy up the policy and planning agenda, driven by the desire to improve public health and well-being, alleviate poverty, tackle climate change and improve local resilience, among other goals, and supported by the falling prices of renewables; overall, more than 1 billion people – around a quarter of the global urban population – lived in a city with a renewable energy target and/or policy (for a total of over 1,300 cities), and around 260 cities set new targets or passed new policies in 2020.[1] In many cases, municipal targets and policies are far more ambitious than those in place at higher levels of government.[2]

Municipalities have numerous policy options to stimulate renewable energy deployment. They can set targets and scale up the use of renewables for their own **municipal operations** (whether in buildings or transport fleets) through on-site generation and procurement policies. They also can use their role as regulators and policy makers to implement direct regulatory policies, financial and fiscal incentives as well as indirect support policies to encourage the **city-wide** adoption of renewable technologies.[3] In addition, municipal governments can raise awareness about the benefits of renewables, facilitate dialogue, and engage local residents, businesses and other stakeholders in the energy transition[i],[4]

Municipal governments have been advancing the production and use of renewable energy through various measures, including integrating renewables directly into near- and long-term energy and resource planning (→ *see City Snapshot: Orlando*).[5] For example, mandating the inclusion of renewable technologies and/or electric vehicle charging infrastructure in new construction can enable higher renewable energy shares while helping to achieve other city-wide goals. Governments also can advance renewables by planning infrastructure and the built environment in more efficient ways, considering urban density, building orientation and related effects on mobility to enable greater renewable energy use in key sectors such as buildings, industry and transport.[6]

i For more on the multiple roles of municipal governments in the energy transition, see Chapter 1, "Cities in the Renewable Energy Transition", in the REN21, *Renewables in Cities 2019 Global Status Report* (Paris: 2019), https://www.ren21.net/wpcontent/uploads/2019/05/REC-2019-GSR_Full_Report_web.pdf.

ORLANDO

FLORIDA (UNITED STATES)

Land area (km²)	Population size (2019)	Greenhouse gas emissions (CO_2 equivalent)
295	over 280,000	6,994,170 tonnes

The City of Orlando has a strong reputation for its city-wide achievements in sustainability and resilience. Over the last decade, the Green Works Orlando initiative has revolutionised the city by adding a sustainability chapter to the local municipal code. The implementation of sustainability policies and plans has made the city a leader in developing environmentally friendly communities.

In 2020, the Orlando Utilities Commission (OUC) began developing its Electric Integrated Resource Plan, with the aim of becoming carbon neutral by 2050 (with interim CO_2 emission reduction targets of 50% by 2030 and 75% by 2040). The plan also acts as a pillar to achieve the mayor's ambitious goal of 100% renewable electricity generation[i] in the city by 2050. It supports the phase-out of coal by 2027 and provides a roadmap to diversify the city's existing electricity mix. Although solar PV will remain the main source of new energy, Orlando will invest in energy storage and other related technologies to ensure reliability and resilience.

The OUC has a major role in making solar energy affordable and accessible in the city and has found innovative ways to harness power from the sun. In 2017, it established long-term power purchase agreements to buy power from the 12.6 megawatt (MW) Kenneth P. Ksionek Community Solar Farm, the first in the country to include a solar PV array that sits atop a by-product landfill. In 2020, the OUC backed the construction of two new solar PV farms – the Harmony Solar Energy Center in St. Cloud and the Taylor Creek Solar Energy Center in east Orange County[ii], together capable of powering 30,000 homes – and started purchasing power from them.

Orlando also is home to more than 1 MW peak of floating solar PV and has been a pioneer in this new application since 2017. The OUC will to continue to study the performance and scalability of floating solar PV in collaboration with the National Renewable Energy Laboratory thanks to a USD 1 million grant from the US Department of Energy. In 2020, the City of Orlando unveiled the new "floatovoltaics" at its international airport, showcasing this unique solar application. The local government has installed several "solar sculptures" and "solar trees" in the city to generate electricity and educate customers on the benefits of solar power.

Source: See endnote 5 for this chapter.

i According to the CDP-ICLEI Unified Reporting System, the share of renewables in electricity generation in Orlando was 2% (no date specified).

ii These are two of five projects being developed in the context of the Florida Municipal Solar Project, a partnership between the Florida Municipal Power Agency and 16 Florida public power utilities, including the OUC.

TARGETS

RENEWABLE ENERGY

Globally, at least 834 cities in 72 countries had a renewable energy target in at least one sector[i] by the end of 2020.[7] This means that an estimated 558 million people worldwide are living in a city with at least one renewable energy target.[8] Altogether, these cities have a combined total of 1,088 targets, as several cities have adopted more than one renewable energy target (whether for municipal operations and/or city-wide energy use) (→ *see Figures 3 and 4 and* ***Reference Table R1***).[9] Although most municipal targets are aimed exclusively at the power sector (62%), several municipalities have enacted targets specifically for heating and cooling or for transport, and some have committed to cross-sector or economy-wide targets.[10]

Geographically, the number of municipal renewable energy targets has increased in all regions of the world, although most targets are in North America and Europe (a combined 81%) followed by Asia (8%).[11] In Europe, targets are especially prevalent in Germany and Italy, facilitated by rising awareness of the influence of cities within the EU as well as by governance structures that allow local participation in energy issues.[12] In North America, targets are most common in the United States, which is home to 419 targets (39% of the global total), demonstrating the long-term commitment of municipal authorities despite the temporary US withdrawal from the Paris Agreement.[13] Overall, more than 80% of renewable energy targets globally are in regions that have higher income per capita, and are predominantly in countries with colder climates.[14] Generally, small and medium-sized cities in the population range of up to 500,000 inhabitants have emerged as frontrunners in target-setting, home to 74% of all targets (→ *see Figure 5*).[15] However, some larger cities and megacities – such as Beijing (China), Cape Town (South Africa), Copenhagen (Denmark) and Frankfurt (Germany) – also have targets.[16]

Municipal renewable energy targets differ in several ways[ii]. Although many targets are aspirational goals, taking the form of pledges, some cities have enacted legally binding targets.[17] The scope of targets ranges from municipal operations to city-wide energy production or use, and timelines vary widely (→ *see Figure 6*).[18] Some cities also break down their targets into interim, shorter-term targets to facilitate the tracking of progress, and align their action plans accordingly.[19] The majority of cities aim their targets at increasing the overall share of energy from renewables, although many also apply specific capacity or generation goals.[20]

Despite the momentum at the municipal level to establish renewable energy targets, city reporting on actual progress towards achieving these targets has lagged.[21] Many cities are either not gathering or not providing sufficient data to enable adequate monitoring and benchmarking. As a result, it remains difficult to determine the extent to which cities are on track to reach their targets (→ *see Box 1 in Global Overview chapter*).[22]

