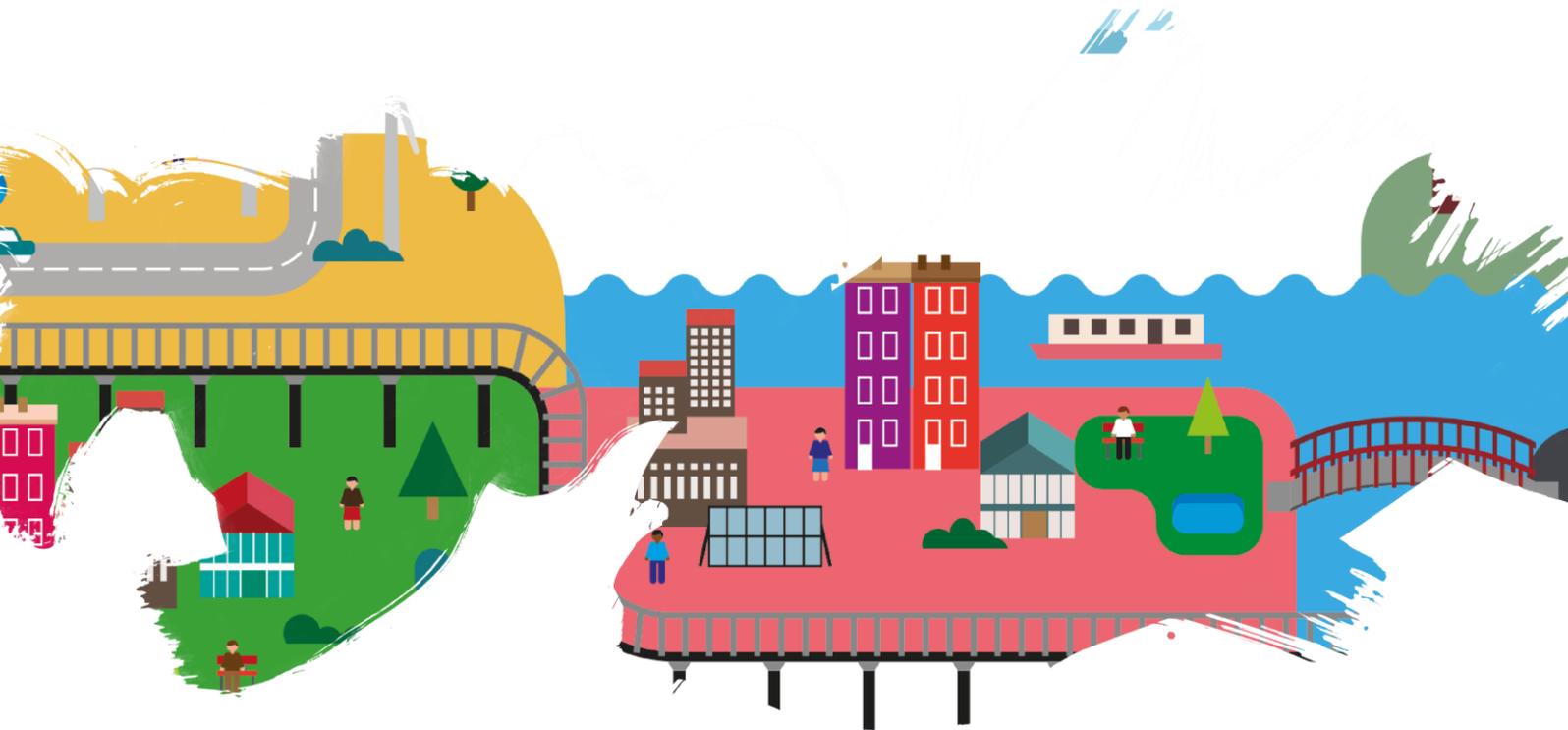




A European Union  
Programme



INTERNATIONAL URBAN COOPERATION  
European Union



# CLEAN ENERGY

## Perspectives from Europe

INTERNATIONAL URBAN COOPERATION PROGRAMME  
LATIN AMERICA AND THE CARIBBEAN

# CLEAN ENERGY

Perspectives from Europe



## Carbon emissions

The major portion of Europe's carbon emissions (81% in 2011) is urban, originating from energy use in residential buildings, transport, industry and other sectors, while in China that proportion was 80% in 2011.<sup>1</sup> In China, the generation of electricity and heat emitted approximately 40% of all carbon while in Europe it was 33%. In China, industries have been responsible for 23% of all emissions. In Europe, transport and residential energy use emissions are much more important. The trends in China show that carbon impact of individual transport and higher living comfort are increasing, as do the respective energy use emission shares.