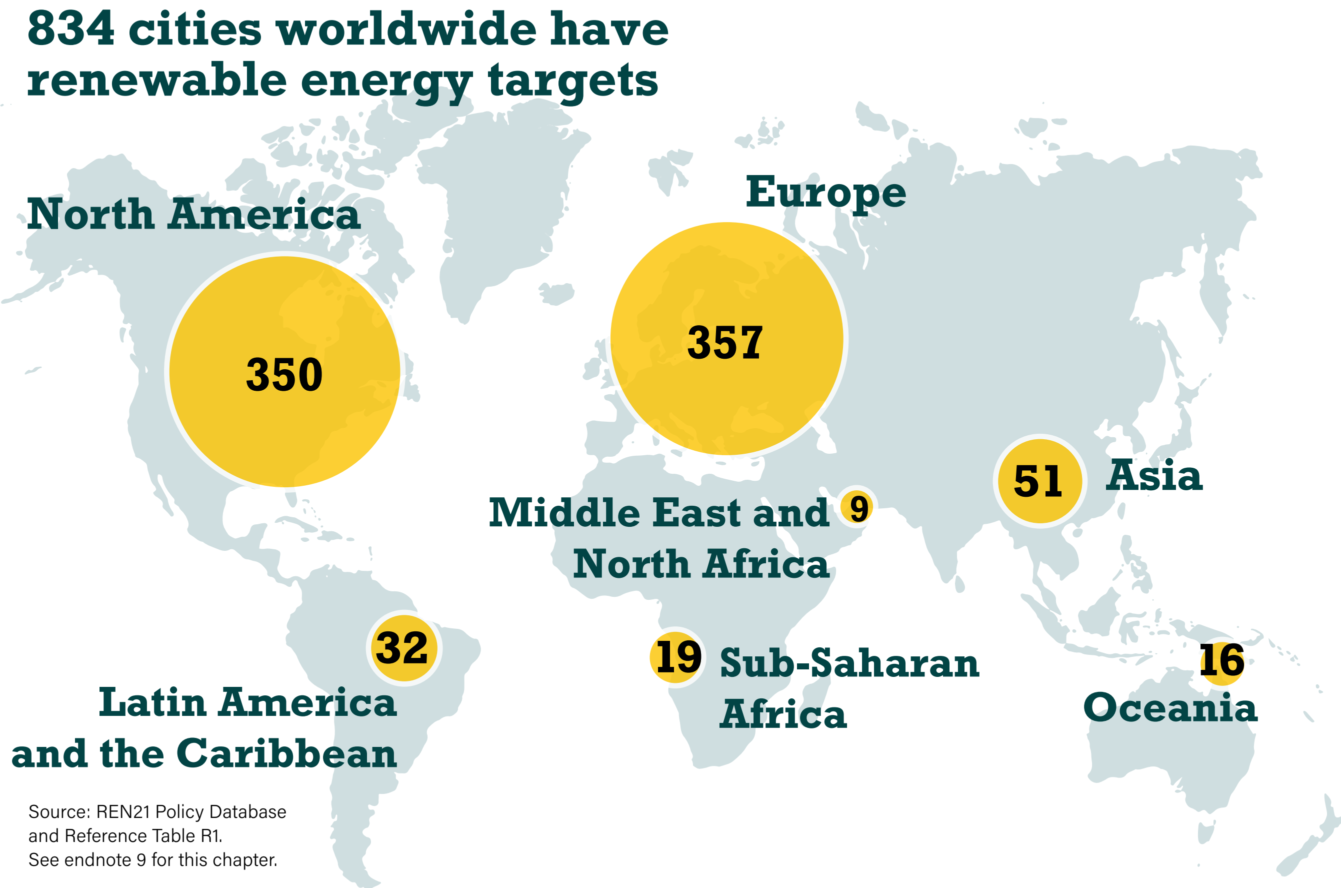

Hong Kong, China

Small and medium-sized cities have emerged as **frontrunners** in renewable energy target-setting.

i This total includes multiple targets for the same city. It covers renewable targets for consumption of all energy as well as for energy specifically in the power, heating and cooling, and transport sectors, as well as targets for specific installed capacity. It excludes targets for enabling technologies such as e-mobility and energy efficiency targets. In some cases, city governments have passed renewable energy targets but it remains unclear whether they are for renewable electricity or economic-wide targets (→ *see Box 1 in Global Overview chapter*).

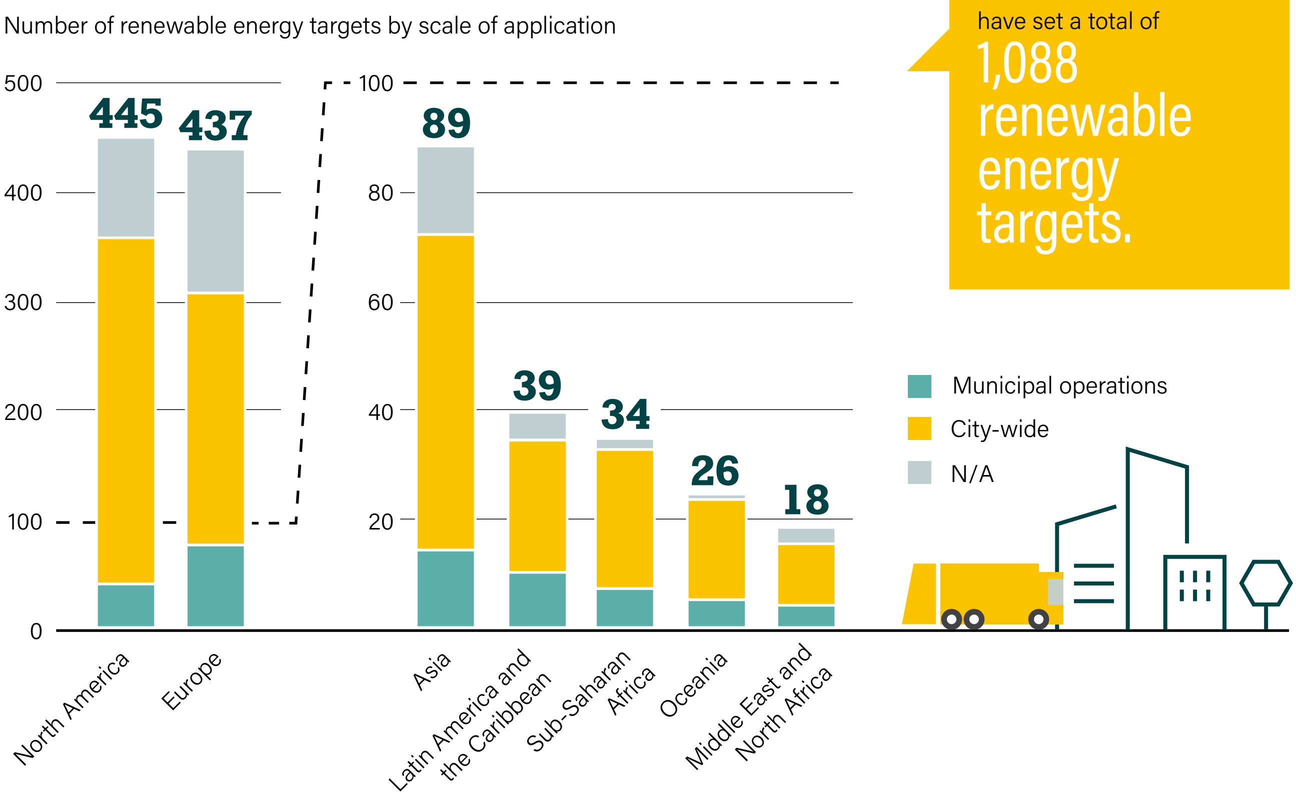
ii For more on the nature of renewable energy targets in cities, see REN21, *Renewables in Cities 2019 Global Status Report* (Paris: 2019), https://www.ren21.net/wpcontent/uploads/2019/05/REC-2019-GSR_Full_Report_web.pdf.

Figure 3. Renewable Energy Targets in Cities, 2020



Source: REN21 Policy Database and Reference Table R1. See endnote 9 for this chapter.

Figure 4. Renewable Energy Targets in Cities, by Scale of Application and Region, 2020



Note: The figure includes cities with renewable energy targets either for municipal operations or for city-wide energy use, or for both. Some cities have more than one renewable energy target. N/A = scale of application not available.

Source: REN21 Policy Database and Reference Table R1. See endnote 9 for this chapter.

Figure 5. Renewable Energy Targets in Cities, by City Size and Region, 2020

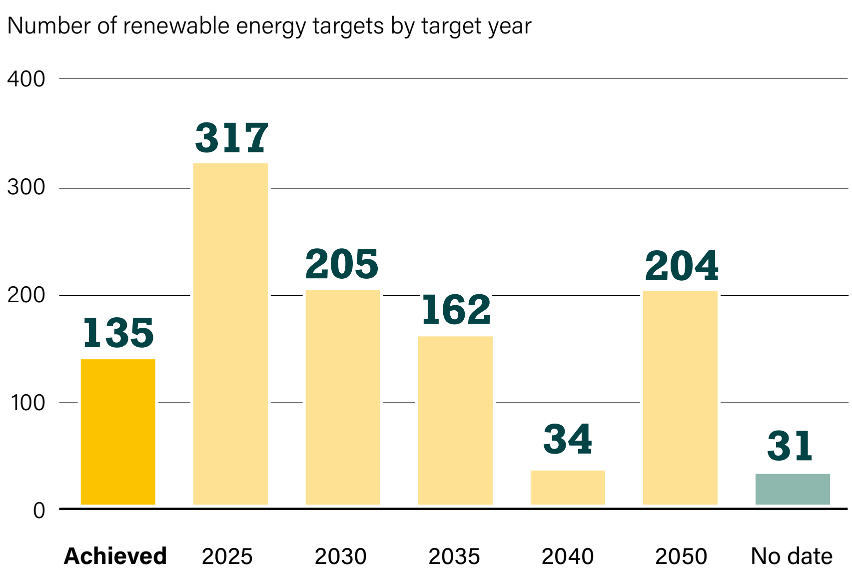
Note: Some cities have multiple renewable energy targets.

Source: REN21 Policy Database and Reference Table R1. See endnote 15 for this chapter.

Cities with less than 500,000 people are home to

74% of all renewable energy targets.

Figure 6. 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).