## Cities and carbon emissions

Energy use and related carbon emissions are concentrated in cities. In China, cities concentrate energy uses and carbon emissions more than its population. That makes urban energy a principle concern in low-carbon strategies, in cities, and gives energy an outstanding position in the sustainable low-carbon agenda. Another are power generators and energy-intensive industrial activities within cities.

## Strategy for comprehensive low-carbon urban energy

It is useful to distinguish the most important sectors of a comprehensive low-carbon urban energy strategy:

- Residential, public and commercial sectors with two subsectors (building and other energy services), including distributed generation;
- Industrial energy sector, including auto-generation;
- Transportation energy subsector;
- Water, waste water and waste management sectors; and
- Energy supply sector, including electricity, heat and CHP plants (public plants as well as auto-producers), and refineries.

## The growth of renewables

Wind, solar, biomass and other renewable energy (RE) technologies grow rapidly in the EU. According to European Energy Agency (EEA) approximate estimates, the EU-wide share of renewables in gross final energy consumption continued to increase from 14.1% in 2012 to 14.9% in 2013 from 8.5% in 2005.<sup>2</sup> Overall statistics of the share of other clean energy technologies are not available. A rough calculation based on the percentage of CHP in power generation - approximately 12%<sup>3</sup> and CHP derived heat (48 Million tons of oil equivalent -Mtoe) according to EUROSTAT<sup>4</sup> - would represent another 8% clean energy, which may be regarded as an estimate on the higher side. The total of clean energy technologies in the EU has been estimated at 20% in 2012.

## Dominance of the urban sector

Most of the distributed generation, in particular when it involves cogeneration takes place in urban areas, whereas the bulk of energy production from renewable energy is situated outside cities. Hydro-

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<sup>1</sup> According to World Resources Institute the GHG emissions 2011 (latest available overall numbers all in MtCO<sub>2</sub>equivalent) for EU 28 were 3688 for energy (including energy sector and energy use) of 4541 (total) and for China 8392 of 10552 (energy related ); <http://cait.wri.org/>

<sup>2</sup> European Environment Agency (EEA). 2015. Renewable energy in Europe – approximated recent growth and knock-on effects. Technical report 01/2015. Luxembourg. [www.eea.europa.eu/publications](http://www.eea.europa.eu/publications)

<sup>3</sup> Kiss, C. , Update on cogeneration in Europe, A view from the COGEN Europe National Associations; , <http://www.endseurope.com/docs/130419a.pdf>

<sup>4</sup> EUROSTAT; [http://ec.europa.eu/eurostat/statistics-explained/images/4/4a/Simplified\\_electricity\\_and\\_derived\\_heat\\_balance%2C\\_EU-28%2C\\_2012\\_%28in\\_ktoe%29\\_new.png](http://ec.europa.eu/eurostat/statistics-explained/images/4/4a/Simplified_electricity_and_derived_heat_balance%2C_EU-28%2C_2012_%28in_ktoe%29_new.png)

power plants, which are still the most important contributors of RE in power generation, and other resource-dependent plants such as wind-parks and geothermal power stations, and area consuming solar parks are usually not situated within municipal boundaries. But all these may be taken into account in the cities' sustainability goals since they contribute to their electricity supply. In Europe, decentralised solar PV on roof-top is up to now by far more important than ground mounted solar parks, which in terms of capacity and production remain below 50% even in some strong solar PV countries like Germany, Italy, Spain and UK.<sup>5</sup> Roof-top PV generation is situated to a large part within urban areas, in particular those on commercial buildings. The residential roof-top systems are found massively on single family housing in low density urbanisations and villages.

## Growing importance of renewables

Without the clean energy technologies, GHG emissions in the EU would be approximately 400 Mtoe, i.e. 10% higher. According to the recent European Environment Agency (EEA) report, RE have been important recent driving forces in reducing greenhouse gas emissions in Europe.<sup>6</sup> Without the deployment of renewable energy since 2005, greenhouse gas emissions in 2012 could have been 7% higher than actual emissions. Thus, the recent surge of wind and solar energy in Europe has contributed massively to GHG reduction. Other more traditional clean energy technologies like bioenergy and CHP have also advanced, however less rapidly. The main drivers for this shift to renewables are the increasing cost-competitiveness of renewable energy technologies and policies to implement other benefits such as improved energy security and decreased air pollution. Below graph<sup>7</sup> shows the price development of Solar PV modules as one important factor.

## Energy Targets

RE sources are expected to provide 20% of EU gross final energy consumption (GFE) by 2020 and progress indicates that this objective will be achieved. In addition, other clean energy technologies will also grow, which means that a 30% clean energy target is achievable. In the EU framework, member countries have agreed to overall RE targets for the power sector (20% in Gross Final Energy Consumption [GFE]) by 2020 as part of the Renewable Energy Directive<sup>8</sup>. The countries do have individual targets agreed between them from 10% for Malta to 48% for Sweden, taking into account their status in 2005<sup>9</sup>, the GFE demand perspectives and the particular RE potentials and options. For the transport sector an overall minimum renewable energy (i.e. biofuel) share was set at 10%. Each country has submitted a National Renewable Energy Action Plan to the EU, explaining how they intend to reach their targets.<sup>10</sup>

**National policies.** The national policies vary between countries.<sup>11</sup> All EU countries have some kind regulatory support policy for RE for the power sector, although distinct concepts, including

- feed-in tariffs for electricity delivered to the grid, differentiated by technology and other criteria;
- obligations or quota for electricity suppliers, often combined with a tradable certificate scheme;

<sup>5</sup> See the reports from the European Solar Industry Association, EPIA, [http://www.epia.org/fileadmin/user\\_upload/Publications/44\\_epia\\_gmo\\_report\\_ver\\_17\\_mr.pdf](http://www.epia.org/fileadmin/user_upload/Publications/44_epia_gmo_report_ver_17_mr.pdf)

<sup>6</sup> European Environment Agency (EEA). 2015. Renewable energy in Europe – op. cit.

<sup>7</sup> Fraunhofer ISE; Aktuelle Fakten zur Photovoltaik, update 19.05.2015, [www.pv-fakten.de](http://www.pv-fakten.de)

<sup>8</sup> DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009

on the promotion of the use of energy from renewable sources ; <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0028>

<sup>9</sup> Sweden and other countries including Austria exhibit high hydro-power shares already in the base-year.

<sup>10</sup> See REN21 Global Status Reports for a detailed overview of RE targets, latest published is REN21 GSR 2014 [http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014\\_full%20report\\_low%20res.pdf](http://www.ren21.net/Portals/0/documents/Resources/GSR/2014/GSR2014_full%20report_low%20res.pdf)

<sup>11</sup> For a detailed overview of RE support policies See REN 21 Global Status Report op.cit. in the above footnote.

- tendering and bidding schemes or auctions, for individual sites or for defined quantities of electricity, differentiated by technologies; and
- net metering of electricity drawn from the grid, crediting surplus feed-in.

## RE for heating and cooling energy

Some countries have started regulatory policies, i.e. obligations also for RE for heating and cooling energy. Scandinavian countries have a tradition of biomass use. Currently, the principle energy source for heating in Europe is natural gas, used in central building or apartment boilers, or for cooking. High efficiency boilers and heating systems are employed, and natural gas entails significantly less CO<sub>2</sub> emissions than coal or mineral oil products. This helps reducing the carbon footprint of a city. Nonetheless, natural gas fuelled systems are not considered clean energy systems. Transport fuel suppliers have blending obligations.<sup>12</sup>

## Fiscal policies with EU countries

Within the EU there are also numerous fiscal support policies and public financing schemes. There is a decade long intensive exchange on policies and some convergence, but no harmonization of policies yet.

## Cogeneration

With regard to poly- or cogeneration (Combined Cool, Heat and Power Generation [CCHP]), which constitutes is the second largest group of clean energy technologies, there are also various support policies in EU countries. Germany e.g. in pursuance of the fundamental energy transition ('Energiewende') provides a premium for power fed-in from cogeneration.

## District heating

Due to the economies of density which are typical for the heating grids, district heating is traditionally an urban energy technology in winter cold regions. European cities have since long time used it in their energy strategy. Innovations and new circumstances make it even more versatile and important for cities' low-carbon energy strategies. Cities in Scandinavian, eastern and central European countries including Germany have long standing district heating systems, some long distance and integrated grids, some only local, e.g. on block level. Simple heat generators have been replaced by heat from large CHP with external combustion and turbines increasingly from smaller plants driven by internal combustion engines, and waste heat from industry or others. Cooling grids are local, and connected block- or building level CCHP, or micro-plants. From the power sector point of view, cogeneration is considered to become the cornerstone for a low-carbon power sector (like the ones targeted e.g. in Denmark and Germany, which is principally supplied by RE technologies, but needs some technologies to balance the variable generation from fluctuating RE sources like wind and solar. Therefore, thermal storage will become more important in order to allow cogeneration plants running temporarily when thermal demand is low.

## Obligations

Within EU, each country is required to carry out a comprehensive assessment of the national potential of cogeneration and district heating and cooling of all countries by December 2015, according to the Energy Efficiency Directive.<sup>13</sup> Hence, cogeneration is considered in the common framework of measures for the promotion of energy efficiency within the EU in order to ensure the achievement of

<sup>12</sup> See reference in the RE Directive.