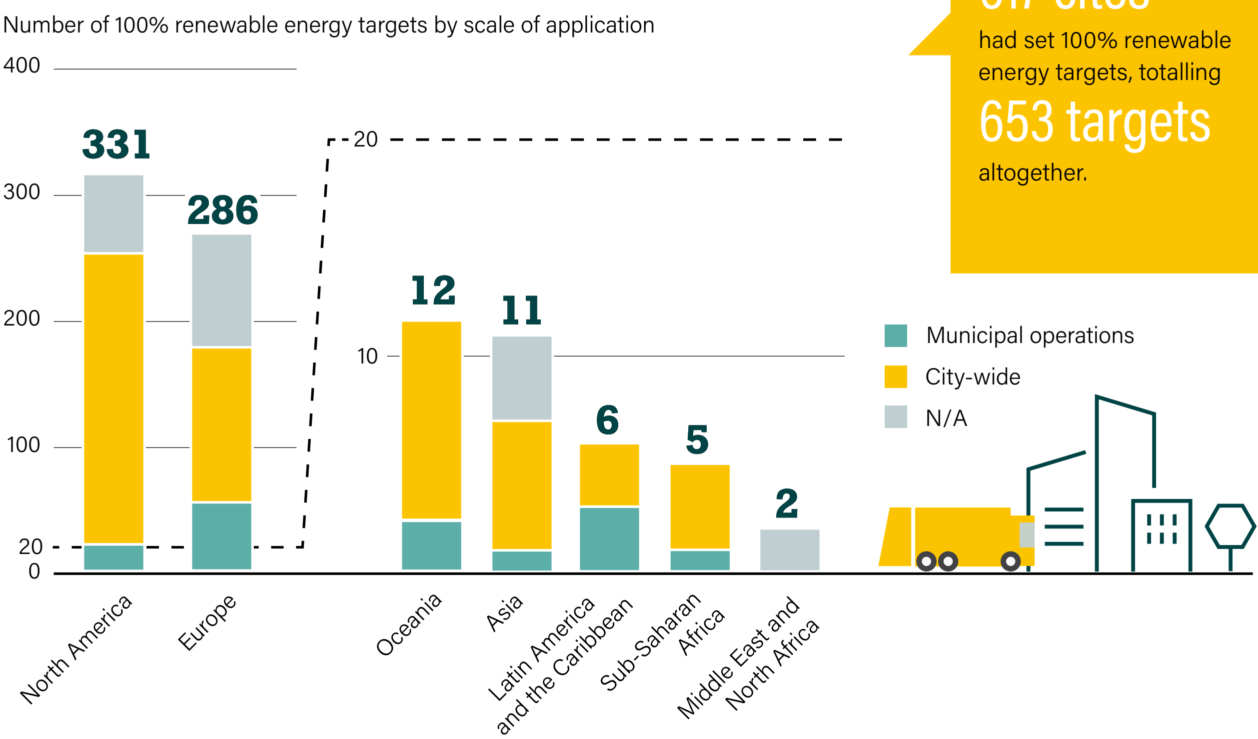
Source: REN21 Policy Database and Reference Table R1. See endnote 18 for this chapter.


Houston, United States

The movement towards 100% renewable energy – particularly 100% renewable electricity – has continued to gain traction. Globally, 617 cities had set 100% targets for either municipal operations or city-wide energy use as of 2020, together totalling 653 targets (→ *see Figure 7*).[23] Most of these commitments are for the power sector only. Although most such targets aim for years in the 2030 to 2050 period, at least 125 cities (including 47 in the United States alone) already had achieved their 100% renewable electricity targets by the end of 2020 (→ *see City Snapshot: Adelaide*).[24] For example, Houston (Texas) has met its target of powering its municipal operations – including its wastewater treatment plants, zoo and three airports – with 100% renewable electricity, making it the largest US city to power its operations entirely by renewables.[25]

Figure 7. 100% Renewable Energy Targets in Cities, by Scale of Application and Region, 2020

617 cites had set 100% renewable energy targets, totalling 653 targets altogether.



Note: The figure includes cities with 100% renewable energy targets either for municipal operations or for city-wide energy use, or for both. Some cities have more than one 100% renewable energy target. N/A = scale of application not available.

Source: REN21 Policy Database and Reference Table R1. See endnote 23 for this chapter.

ADELAIDE

AUSTRALIA

Land area (km²): **15.6**

Population size (2019): **1.3 million**

GHG

Greenhouse gas emissions (CO_2 equivalent): **360,759 tonnes**

As part of a power purchase agreement, the City of Adelaide's municipal operations have been powered by 100% renewables since July 2020, using electricity generated from wind farms in mid-north South Australia and new solar PV farms on Eyre Peninsula and in the South East. This long-term commitment supports the Adelaide Carbon Neutral Strategy 2015-2025, which sets a target for carbon neutrality by 2025.

As a step towards achieving this goal, the City adopted the Carbon Neutral Adelaide Action Plan 2016-2021 to reduce greenhouse gas emissions. The plan sets out 104 actions for council and local government under several low-emission pathways: energy-efficient built form, promoting walking and cycling, hybrid and electric vehicles for individuals and businesses, "zero-emission" transport, towards 100% renewables with solar PV and solar hot water, reducing emissions from waste and water use, and offsetting carbon emissions. The projects under the 100% renewable pathway generate cost savings for residents and businesses along with reducing emissions. In total, the city had installed 8.3 MW-peak of solar PV capacity as of 2019, including 2,362 kilowatts (kW) at city-owned and -operated sites.

Local government investments in energy storage support the deployment of new affordable storage technologies. For example, the Hornsdale Power Reserve, referred to as South Australia's Big Battery, was established in 2017 with 100 MW-peak, and another 50 MW-peak had been added in early 2020. Located next to the 316 MW Hornsdale Wind Farm, the Power Reserve is one of the world's largest lithium-ion batteries, providing grid services that enable the penetration of variable renewable energy sources like wind and solar power.

In addition, the Carbon Neutral Adelaide Action Plan provides incentives to create new economic opportunities and to support the business sector. Building upgrade finance provided by private financiers in partnership with the local council helps to improve the energy, water and environmental efficiency of non-residential buildings and infrastructure. This mechanism offers loans from the financier to building owners, which are repaid by the local council. Upgrading the infrastructure provides financial returns and has the potential to reduce electricity use 43% by 2030.

The Sustainability Incentive Scheme and the CitySwitch Green Office support city residents with financial incentives for the uptake of sustainability practices, technology and trends for low-carbon living. Rebates of up to AUD 5,000 (USD 3,831) are available for households, businesses and car parks for the installation of energy-saving technologies, solar PV systems, EV charging, solar hot water systems and energy storage systems.

The City of Adelaide also is assessing adaptation actions to increase the energy self-sufficiency of its wastewater treatment plants by harnessing biogas to generate renewable electricity. A total of 39,000 megawatt-hours (MWh) was generated from wastewater biogas in 2018-19. In parallel, the local government has been exploring the potential of carbon offset projects. In 2017, a demonstration carbon sequestration site was established near Adelaide High School to provide the community with a practical example of a carbon sink.

Source: See endnote 24 for this chapter.

City governments continued reporting on renewable energy targets, with 812 cities providing data to the CDP-ICLEI Unified Reporting System by the end of 2020.[26] Of these, 95 were in the progress of developing a renewable energy target in 2020 and 152 intended to pass one in the next two years.[27]

Targets in the **power** sector have continued to receive most of the attention. As of 2020, at least 612 cities had renewable energy targets focused on the power sector (678 targets altogether), including targets to switch to renewable electricity consumption or targets for a specific amount of renewable generation.[28] Cities with new renewable power targets in 2020 included Araçatuba (Brazil); Blacksburg, Houston, Las Vegas and Louisville (all US); Evora (Portugal); Murcia (Spain); and Singapore.[29]

A growing number of cities have set targets for renewable **heating and cooling**, particularly in Europe and the United States. This trend is especially pronounced in cities that have adopted net-zero or other climate targets, as recognition grows of the critical role that the heating and cooling sector plays in achieving decarbonisation.[30] In Scandinavia, Baerum (Norway) and Helsingör (Denmark) have targets for the use of 100% renewables in district heating, and Helsingör has specified that its district system will rely entirely on bioenergy.[31] Momentum also has grown for the adoption of solar water heater targets, particularly in developing countries. Mexico City committed in 2019 to retrofitting eight public buildings with solar water heating, and similar targets also exist in Alheim (Germany) and Antofagasta (Chile).[32]

In the **transport** sector, most city-level targets focus on electric vehicles, with some linked directly to renewable power (→ *see E-mobility and Hydrogen section*).[33] Although most **biofuel targets** for transport are set at higher levels of government, a few examples exist in cities, including in Auckland (New Zealand) since 2014, and in Helsingborg (Sweden) and Mexico City (Mexico) since 2019.[34] Some municipal governments also have worked with ports and port authorities to develop decarbonisation targets and strategies, including for increasing the production and use of renewables (→ *see Box 1*).[35]

At least
67 cities
have e-mobility targets.

E-MOBILITY AND HYDROGEN

E-mobility targets dominate urban transport-related targets and increasingly are being adopted in cities worldwide. Overall, at least 67 cities had e-mobility targets as of the end of 2020, up from 54 in mid-2019.[36]

Electrification offers the potential to increase the use of renewable energy in transport[i].[37] Although most cities with e-mobility targets do not link them directly to renewable electricity, several cities have adopted separate targets for e-mobility and renewable electricity – including Amsterdam (Netherlands), Cape Town (South Africa), Dubai (United Arab Emirates), Hamburg (Germany), Portland (Oregon, US) and Toronto (Canada) (→ *see Figure 8 and* ***Reference Tables R2 and R3***).[38]

E-mobility targets often aim for a certain number or percentage of EVs either sold, in circulation or registered in a city by a certain year. In 2019 and 2020, at least four cities – Delhi (India), Los Angeles (California, US), Santiago (Chile) and Seoul (Republic of Korea) added to their existing e-mobility targets, and at least three additional cities – Hamburg (Germany), Singapore and Tallinn (Estonia) – announced their first e-mobility targets.[39] To reduce local air pollution, the government of Delhi (India) set targets in 2019 for at least 500,000 EV registrations by 2024, and for delivery companies in the city to electrify 50% of their fleet by 2023 and 100% by 2025.[40] Also in 2019, Los Angeles (California, US) announced plans to increase the city's share of zero-emission vehicles[ii] in operation to 25% by 2025, 80% by 2035 and 100% by 2050.[41] In 2020, Santiago (Chile) announced a target to electrify 4,250 of its 6,600 buses by the end of 2021.[42]

Hamburg, Germany

i Researchers and policy makers increasingly recognise that to truly decarbonise the transport sector, e-mobility targets need to be linked directly with or at least complemented by renewable electricity targets. See REN21 and FIA Foundation, *Renewable Energy Pathways in Road Transport* (London: November 2020), https://www.ren21.net/wpcontent/uploads/2019/05/REN21_FIA-Fdn_Renewable-Energy-Pathways_FINAL.pdf.

ii Zero-emission vehicles do not produce tailpipe emissions. These air pollutants, emitted during the operation of a vehicle, often include greenhouse gases, particulate matter, volatile organic compounds, nitrogen oxides, carbon monoxide and sulphur dioxide.