<sup>13</sup> Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency; <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>

the Union's 2020 20 % headline target of energy efficiency. In terms of regulation, EU countries must ensure a cost-benefit analysis is conducted on the potential for using cogeneration when building or substantially refurbishing heat or electrical installations, industrial installations generating waste heat, or a district heating and cooling network. But in any case this regulation excludes small installations of 20 MW and below. Since the 2015 Paris agreement on Climate Change (COP21), many cities have issued statements to pronounce ambitious targets to stop using coal altogether, or to become carbon-neutral. <sup>14</sup> However, the translation of political commitments into action is not always direct. A recent study tried to establish which of the EU countries would be most consequential in the implementation of their commitments. <sup>15</sup>

## EU emissions trading system

Another important framework for clean energy is the EU Emissions Trading System (EU ETS). Cities do not participate in the ETS. However, fossil power stations and industry within the cities are supposed to be penalized and clean energy favored by high carbon prices. The EU ETS is a cap-and-trade system for GHG emissions from power stations and industry, leading to a market for carbon and prices for Emission Allowances. It allows to a certain degree the use of Certified Emission Reductions (CER) from the Kyoto Protocol. The price for Emission Allowances ('carbon price') has fallen in the wake of the global economic crisis, which was not expected when the emission caps were calculated and allocated. Reforms of EU ETS are being discussed which target the reduction of allowances and the increase of carbon prices in order to make them sensitive to the cost of CO<sub>2</sub>-intensive production.<sup>16</sup>

## Effort Sharing Decision

Around 60% of the EU's total emissions come, however, from sectors outside the EU ETS. Under the so-called Effort Sharing Decision, member states have taken on binding annual targets for reducing their greenhouse gas emissions from these sectors, such as housing, agriculture, waste and transport by overall 10% by 2020 compared to 2005 levels,<sup>17</sup> much of which is taking place in cities. The national emission reduction targets are differentiated according to EU member states' relative wealth. They range from emissions reduction by the early member states (up to a 20% decrease in the richest) to some increase up to 20% by the least wealthy, mostly new member states.

## Power and gas sectors' institutional framework

The national power and gas sectors' institutional framework and factual organization constitute another important set of condition for cities' energy strategies. In most EU countries, the power sector is unbundled and vertically disintegrated: Power generation, transmission, distribution and retail are in principle separated and conducted by different entities. Generators, large users and retailers participate in wholesale markets, organized in form of energy exchanges. Also retail is organized to allow competition. Transmission and distribution are regulated. Similarly, the natural gas supply chain has been unbundled; in particular transmission cannot be controlled by large producers or large trading organizations. The details vary somewhat and not all countries have completed the reforms.<sup>18</sup>

<sup>14</sup> Chow, L. 2016. Finland Set to Become First Country in the World to Ban Coal. *EcoWatch*. 25 November. [http://www.ecowatch.com/finland-ban-coal-2110924313.html?utm\\_source=EcoWatch+List&utm\\_campaign=8345c0dad9-MailChimp+Email+Blast&utm\\_medium=email&utm\\_term=0\\_49c7d43dc9-8345c0dad9-86067345](http://www.ecowatch.com/finland-ban-coal-2110924313.html?utm_source=EcoWatch+List&utm_campaign=8345c0dad9-MailChimp+Email+Blast&utm_medium=email&utm_term=0_49c7d43dc9-8345c0dad9-86067345)

<sup>15</sup> Ayre, J. 2017. Only 3 EU Countries Pursuing Policies In Line With Paris Climate Agreement. 12 April 2017. *Cleantecnica*. [https://cleantecnica.com/2017/04/12/3-european-union-countries-pursuing-policies-line-paris-climate-agreement/?utm\\_source=feedburner&utm\\_medium=feed&utm\\_campaign=Feed%3A+IM-cleantecnica+%28CleanTechnica%29](https://cleantecnica.com/2017/04/12/3-european-union-countries-pursuing-policies-line-paris-climate-agreement/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+IM-cleantecnica+%28CleanTechnica%29)

<sup>16</sup> See : The EU Emissions Trading System (EU ETS), [http://ec.europa.eu/clima/policies/ets/index\\_en.htm](http://ec.europa.eu/clima/policies/ets/index_en.htm)

<sup>17</sup> See for the effort sharing decision [http://ec.europa.eu/clima/policies/effort/index\\_en.htm](http://ec.europa.eu/clima/policies/effort/index_en.htm)

<sup>18</sup> The EU has played a pivotal role in the institutional reform of the power and gas sectors, because they are considered fundamental parts of the EI internal market. Following the first liberalisation directives adopted in 1996 (electricity) and

## Important features of urban energy strategies

For European cities' energy strategies, the following features are important:

- Gas and power supply to customers is competitive: restrictions on customers from changing their supplier are removed from operation of networks (gas and electricity). Network operations are non-competitive and regulated, operators of these grids are obliged to allow third parties to have access to the infrastructure;
- Cities may participate in utilities but in a very different way than the old integrated patterns: city-owned utilities may run the distribution grids under regulation, based on long-term leases, and participate in retail supply of households, commercial and public customers. Cities may undertake these operations only in competition to alternative suppliers, which must have access to distributions lines. Cities' utilities may run power stations and generations, also participate in generators outside frontiers, and participate in wholesale markets, etc. but again only in competition.
- Availability of different suppliers: Cities may buy 'green' electricity from external suppliers.

## Disruptive change of the power sectors in Europe

Currently, due to distributed generation, fluctuating RE and smart grid developments, another disruptive change of the power sectors in Europe, which is very relevant to cities, is in the making. The RE and other feed from small producers or 'prosumers' (which are consumers and producers at the same time) and potential local coalitions of mini and micro grids cause multidirectional electricity flows. New storage opportunity and distribution technologies may reduce the need to supply from higher voltage levels and allow different system network configurations. Proposals to create a regional market for specific energy services are on the table and may become very relevant in particular for cities, where these new forms of energy exchange (coalitions, mini grids, smart grids) are starting already. Cities are expected to contribute, and are entitled to receive significant support which is financed by the EU.

## EU CONCERTO and Smart Cities Information System

CONCERTO is a European Commission initiative within the European Research Framework Programme (FP6 and FP7). It aimed to demonstrate that the energy-optimization of districts and communities as a whole is more cost-effective than optimizing each building individually, if all relevant stakeholders work together and integrate different energy-technologies in a smart way. The EU initiative under of the European Commission's Directorate General for Energy started in 2005 and has co-funded more than € 175 million in 58 cities and communities in 22 projects in 23 countries. Currently, CONCERTO is discontinued and its results and experiences will be documented in a user-friendly way in the Smart Cities Information System.<sup>19</sup>

## EU Smart Cities Initiative

The smart cities initiative 2010 – 2020 has the objective to demonstrate the feasibility of rapidly progressing towards our energy and climate objectives at a local level while proving to citizens that their quality of life and local economies can be improved through investments in energy efficiency and reduction of carbon emissions. The initiative fosters the dissemination throughout Europe of the most efficient models and strategies to progress towards a low-carbon future, and builds on existing EU and

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1998 (gas) and the second liberalisation directives adopted in 2003, the European Union has adopted the third Energy Package is a legislative package for an internal [gas](#) and [electricity](#) market in the [European Union](#). It entered force on 3 September 2009. For an overview of the package and a reference to the five directives see <https://ec.europa.eu/energy/en/topics/markets-and-consumers/market-legislation>

<sup>19</sup> The Smart City Information System will be visible in the concerto website. [www.concerto.eu](http://www.concerto.eu)

national policies and programs, including CONCERTO and Intelligent Energy Europe.<sup>20</sup> This initiative will support cities and regions in taking ambitious and pioneering measures to progress by 2020 towards a 40% reduction of greenhouse gas emissions through sustainable use and production of energy. This will require systemic approaches and organizational innovation, encompassing energy efficiency, low-carbon technologies and the smart management of supply and demand. In particular, measures on buildings, local energy networks and transport are the main components of the Initiative.

## Energy Cities

The network of 'Energy Cities' is the European Association of local authorities engaged in energy transition. It represents 1000 towns and cities in 30 countries. Its main objectives are (i) to strengthen the cities' role and skills in the field of sustainable energy, (ii) to represent members' interests and influence the policies and proposals made by EU institutions in the fields of energy, environmental protection and urban policy, and (iii) to develop and promote your initiatives through exchange of experiences, the transfer of know-how and the implementation of joint projects. Energy Cities is advocating decentralized energy production and a switch from the "big-scale infrastructure" perspective to one of "aggregating the small units" of energy producers.<sup>21</sup>

## The EU Covenant of Mayors

This covenant is an initiative that created a community of local governments focused on climate protection, since the 2009 signature ceremony in Brussels, over two thousand local authorities have opted to join the Covenant. World-wide this has become a sort of movement propelled by the global climate change conferences, and the activities of the EU and International Coalition of Local Environmental Initiatives (ICLEI).<sup>22</sup> An ever growing number of cities are preparing Sustainable Energy Action Plans (SEAPs). Signatories of the Covenant of Mayors formally commit to achieve the ambitious targets set in the EU Climate Action and Energy Package. However, non-European cities may also join the covenant. The Climate and Energy Package aims to:

Reduce EU greenhouse gas emissions by at least 20% from 1990 levels by 2020;

Increase the EU's use of renewable energy to account 20% of total consumption; and

Reduce energy consumption by 20% through increased energy efficiency.