BOX 1. Renewable Energy in Urban Ports and Port Authorities

Since most ports are located in cities, many interlinkages exist between ports and the urban environment. These linkages often have negative consequences at the local level: for example, in Hong Kong (China) more than half of the city's sulphur dioxide emissions are related to shipping. To address these concerns, both municipal policies and port development strategies increasingly have included measures to reduce emissions, mitigate the environmental impacts of port activities (including loading and unloading) and scale up renewable energy.

Nearly 90% of Europe's port authorities are publicly owned, meaning that local and other governments have a key role to play in the uptake of renewables at these ports. For example, the Climate Neutral Roadmap 2050 of Amsterdam (Netherlands), published in 2020, includes plans to transform the city's port into a "battery" to store and distribute renewable electricity and produce renewable hydrogen. In general, on-site hydrogen production via electrolysis using renewable energy sources (mainly solar PV and wind power) has begun attracting the attention of city ports around the world (→ *see Markets and Infrastructure chapter*).

Several city ports have adopted decarbonisation targets and strategies that affect not only port activities but also the diverse industries often hosted by ports, including shipping, cruise tourism, heavy transport and power generation. In 2019, in partnership with the municipal government, the Port of Oslo (Norway) set a target for an 85% reduction in its greenhouse gas emissions by 2030, with the goal of eventually becoming the world's first zero-emission port. Strategies to achieve this include working with operators to electrify ferries and building shore power[i] connections that allow boats to cut their engines and plug in to the grid when docked.

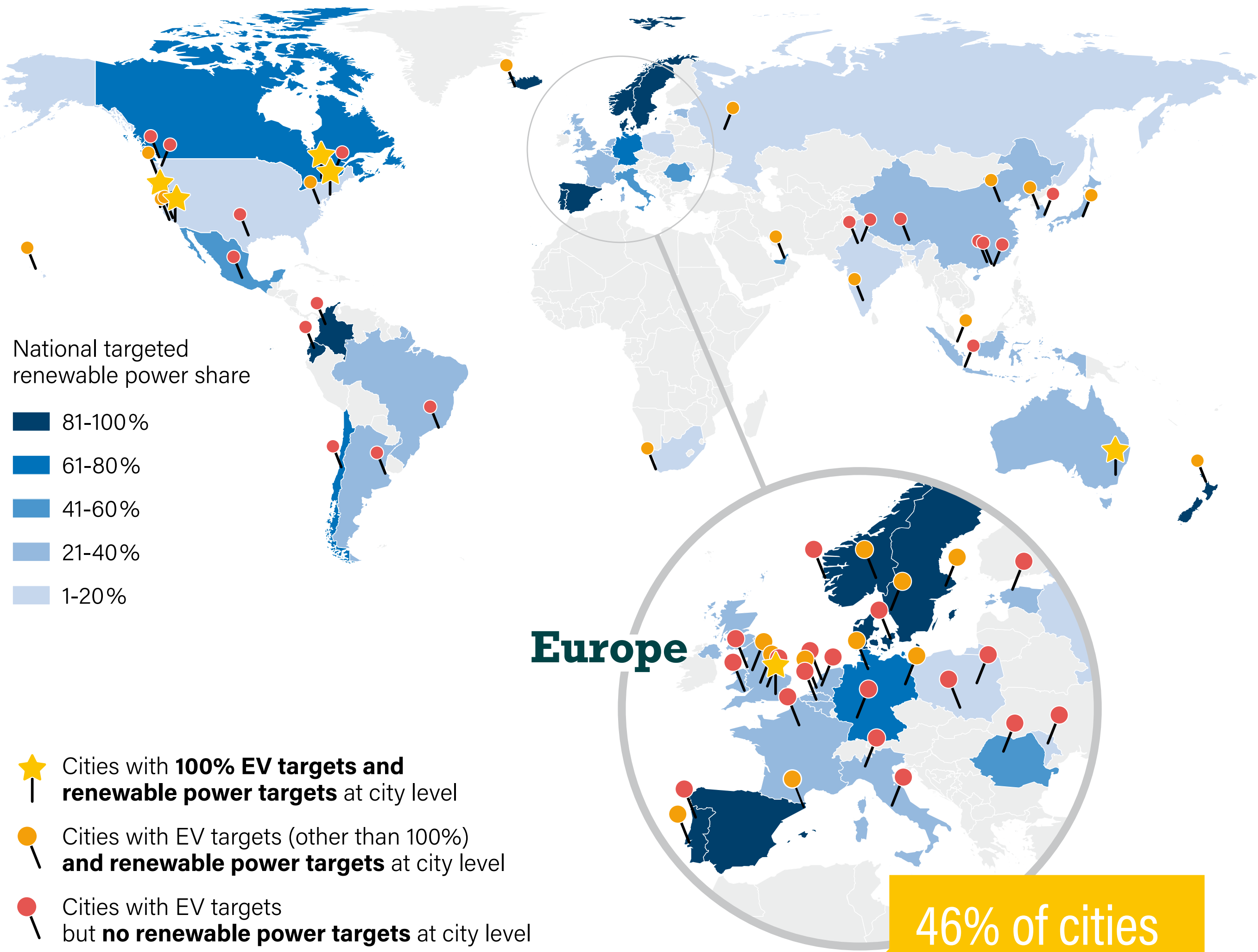
In 2020, the Port of Esbjerg (Denmark) and the Port of Rotterdam (Netherlands) announced plans to build on-site facilities to supply renewable power to ships. The first shore power supply plant at the Port of Kiel (Germany) has been in operation since 2019, supplying ferries with renewable electricity. In North America, the use of shore power is mandatory under state regulation at ports in California (US), including Los Angeles, Oakland, San Diego and San Francisco. Shore power connections also are available in Halifax (Nova Scotia, Canada), Seattle (Washington, US) and Vancouver (British Columbia, Canada). Starting in 2020, the Port of Houston became the first US port to agree to purchase renewable electricity for port-wide activities.

Source: See endnote 35 for this chapter.

Rotterdam, Netherlands

i Shore power is the process of providing electrical power from the shore to a ship while it is docked. The provision of shore power offers the potential to increase the use of renewable electricity when ships are at berth, depending on the share of renewables in the port's electricity mix. By the end of 2019, nearly 80 ports, three-quarters of them in Europe, had shore power capability.

Figure 8. National Renewable Power and Electric Vehicle Targets in Cities, 2020



46% of cities with EV targets

also have a city-wide renewable electricity target.

Source: REN21 Policy Database and Reference Tables R2 and R3. See endnote 38 for this chapter.


Feletto Umberto, Italy

Some cities have committed to phasing out fossil fuel vehicles in certain fleets (typically public transport fleets such as buses and ferries) and to procuring only "carbon-neutral", "zero-emission" or "clean"[i] vehicles. In 2019, Turku (Finland) committed to 100% carbon-neutral public transport by 2029.[43] Hamburg (Germany) has pledged to procure only zero-emission buses from 2020.[44] Also in 2020, Singapore set a target to transition its entire bus fleet to clean energy by 2040, and Seoul (Republic of Korea) announced plans to phase out diesel vehicles in public fleets by 2025 and replace them with battery electric and hydrogen-powered vehicles.[45]

Targets for the use of **renewable hydrogen**[ii] in transport are not common[iii], but policy attention and interest in fuel cell vehicles are emerging in some cities, especially in East Asia, Australia, California (US) and Europe (although typically without requirements for renewable hydrogen).[46] In 2020, the municipal government of Zhangjiakou (Hebei Province, China) announced a target to have more than 2,000 fuel cell vehicles and 16 hydrogen refuelling stations in operation by 2022.[47] (→ *see Policies section in this chapter, and Markets and Infrastructure chapter.*)

Seoul, Republic of Korea

EMISSION REDUCTION AND NET-ZERO TARGETS

Several cities have adopted climate-related targets, focusing on reductions in carbon and/or broader greenhouse gas emissions. Although such targets do not necessarily specify a role for renewable energy, renewables are expected to be instrumental in efforts to achieve them, alongside promoting energy efficiency and other actions.[48] Globally, by the end of 2020, around 10,500 municipal governments, representing some 946 million inhabitants[iv], had committed to reducing their carbon emissions by a specific date; most of these cities are in Europe, but targets are emerging elsewhere as well.[49]