Upon signing the Covenant, local authorities commit themselves to submitting their Sustainable Energy Action Plans (SEAPs). Each SEAP lays forth in greater detail how each local government intends to reach its CO<sub>2</sub> targets by 2020.<sup>23</sup>

## The European Energy Award

Since 1988 this award supports municipalities willing to contribute to sustainable energy policy and urban development through the rational use of energy and increased use of renewable energies. Members are 8 European Countries around Switzerland and some city and regional programs outside of these. There are more than 1,300 municipalities participating. At the European level, it is interlocked with other programs and activities, such as the Smart Cities Initiative and the Covenant of Mayors. The specific feature is the quality management and certification process. As per the end of

<sup>20</sup> <http://ec.europa.eu/energy/intelligent/>

<sup>21</sup> Energy Cities. Energy Cities' Position on the European Energy Union. The European Union of local authorities in energy transition. Position Paper. Brussels. December 2014. [www.energy-cities.eu](http://www.energy-cities.eu), and <http://energy-cities.eu/-Association,8->

<sup>22</sup> [http://www.covenantofmayors.eu/index\\_en.html](http://www.covenantofmayors.eu/index_en.html);

see also: EU. 2008. Action Plan for Energy Efficiency: Realising the Potential. <http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A6-2008-0003&language=EN>

<sup>23</sup> EU. 2010. *How to Develop a Sustainable Energy Action Plan (SEAP) – Guidebook*. Brussels. [http://www.eumayors.eu/IMG/pdf/seap\\_guidelines\\_en.pdf](http://www.eumayors.eu/IMG/pdf/seap_guidelines_en.pdf)

2014, 720 municipalities had been awarded the European Energy Award, 87 of which the European Energy Award in the 'Gold' category.<sup>24</sup>

## The Mexico City Pact

The Mexico City pact builds on existing regional action (e.g. Covenant of Mayors in Europe or the US Conference of Mayors Climate Protection Agreement) and the achievements of global advocacy through the International Coalition of Local Environmental Initiatives (ICLEI)'s Local Government Climate Roadmap.<sup>25</sup> The Mexico City Pact goes even further through the introduction of the concept of globally measurable, reportable, and verifiable (MRV) local climate action. The Mexico City Pact was launched at the World Mayors Summit on Climate that was held in Mexico City on 21 November 2010.<sup>26</sup>

## The carbonn Climate Registry (cCR)

This registry is a global mechanism for cities and local government to make commitments to climate change. Article 4 of the Mexico City Pact envisages that signatories report their climate commitments, performance and actions through the carbonn Cities Climate Registry. Developed by local governments for local governments, the cCR supports the global credibility of local climate action by ensuring transparency, accountability and comparability and presents the global response of local governments to measurable, reportable, verifiable climate action of cities, not only of Mexico City Pact Signatories.<sup>27</sup>

## Energy Agencies

Energy agencies have been set up in many cities and regional governments. They serve an important role in introducing good energy management practices, promoting sustainability, providing quality information and guidance, and offering other services based on local needs. International co-operation, networking and peer learning among these actors is essential. Therefore an EU Energy Agencies Association was formed. ManagEnergy<sup>28</sup> was established to enable local energy agencies to work together more effectively. The initiative provides a range of services for this purpose: directories and interactive maps, partner search facilities, information on successful projects, and regularly scheduled workshops.

### Good Practices – Illustrations from Europe

<p><b>Photovoltaic system in Berlin, Germany</b></p>	<p><b>Renewable energy in the city</b></p> 
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<sup>24</sup> For more information see eea-brochure <http://www.european-energy-award.org/fileadmin/Documents/Download/eea-optimising-activities-2012.pdf>

<sup>25</sup> for further information see <http://www.iclei.org/index.php?id=1197>

<sup>26</sup> To see the updated list of signatories and sign the Pact, please visit [www.mexicocitypact.org](http://www.mexicocitypact.org)

<sup>27</sup> cf. Carbonn Climate Registry website is <http://carbonn.org/>

<sup>28</sup> cf. <http://www.managenergy.net/about>



Source: Wikipedia

Source: S. Lehmann. 2009. The Principles of Green Urbanism – Transforming the City for Sustainability. Earthscan. London et al.

**Solar water heating panels** similar to these now provide 60% of the hot water used in newly constructed buildings in Barcelona, Spain.



Photo: Oliver Reichert Photography

Hurst, T., Lam, D., and Ball, M. 2012. Energy Strategy for Green Cities, in: Lindfield, M. and Steinberg, F. (eds.). (2012) Green Cities. Asian Development Bank. Urban Development Series. Manila

**Photovoltaic technologies in buildings**  
**HIT solar panels generate electricity**



Source:  
<http://www.triplepundit.com/2011/11/green-energy-park-japan-panasonic/>

**Private Sector Companies Preparing for Green Energy and microgrids**



Source: Florian Steinberg

**Solar Powered Municipal Bus Fleet, Adelaide, Australia**



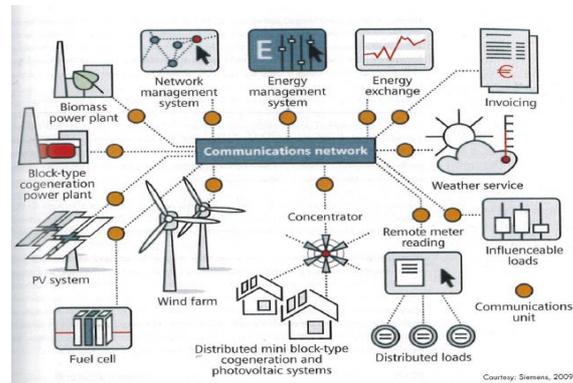
Source: ICLEI, UN-Habitat, UNEP. 2009. Sustainable Energy Handbook: A Handbook for Cities and Towns in Developing Countries. Nairobi. p. 68.  
[www.mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2839](http://www.mirror.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2839)

### Wind energy



Source: EEA 2015

### Options of renewable energy in the city



Achievable, realistic renewable energy targets for eco-districts

Source: S. Lehmann. 2009. *The Principles of Green Urbanism – Transforming the City for Sustainability*. Earthscan. London et al.

### Solar-powered Lighting for Outdoor Space, Berlin



Source: Florian Steinberg

### Solar-powered Lighting for Outdoor Space, Berlin



Source: Florian Steinberg

Clean energy will advance more and broadly in European cities. City governments embrace the concept of responsibility in climate protection, also because they can see the co benefits for quality of life and other key factors for the cities' development.

The distributed generation will become more and more common, which will disrupt fundamentally the operational pattern of electricity supply, in particular on the low voltage level, integrating power production by consumers ('prosumers') with mini-grids, storage, flexibility. If in the past, energy for heating services was the main concern and district heating expansion and refurbishment was the pivot factor in clean energy concepts, in the future the new electricity system will be the main and disruptive innovation sector.

It is therefore recommended to immediately 'leap frog' to hybrid heating, cooling and electricity planning and implementation concepts<sup>29</sup>, where both areas of building energy services are considered jointly, and strong interrelations to transport electrification as well as industrial development are be taken into account.

<sup>29</sup> Description of the research to develop hybrid planning procedures supported by the Federal Ministry of Economic Affairs and Energy. Berlin (in German).

See: <http://www.eneff-stadt.info/de/planungsinstrumente/projekt/details/hybrides-planungsverfahren-zur-energieeffizienten-waerme-und-stromversorgung-von-staedtischen-verte/>

## Four lessons from Europe's climate leaders

“What do Europe's leading cities have in common when it comes to cutting greenhouse-gas emissions? ..

### 1. Look for partnerships

Local authorities can't do it alone. That's evident in the way Amsterdam is working to achieve its sustainability plans. The city is systematically seeking agreements to reduce carbon emissions with industries, supply-chain managers and real estate developers, as well as bus and taxi companies.

### 2. Make it convenient to go green

Making climate-friendly choices shouldn't have to be an alternative lifestyle. Smart cities are making it easy for residents to do the right thing. That's the philosophy in Rotterdam, where a programme called Power Surge strongly encourages residents to switch to electric cars. Rotterdam already provides 2,000 charging stations for electric vehicles, and is adding 2,000 more. As one added inducement, the city offered free parking permits for the first 1,000 vehicles to register for the programme. As another, electric car owners get a free charging point from the city.

### 3. Reuse energy and natural resources

Waste nothing. That's an attitude some European cities have adopted to reduce the energy used in heating buildings — especially in cities fortunate enough to have district heating systems that deliver heat to buildings through networks of pipes. (Some cities also offer district cooling.)

Stockholm has a vast district heating system with nearly 3,000 kilometres of underground heat pipes that supply four-fifths of the city's heating needs. The system captures waste heat from power plants and industries and shares it with homes and more than 10,000 large buildings. ... District heating is integral to Rotterdam's plan to eventually phase out natural gas and reduce carbon emissions. The city is committed to getting 40 percent of its residents on district heat by 2020 and aspires to have 50 percent connected to district heating by 2035.

### 4. Stress economic payoffs and quality-of-life benefits

While it's easy to dwell on the calamitous impacts of climate change in terms of rising seas and severe weather, smart city leaders stress the positives. There are economic and other opportunities in pursuing these kinds of local climate solutions. Since 2009, Copenhagen has not just been narrowly focused on cutting carbon dioxide emissions. It has instead been determined to show the world that it is possible to combine growth, development, and quality-of-life improvements with radical reductions in emissions. Thus the city's plan is to become greener, more efficient, more liveable, more competitive, and more prosperous. A drive to make the city carbon neutral by 2025 is framed as an effort to create new jobs, innovation, investment in green technologies.” 30