Momentum also has grown for the adoption of net-zero[v] commitments – achieving a balance between CO_2 emissions and removals. Overall, the number of net-zero targets in cities has increased roughly eight-fold from 2019 (even growing amid the COVID-19 crisis), and by the end of 2020 a total of 796 municipal governments in 63 countries had adopted such targets.[50] This means that around 700 million people (9% of the global population) live in a city with a net-zero target (excluding targets set at the state, national or other levels of government).[51] Net-zero targets are most prevalent in Europe and in Latin America and the Caribbean, followed by East Asia and the Pacific and North America.[52]

Some municipal governments are making net-zero pledges on their own, and many are joining networks of like-minded actors. For example, the Carbon Neutral Cities Alliance as well as 88 members of C40 Cities have signed on to Deadline 2020, committing them to being greenhouse gas emissions neutral and climate-resilient by 2050.[53] Municipal interest in becoming net-zero also was catalysed by the launch of the Climate Ambition Alliance at the United Nations Climate Conference in December 2019 and by the launch of Race to Zero[vi] in early 2020.[54]

It remains to be seen how municipal governments will implement their net-zero targets in their policy documents and specify a role for renewables. Of the 796 municipal governments with net-zero targets, 222 had passed a renewable energy target as of the end of 2020, either specified as part of their net-zero commitment or as an independent target (→ *see Figure 9 and* ***Reference Table R4***).[55] For example, Adelaide (Australia) plans to achieve net zero through a variety of energy efficiency measures as well as 100% renewable energy.[56]

i The terminology used in this chapter mimics the terminology that cities generally use in setting targets and policies to decarbonise transport. Different cities adopt different concepts, such as "carbon-neutral", "zero-emission" or "clean" vehicles, which typically refer to electric vehicles and are not necessarily linked with renewable energy.

ii Also referred to as green hydrogen. See Glossary for definition.

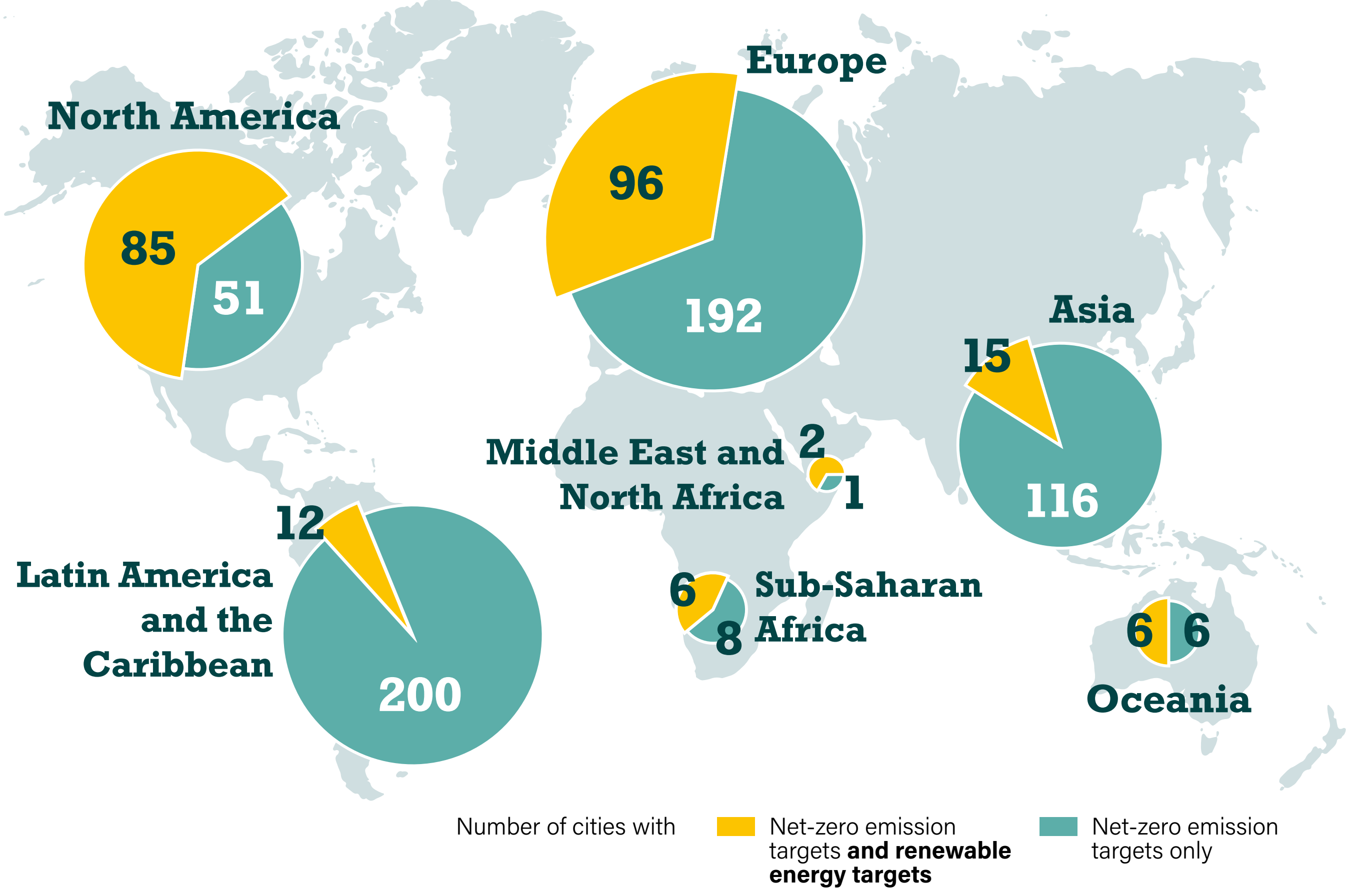
iii A few countries have targets for renewable hydrogen at the national level that could be complementary to city-level hydrogen targets. See REN21, *Renewables 2021 Global Status Report* (forthcoming).

iv As stipulated under the Global Covenant of Mayors for Climate & Energy.

v This can be achieved, for example, by using natural sinks, such as reforesting land or adopting agricultural best practices, or through a technological solution, such as carbon capture and storage. Net-zero targets also are referred to commonly as "climate-neutral", "carbon-neutral" or "zero-emission" targets, although technically these are not the same. Carbon neutrality refers to net-zero emissions of only CO_2, whereas climate neutrality indicates a broader focus on net-zero emissions of all greenhouse gases. There is no agreed-upon definition, and implementation of these targets also varies broadly. See endnote 48 for this chapter.

vi Race to Zero is mobilising a coalition of leading net-zero initiatives, bringing together businesses, cities, regions and investors to facilitate the shift to a decarbonised economy ahead of the 2021 United Nations Climate Change Conference. See https://racetozero.unfccc.int.

Figure 9. Net-Zero Emission Targets and Renewable Energy Targets in Cities, by Region, 2020



Source: REN21 Policy Database and Reference Table R4. See endnote 55 for this chapter.

As with renewable energy targets, net-zero targets vary in the scope of emissions covered (CO_2 only or also other greenhouse gas emissions), the scale of application (municipal only or city-wide) and the timeline.[57] While some cities, such as Adelaide (Australia) and Copenhagen (Denmark), aim to become net zero by 2025, most cities have targeted 2050, and others (including 21 of the 454 cities in Race to Zero) aim for various years before 2050.[58] As of 2020, only a few municipal governments (including 25 of the 454 cities in Race to Zero) had created action plans or binding legislation to achieve their net-zero targets.[59] Thus, how cities will implement and report on action in this area remains to be seen.

MUNICIPAL OPERATIONS

To achieve their renewable energy targets, municipal governments have adopted various policy measures to advance renewables in the power, heating and cooling, and transport sectors. Some cities have implemented policies to increase renewables across municipally owned operations (→ *see Markets and Infrastructure chapter* for more on renewable energy installations in cities and on the procurement of renewables in the buildings and transport sectors). Other municipal governments have used their role as policy makers and regulators to pass comprehensive (city-wide) policies to encourage the uptake of renewables among residents, businesses and other urban actors. (→ *see Policies section in this chapter*).

MUNICIPAL BUILDINGS

In jurisdictions where it is possible, municipal governments have increased their investments in renewables for their own-use in municipal buildings, whether through direct investment in on-site generation, procurement processes or strategic purchasing of renewable energy directly from third-party providers.[60]

Municipal governments have implemented policies to install renewable **power** capacity on or near municipally owned buildings such as city halls, sport facilities and schools. In Dublin (Ireland), the city council issued a contract in 2019 to equip seven sports centres with solar PV, saving EUR 129,000 (around USD 158,400) in energy costs and reducing 321 tonnes of carbon emissions annually.[61]

In some cases, cities have installed renewable power specifically to boost their resilience and energy security, particularly during extreme weather events.[62] In 2020, Portland (Oregon, US) installed a solar PV system with battery storage at its main fire station to provide sustained, reliable power in the event of prolonged grid outages.[63] Adelaide (Australia) completed a 12 MW ground-mounted solar PV project at its main drinking water pumping station in 2020 as part of its plan to meet its electricity needs with 100% renewables.[64] Boston and Los Angeles (both US) as well as Quezon City (Philippines) have begun incorporating renewable energy infrastructure directly into their resilience planning.[65]

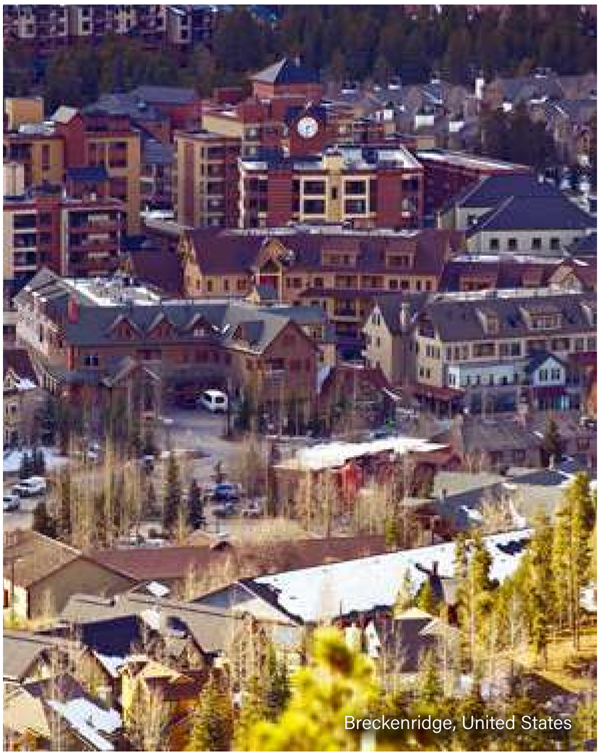
For municipal governments that face constraints to installing renewables within city limits (such as high land costs or land scarcity), among the only ways to achieve renewable energy targets are to increase their procurement of renewable electricity or to partner with third-party operators to develop projects outside of city boundaries. Municipal procurement of renewables has spread rapidly in cities around the world, including Chennai (India), Karak (Jordan), Pico Truncado (Argentina) and Windhoek (Namibia).[66]

Between 2015 and mid-2020, cities in the United States supported a total of 433 renewable power procurement deals for a combined 9,188 GW of capacity.[67] Partly as a result of these arrangements, the total renewable energy capacity installed annually in US cities nearly tripled from 1,042 MW in 2017 to 2,716 MW in 2019.[68] Most of these deals consisted of community solar initiatives and power purchase agreements signed with developers beyond city borders, although they also included efforts to procure renewable power directly for municipal operations (such as projects sited at municipal buildings).[69]

Officials in Breckenridge (Colorado, US) explored several options to develop or procure as much renewable energy as possible within the city to achieve its goal of 100% renewable electricity in municipal use by 2025.[70] However, developing projects within city limits was deemed uneconomical due to the high cost of land, and it was more financially attractive to purchase power from off-site "solar gardens" (community solar projects) in surrounding areas.[71] Upon completion of these projects, Breckenridge will have met its 100% goal five years early.[72]

Municipal governments have increased their investments in renewables for municipal buildings.


Quezon City, Philippines


Breckenridge, United States

Compared to the power sector, policies to increase the share of renewables directly in the **heating and cooling** of municipal operations are less widespread, due to the decentralised character of this demand and the limited awareness of available options. However, the importance of heating and cooling has moved up the policy agenda in some areas, notably among local energy suppliers and at the EU level.[73] To reduce CO_2 emissions and improve air quality, the municipal government of Gdynia (Poland) has called for replacing solid fuel stoves with renewable energy sources (or gas boilers) in all municipally owned buildings by 2023.[74] Some municipal governments also have implemented bans and restrictions on fossil fuels for city-owned buildings. For example, the new public hospital in Canberra (Australia) will ban the use of natural gas and be powered 100% by renewables.[75]

Increasingly, municipal governments are facilitating the integration of renewables into their district energy networks, often in co-operation with public or private partners. In Temuco (Chile), the municipal government is developing district heating infrastructure (using biomass) through public-private financing and with the support of the National District Energy Office.[76]

Most public procurement of **zero-emission vehicles** focuses on electric vehicles.

MUNICIPAL TRANSPORT

City governments have made strides to decarbonise transport fleets and mobility infrastructure to improve local air pollution and mitigate other impacts of urbanisation such as congestion and noise.[77] In most cases, cities rely on public procurement or direct investment to source renewable fuels for public and municipal fleets, to replace internal combustion engine vehicles with electric vehicles that can be renewably powered, and/or to build associated infrastructure.

Although most **biofuel** policies are enacted at the national or regional levels, some cities have sought to increase the use of biofuels in public fleets.[78] Santa Barbara (California, US), stimulated by state and national mandates and building on its local feedstocks, announced in 2019 that it would replace petroleum diesel with biodiesel to fuel its municipal bus fleet.[79] Also in 2019, Longmont (Colorado, US) started sourcing locally produced biogas to fuel new refuse trucks.[80] In 2020, the Liverpool City Council (UK) commissioned a fleet of 20 refuse trucks that run on biogas.[81]

Still, most public procurement of zero-emission vehicles focuses on **electric vehicles**, with electric buses garnering the most attention from city governments worldwide. Although Chinese cities continued to dominate the global electric bus market during 2019 and 2020, interest in electrified bus transport also expanded to cities in North America, Latin America, Europe and elsewhere.[82]

Policies that promote electric vehicles are not in themselves renewable energy policies; however, they provide a critical entry point for higher uptake of renewables in transport, especially if combined with renewable electricity policies set by municipal, state and/or national governments.[83] A few cities require the use of renewables to charge electric buses: in 2019, São Paulo (Brazil) integrated 15 electric buses into its fleet that must be

China

charged using solar power, and new electric buses in Portland (Oregon, US) will be 100% wind-powered as part of the city's aim for a non-diesel fleet by 2040.[84]

Electric vehicles also are being procured for municipal delivery and refuse fleets, including in cities bound by renewable energy targets and policies.[85] In 2020, Leeds City Council (UK) took delivery of 122 electric vans to be used for services ranging from property maintenance to civil enforcement.[86] That same year, several cities started testing and integrating electric refuse trucks in their municipal fleets – including Blue Mountains (New South Wales, Australia) and Jersey City and New York City (both US).[87]

In some cases, EV procurement programmes are the result of public authorities increasingly adopting related purchasing obligations.[88] For example, the Supreme Council of Energy of Dubai (United Arab Emirates) has directed government organisations to increase the share of electric and hybrid vehicles they procure annually to at least 10% by the end of 2024, 20% by the end of 2029 and 30% from 2030 onwards.[89] Under Dubai's Clean Energy Strategy, in force since 2015, the share of renewable electricity used to charge EVs is targeted to grow from 7% in 2020 to 25% in 2030 and 75% by 2050.[90]

Several cities in East Asia, particularly in China, have procured **hydrogen** fuel cell buses. However, since nearly all of the hydrogen produced globally today is based on fossil fuels, only a few of the buses operate on hydrogen produced with renewable electricity.[91] In 2019, Zhangjiakou (Hebei Province, China) added 174 fuel cell electric buses to its expanding hydrogen fleet, which is fuelled with renewable hydrogen.[92] The municipality of Aalborg (Denmark) purchased three fuel cell buses that begun circulating in 2020 and rely on renewable hydrogen.[93]