### Enhancing the European energy sector goals

In light of the slack performance of some of the EU countries, the EU Parliament wants to accelerate the energy reform process: “The European Parliament wants production of energy from renewable sources between 2020 and 2030 to meet more ambitious goals than those suggested by the executive in Brussels. Renewable-energy production will be key to ensuring that the European Union itself complies with the UN-sponsored Paris Agreement, the first universal and legally binding global climate deal. While the European Commission wants production of at least 27% of energy in 2030 to come from renewable sources, a final report by the MEP in charge of this matter, Spaniard José Blanco, raises this figure to 35%, and asks to restore binding national targets. In what

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<sup>30</sup> Berger, J. J. 2017. Four lessons from Europe's climate leaders. *CityScope*. 9 May 2017. [http://citiscopes.org/story/2017/four-lessons-europes-climate-leaders?utm\\_source=Citiscopes&utm\\_campaign=3f382ba81f-Mailchimp\\_2017\\_05\\_09&utm\\_medium=email&utm\\_term=0\\_ce992dbfef-3f382ba81f-118049425](http://citiscopes.org/story/2017/four-lessons-europes-climate-leaders?utm_source=Citiscopes&utm_campaign=3f382ba81f-Mailchimp_2017_05_09&utm_medium=email&utm_term=0_ce992dbfef-3f382ba81f-118049425)

direction does a Europe that proclaims itself a world leader against climate change want to head? Does it want to drift along on the issue of renewable-energy production, or does it want to set itself ambitious goals that will entail greater effort? This, in a nutshell, is what the EU must now decide. ... The union is now working on the regulations that will set clean-energy goals for 2030, since the 2020 targets – reaching 20% of energy from renewables – are already in place. The final document is expected to be ready and approved by the summer of 2018. Negotiations are three-way, between the EU Commission, the Parliament and the governments of the various member states. After signing the Paris Agreement in 2015, Europe already knows where it needs to be by 2030: it must have achieved a 40% reduction in greenhouse gas emissions, which scientists agree are responsible for global warming, down from 1990 levels. The next step is to define the instruments to reach that goal. And the energy sector is key in this respect. Late [in 2016], the European Commission presented its so-called Winter Package, a proposal for an energy directive for the 2020-2030 period. This package of measures stated that production of at least 27% of energy should come from renewable sources by 2030. But environmental groups and the renewables sector complained that this goal lacked ambition. These critics said that the EU was just drifting along on clean-energy issues, and even stepping on the brakes when it comes to encouraging clean energy, which is becoming increasingly competitive as demonstrated by an electricity auction held in Spain this past Wednesday. Between 2004 and 2015 (the last year with final Eurostat figures), the percentage of renewable-energy consumption grew from 8.5% to 16.7%. An official report by the EU Commission admitted that, simply by maintaining the current situation without introducing any additional measures – business as usual – by 2030 Europe will have reached 24.3% of renewable energy over final consumption. And that is without taking into account technological advances that are considerably reducing the costs of wind and solar energy, year after year. The report ... proposes raising the 2030 goal to 35%. The report will now require approval by the EU Parliament's energy committee and by the plenary session. Parliament sources said that in any event, the final proposal will be more ambitious than the Commission's original goal. A year ago already, the EU Parliament said that this goal should be at least 30%." 31

### **The grand vision for cities**

Obviously, the most logic conclusion is the emerging vision of a city that produces more energy than it uses. 32

## **RENUNCIA**

La ilustración de los estudios de caso de IUC-LAC solo fue posible mediante el uso de una amplia gama de materiales publicados, la mayoría de ellos disponibles en línea. Muchas de las ilustraciones (fotografías y gráficos) se originan en fuentes de Internet, y se reproducen aquí con citas y referencias adecuadas. El uso de estos materiales es únicamente con el propósito de compartir conocimientos, sin ningún uso o intención comercial.

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<sup>31</sup> EU Parliament wants more ambitious renewable energy goals for 2030. 19 May 2017. <http://www.factorco2.com/en/eu-parliament-wants-more-ambitious-renewable-energy-goals-for-2030/new/1420>

<sup>32</sup> Bula, F. 2017. At 'renewable cities' forum, envisioning a city that produces more energy than it uses. *CityScope*. 19 May 2017. <http://citiscopes.org/story/2017/renewable-cities-forum-envisioning-city-produces-more-energy-it-uses>



# IUC-LAC PROGRAMME

The International Urban Cooperation Programme - Latin America and the Caribbean (IUC-LAC) connect cities in different regions of the world to get in touch and share solutions to common problems. This initiative is part of a long-term strategy of the European Union to promote sustainable urban development in collaboration with both the public and private sectors and with civil groups and citizens. Through participation in the IUC-LAC, Latin American municipalities exchange knowledge with their counterparts in Europe, thus building a greener and more prosperous future.

IUC-LAC activities promote the achievement of political objectives and important international agreements on urban development and climate change, such as the EU Urban Agenda, the UN Sustainable Development Goals and the Paris Agreement.

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\* All the aforementioned information is based on internet and published source mentioned in footnotes.