Oregon, United States

Tigard, Oregon, United States

CITY-WIDE POLICIES

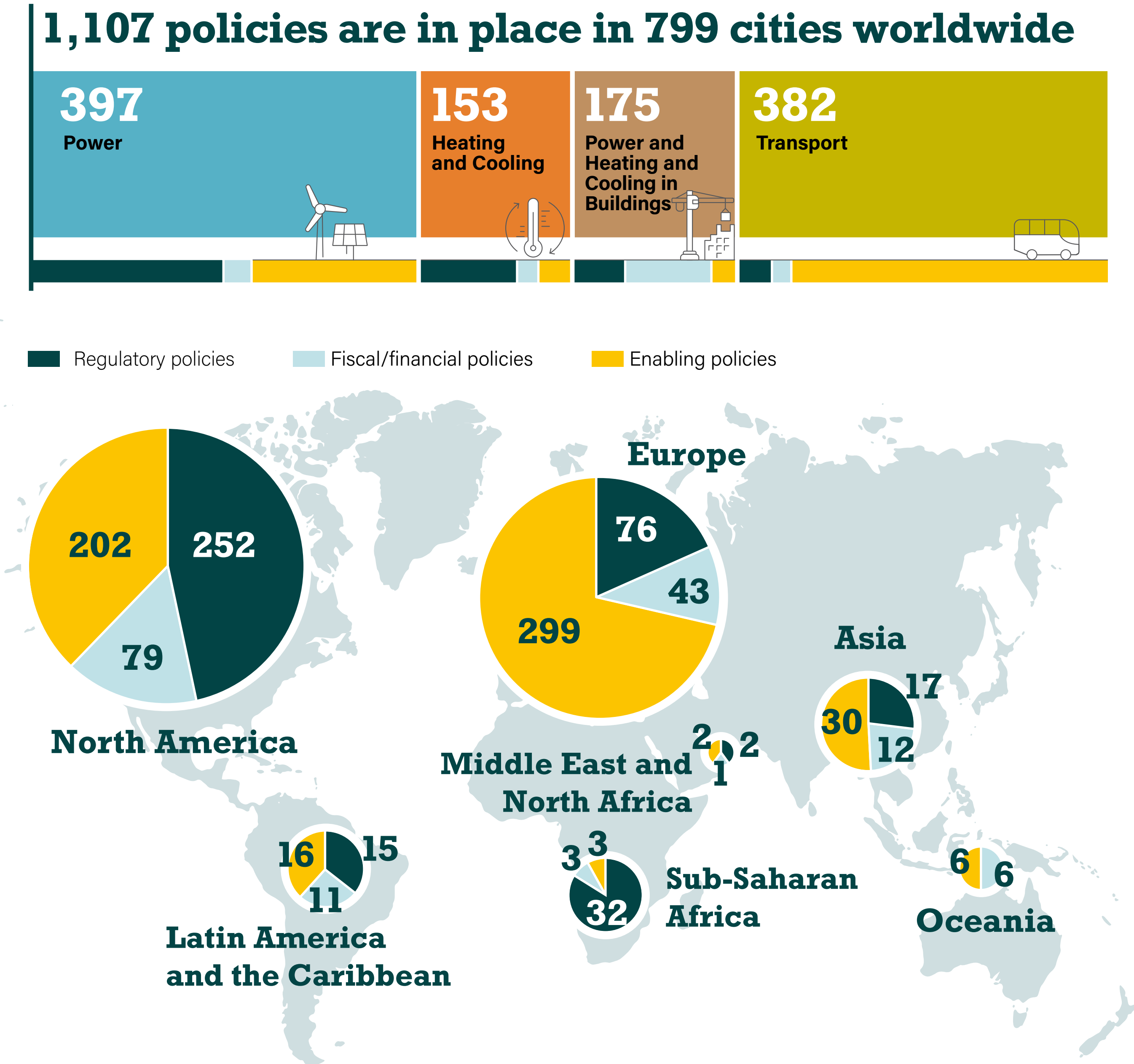
At least
799 municipal governments
had in place renewable energy policies.

Municipal operations often account for only a small portion of urban energy use. Thus, the success of cities in meeting their energy and climate goals relies not only on municipal investments in city facilities and fleets, but also on the decisions made by citizens, businesses and other urban actors regarding how to heat and cool their buildings, move around goods and people, and power their lights, appliances and activities.

To encourage the uptake of renewables city-wide, municipal governments have adopted a range of comprehensive policies.[94] By the end of 2020, at least 799 municipal governments had in place either renewable energy policies or policies supporting the scale-up of renewables across buildings and transport (for a combined total of 1,107 policies, with some cities having more than one policy).[95] These included regulatory policies (394 policies), fiscal and financial incentives (155 policies) and indirect policies that support the overall enabling environment for renewables (558 policies).[96] Most of the cities with policies were in the United States (532 policies) and Europe (418 policies), followed by Asia and Latin America and the Caribbean (→ *see Figure 10 and* ***Reference Table R5***).[97]

2

Figure 10. Renewable Energy Policies in Cities, by Type and Region, 2020



Source: REN21 Policy Database and Reference Table R5. See endnote 97 for this chapter.

Note: Some city governments have more than one renewable energy policy. Policies in buildings apply in the buildings sector and can include power, heating and cooling and/or transport elements.

City-level policy portfolios have expanded beyond power to sectors that are lagging at the national level.

The most successful city-level efforts have made use of different policy approaches in creative and synergistic ways. For example, a wide variety of city-led solar gardens (community solar projects) are starting to emerge around the world, creating new ways for the city government to partner with local citizens and businesses on accelerating the urban energy transition. Local governments are engaging either by investing the city's own resources or by making available municipal land for the development of local solar power projects. By doing so, the city government, individual citizens, as well as local businesses can purchase a portion of the project's output to meet all or part of their electricity needs.

Other city policies encourage investments in EV charging infrastructure, including by making it easier to lease municipal land to build charging stations. In turn, this infrastructure can help meet the growing charging needs of both municipal fleets and the wider community. In addition, some municipal governments are using renewable technologies specifically to alleviate energy poverty at the household level (→ *see Box 2*).[98]

Such policies have a direct impact on the adoption of renewable energy technologies and help expand the market. In turn, in jurisdictions with higher annual installations and more market activity, installers tend to find more ways to improve installation times and reduce overall costs to stay competitive.[99] Such reductions in "soft costs"[i] can bring down overall costs for end-users, helping to increase demand.[100]

i Soft costs consist of all non-hardware costs associated with renewable energy development, including permitting, installation, customer acquisition and supply chain costs. In the United States, soft costs make up an estimated 64% of the cost of a solar PV system. See US Department of Energy, Office of Energy Efficiency and Renewable Energy, "Soft costs 101: The key to achieving cheaper solar energy", https://www.energy.gov/eere/articles/soft-costs-101-key-achieving-cheaper-solar-energy, updated 25 February 2016.

BOX 2. Municipal Policies Using Renewables to Reduce Energy Poverty

A growing number of cities have recognised the potential of renewable energy technologies to alleviate energy poverty[i]. In developing countries, renewable energy can help improve access to modern energy services, while in developed countries it can reduce the share of urban household energy spending, including for electricity, heating and cooling, and transport fuels.

A few cities have developed policy strategies to deploy solar systems to fight energy poverty. In major urban and peri-urban areas in Sub-Saharan Africa, such as Arusha (Tanzania) and Lagos (Nigeria), solar home systems – small solar arrays connected to a battery bank – have driven access to direct, local renewable energy supply. In Seoul (Republic of Korea), solar PV systems have been deployed on low-income housing as part of the city's target to install more than 1 million individual solar PV systems on city rooftops (including all government buildings) by 2022. Solar PV systems also have been installed on low-income housing in a growing number of US cities, including on senior housing as a means to reduce monthly energy costs for residents.

Such projects can be supported by municipal financial incentives. For example, in Honolulu (Hawaii, US), the municipal government provides loans for low-income homeowners to install solar water heating systems. In 2017, the municipality of Porto Torres (Italy) created a revolving fund of EUR 250,000 (USD 307,061) to support rooftop solar installations for families in need.

In some cases, municipal governments have partnered with energy suppliers to alleviate energy poverty. Vienna (Austria) has worked with the country's largest energy provider, Wien Energie, to safeguard the supply of energy to people in precarious living situations – for example, by cancelling so-called dunning costs[ii] and interest. In Spain, Martorelles and other municipalities have collaborated with Som Energi, a green energy co-operative, to cover the electricity bills of households in need. Hackney (UK) is implementing a Green Homes programme through the publicly owned energy company Hackney Light and Power that provides free insulation and trials renewable heating upgrades to help residents save on energy bills while reducing greenhouse gas emissions. Also in the UK, the Mayor of London and Octopus Energy formed London Energy in 2019, a renewable energy company that aims to fight the fuel poverty affecting 1 million Londoners.

Source: See endnote 98 for this chapter.

Maloti hills, Lesotho

i See Glossary for definition.

ii Dunning involves any communication between the utility and the customer such as phone calls or letters to ensure the collection of payment on outstanding invoices. Dunning costs refer to any additional expenses associated with this process.

CITY-WIDE BUILDINGS

In the buildings sector, some municipal governments differentiate their policy approaches between new and existing buildings, as well as by building type (residential, commercial, industrial, public).[101] Especially in regions with high rates of urbanisation and population growth, such as Sub-Saharan Africa and parts of Asia, the distinction between new and existing buildings can be critical, as much of the building stock that is projected to be in place in 2050 has not yet been built.[102] Even in Vancouver (Canada), 40% of the floor space expected to exist in 2050 has yet to be built, underscoring the importance of policies and regulations specifically for new construction, such as the introduction of more stringent energy performance standards and renewable energy mandates for such construction.[103]

Large swaths of Europe and North America are home to structures built before the introduction of energy performance standards or energy-related building codes. In Europe, the rate at which new construction is added relative to existing construction is only 1-2%.[104] For regions with slow building replacement rates, the focus on retrofitting initiatives has grown, often with dedicated funding support from other levels of government, such as the EU's recent renovation wave[i].[105]

However, developing and implementing policies for existing buildings has faced resistance, fuelled by factors such as high upfront costs, inertia and split incentives due to the ownership structure of buildings. Rather than using mandates, municipal governments often offer financial incentives such as grants, rebates and low-interest loans to encourage changes to existing structures. In Paris (France), regulations banning the installation of oil-based heating systems as of 2022 are limited to new buildings, whereas grants are being used to encourage the substitution of existing heating systems with cleaner and renewable options.[106]

In the buildings sector, by the end of 2020, around 150 cities had a total of around 180 policies aimed at decarbonising buildings through renewable power and/or renewable heating (typically for solar PV and solar thermal). In addition, some of the around 400 policies aimed exclusively at the electricity sector and some of the around 150 policies focused on heating and cooling more broadly also apply to buildings.[107] That said, electricity accounts for most cooling needs, as well as for a growing share of heating needs and for a small but growing share of transport needs.[108] This highlights the importance of cross-sectoral and integrated policy making, which some municipal governments have started to pursue as part of efforts to scale up renewables. In addition, municipal governments are taking advantage of synergies between energy efficiency and renewable energy by improving the efficiency of energy use in urban infrastructure (→ *see Sidebar 3*).[109]

i The EU's "renovation wave" strategy focuses in large part on the need to improve, retrofit and decarbonise existing buildings. See European Commission, "Renovation wave", https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en, updated 18 January 2021.


Helsinki, Finland

Around
150 cities
have policies in place to support both renewables-based power and heating in buildings.

SIDEBAR 3. Linking Renewable Energy and Energy Efficiency in Buildings

Energy efficiency is fundamental to achieving higher shares of renewable energy in a timely and cost-effective manner. All things equal, energy efficiency reduces the amount of energy required to deliver a product or service. It offers benefits including energy security and improved economic performance and competitiveness. As such, cities increasingly are linking energy efficiency and renewable energy efforts in buildings.

Higher efficiency in urban buildings can make renewable energy technologies – such as renewable heating and cooling systems – more cost-effective compared to fossil fuel options. The US cities of Boulder (Colorado), New York City and Washington, D.C. have partnered with manufacturers, distributors, utilities and government agencies to decarbonise heating and cooling systems in buildings by supporting the installation of high-efficiency heat pumps that are increasingly powered by renewable electricity sources.

Cities – in their roles as energy consumers, managers of energy networks and potential energy producers – are uniquely positioned to harness the synergies between renewable energy and energy efficiency to curb energy use and related emissions from buildings. In 2020, three Albanian cities – Georgios Karaiskakis, Nikolaos Skoufa and Vlora – participated in a demonstration project to reduce energy consumption and CO_2 emissions from schools and other public buildings, using a combination of smart building, energy efficiency and renewable energy technologies to improve heating and cooling.

To stimulate such projects, municipal governments have implemented policy tools including building energy codes and standards, local ordinances, and combined targets for energy efficiency and renewable energy. Building codes[i] for energy efficiency typically are enacted at the national level, and as of 2019 some 73 countries had in place mandatory or voluntary building energy codes, with 4 more countries developing them for 2021 onward. However, national building codes for energy efficiency often are insufficient (either because they are outdated, voluntary or lack enforcement).

In some cases, municipal governments can adopt stricter "reach" codes or requirements that strive to achieve a standard of energy performance above and beyond the minimum set at the state or national level for new municipal, residential and/or commercial buildings. Since 2012, Stockholm (Sweden) has allowed a maximum of 55 kilowatt-hours (kWh) per square metre (m^2) of energy consumption (including electricity and heating and cooling) for new buildings on municipally allocated land, with a view to reduce this to 45 kWh per m^2. As a result, energy use by the city's new buildings is on average 30% below the values set at the national level.

Some jurisdictions have leveraged their building energy codes to require on-site or off-site renewable energy generation in combination with energy efficiency. In California (US), the city councils of San Jose and Palo Alto approved new reach codes in 2019 mandating that new construction be electric-only (meaning that it does not include natural gas to meet on-site cooking or heating and cooling needs) and that it integrates solar readiness[ii] and energy efficiency. San Francisco has mandated that all commercial buildings over 50,000 square feet (4,645 m^2) be powered with renewable electricity by 2030. This policy, combined with a new reach code for all-electric new construction, will ensure that these buildings are 100% renewables-based for power, heating and cooling.

As of 2020, 475[iii] local governments within the CDP-ICLEI Unified Reporting System had set or planned energy efficiency targets to reduce energy and/or electricity demand, as a means to cut greenhouse gas emissions and energy imports or to trim budgets. Of the 200 local governments that had in place energy efficiency targets, at least 150 also had a renewable energy target, another 16 had a target in progress, and 13 were planning to enact a target in the next two years. For example, Leuven (Belgium) has linked its efficiency and renewables targets, aiming for 60% of the existing building stock to reduce energy use to the "lowest possible level" through retrofits, and the remaining 40% to reduce energy use and also to shift to renewable energy.

Source: See endnote 109 for this chapter.


Stockholm, Sweden

i Building energy codes are integral in setting construction standards to reduce the long-term energy demand of buildings.

ii Solar readiness refers to a requirement that new buildings include the wiring required to facilitate the addition of a solar PV system in the future.

iii Of the 812 local governments reporting to the CDP-ICLEI Unified Reporting System in 2020, 185 indicated that they already had an energy efficiency target in place, another 110 had a target in progress, and 93 were planning to enact a target in the next two years.

CITY-WIDE POWER

Regulatory policies

While many cities benefit from renewable energy regulatory policies introduced at other levels of government – such as state or national feed-in tariffs or feed-in premiums – around 190 cities had in place their own regulatory policies for renewable power capacity by the end of 2020, particularly in North America.[110] In addition, some cities also have regulatory policies to support either renewable power and/or heating and cooling in buildings more broadly.

Municipal-level **feed-in tariffs** (FITs) are present in numerous cities, including Canberra (Australia), Fukushima (Japan), Gainesville (Florida, US), Harare (Zimbabwe), Hong Kong (China), Rajkot (India) and Recoleta (Chile).[111] In South Africa, 28 municipalities have in place either net FIT or net billing policies that define the price that (typically) municipal utilities must pay for buying or compensating surplus electricity from solar PV systems in the city (→ *see Feature chapter*); this has been driven by efforts to reduce reliance on predominantly coal-fired generation from the national utility.[112] Similar mandates requiring municipal utilities to purchase power from citizens and local businesses exist in Dubai (United Arab Emirates), Los Angeles (US) and cities throughout Australia.[113]

Several municipal governments have adopted **net metering**[i] policies, which enable electricity customers to supply their own power on-site and then export any surplus generation to the grid in exchange for a one-to-one credit on their bill for every surplus kWh produced.[114] Although most net metering policies worldwide have been adopted at the national or state levels, municipal-level policies are gaining ground, mainly in the United States (including in San Antonio, Texas).[115] Although net metering has come under pressure at all levels in recent years, some municipal governments reaffirmed their policies. The city council of Springfield (Illinois, US) voted in early 2020 to continue net metering, rejecting the municipal utility's proposal to lower the compensation rate for surplus electricity.[116]

A growing number of utilities (including municipal utilities) have started to tighten the rules, offering customers with solar PV systems a separate compensation rate for their net surplus generation that is below the retail rate and that is often linked either directly or indirectly to market prices or to the utility's avoided costs[ii] (as in San Antonio).[117] In other instances, the compensation rate differs depending on whether the solar system is owned by a residential or a commercial customer. Georgetown (Texas, US) offers residential customers one-to-one net metering at the retail rate, whereas commercial customers are compensated at the lower avoided fuel cost rate.[118]

Some municipal regulations are specific only to new construction – or are more stringent for new construction than for existing buildings – allowing municipalities to raise the bar for all future construction city-wide. A growing number of cities have introduced **building codes and/or ordinances** specifically requiring solar PV on new construction (some also require either solar PV and/or solar thermal). Such mandates typically apply to buildings above a certain size (in square metres of total building footprint) or, in the case of the residential sector, to buildings above a certain number of storeys[iii].[119]

In 2014, Davis (California, US) adopted an ordinance requiring solar PV on all new single-family construction; in 2019, it expanded the ruling to require all non-residential construction to feature solar PV systems large enough to supply 80% of the electricity used on-site, or to integrate a certain amount of solar capacity per square metre of suitable roof space[iv].[120] In Sacramento (California, US), all new residential buildings are required as of 2020 to meet their on-site needs with solar PV, either through the installation of on-site systems or by buying into the local utility's "solar shares" programme, which enables households to own shares in larger community solar projects located outside of the city.[121]

In India, the municipal government of Karimnagar passed a regulation in 2019 making it mandatory for new buildings to install rooftop solar PV if the building area exceeds 2,700 square feet (251 m^2).[122] The city offers end-users a 30% subsidy for such installations, and the buildings connect to the grid via a net metering mechanism.[123] Rajkot (India) also has a mandate requiring solar PV rooftop systems on new buildings (→ *see City Snapshot: Rajkot*).[124] In Lahore (Pakistan), the local development authority adopted a regulation in 2019 mandating new commercial buildings to install rooftop solar PV systems to cover at least 20% of a building's total power requirement.[125] In Germany, the municipal government of Amberg passed a mandate in 2019 requiring solar PV in future developments, and similar mandates exist in Freiburg, Hamburg, Heidelberg, Konstanz and Waiblingen (→ *see City Snapshot: Heidelberg*)[v].[126]


India

i See Glossary for definition.

ii There are many different ways of determining a utility's avoided costs, with varying outcomes depending on the methodology employed.

iii Such mandates also exist at the national level such as in France as well as at the state level in countries such as Australia and the United States. However, efforts to introduce state-level mandates have encountered push back, leading to a search for local solutions. For instance, after lawmakers in California (US) introduced a solar mandate on all new construction that was scheduled to begin in 2020, challenges to the mandate led some city governments and local utilities to develop their own policies.

iv In Davis, California, the regulations stipulate 161 watts (direct current) per square metre of rooftop area that is deemed suitable for the installation of solar PV.

v See City Snapshot: Heidelberg online at www.ren21.net/cities