



ACCELERATING SDG 7 ACHIEVEMENT

# POLICY BRIEF 14

INTERLINKAGES BETWEEN ENERGY  
AND SUSTAINABLE CITIES

7 AFFORDABLE AND  
CLEAN ENERGY





# **POLICY BRIEF #14**

## **INTERLINKAGES BETWEEN ENERGY AND SUSTAINABLE CITIES**

### **Developed by**

United Nations Human Settlements Programme (UN-Habitat), United Nations Economic Commission for Europe (UNECE) and UN Environment

## KEY MESSAGES

### Status of the interlinkages between energy and sustainable cities and progress towards achieving SDG 7

- The world is experiencing unprecedented trend of increasing urbanization, especially in the global South. By 2030, cities and towns are expected to house around 60 per cent of the world's projected 8.2 billion people, up from 7 billion people in 2007, with the urban population increasing by around 1 million people per week and with an exponential increasing demand for modern energy.
- Cities and towns globally consume up to 75 per cent of energy, and are responsible for 70 per cent of greenhouse gas (GHG) emissions, along with 70 per cent of resource use. At the same time, 80 per cent of GDP is generated in cities.
- Cities and towns in developing countries have limited access to modern energy, and energy demand is growing faster than supplies. Between 20 per cent and 40 per cent of urban dwellers in developing countries do not have reliable access to electricity. Recourse to traditional biomass use comes with consequences for air quality, health and environmental degradation.
- Growth in urbanization comes with the need to supply housing and basic infrastructure for the new urbanites, the way in which cities are planned and designed will influence energy intensity of these systems. At present energy efficiency improvements in the buildings and construction sector are outpaced by the floor space added. Similarly, improvements of efficiency of vehicles has been outpaced by increasing demand for transport services.
- A reflection of national mix in the energy systems, most urban areas are heavily reliant on fossil fuels as their main sources of energy, and generate a significant amount of GHG emissions. Investments in clean, reliable and affordable energy are critical for sustainability in cities, together with greater energy and resource efficiency in the built environment (housing and infrastructure).
- In developed countries with nearly 100 per cent energy access, an increasing number of cities have initiated major programmes for an energy transition from a fossil fuel-driven economy to cleaner energy generation, increasing the share of renewables in their energy mix, and modern district energy systems, retrofitting old buildings to reduce their operating costs and carbon footprints.
- More cities have committed to 100 per cent renewable energy targets, and the demand in cities for clean, reliable and affordable energy is increasing exponentially as national and local governments adopt low-carbon measures to address climate change. For example, the Global Covenant of Mayors for Energy and Climate brings together over 7,000 cities and towns committed to reducing their carbon footprint through well-elaborated climate action plans.
- Reductions in the costs of energy efficiency and renewables, together with greater competition in the business sector, provide cities with an unprecedented opportunity to transform, decarbonize, and enhance the resilience of, their energy systems.

### Priority actions

- Promoting sustainable cities requires multi-sectoral investments and integrated policies. Key actions areas include: (a) planning, design and implementation of compact and accessible cities with strategic densification and abundant green and blue areas; (b) adoption of clean, efficient, safe and affordable public transportation and non-motorized transport options; (c) deep renovation of existing building stock and designing of energy and resource efficient and resilient new buildings; (d) generation of energy from locally available clean energy sources; (e) adoption of efficient municipal waste management systems with resource recovery; (f) promoting efficiency in the use of resources, including water and electricity, in the commercial and industrial sectors, as well as in the generation and transportation of energy; and (g) use of nature-based solutions.
- In order to achieve universal energy access, cities in developing countries need increased electricity supplies, green technology transfer, capacity development and responsive consumption. Policymakers should make more efforts to increase investments in energy access particularly for the urban poor who live in informal settlements. There is also a strong need for policy reform in the energy sector, to take into account new technology innovations, the transition away from centralized national energy utilities as monopolies and lowered costs for off-grid energy systems.
- Cities in developing countries should invest in green industrial transformation (SDG 9), creating new jobs (SDG 8) in connection with manufacturing and assembling (SDG 12) cleaner energy technologies, and electric appliances.

## Energy and sustainable cities and the Sustainable Development Goals

### Key challenges

The main challenges are in the form of market barriers, inappropriate policy frameworks, and financing gaps, as well as limited capacity for design, planning and implementation, plus lack of affordability and reliability of energy. This is particularly the case in poor and vulnerable urban communities, Least Developed Countries and Small Island Developing States, where citizens disproportionately lack access to modern energy services. The case for increased energy access for urban poverty alleviation in this context is compelling. However, actions have been too slow at both the national and local levels. In terms of a transition to modern renewable energy, cleaner energy technologies are still not exempted from taxes in many countries, and fossil fuels still receive heavy subsidies. Energy efficiency measures and actions in cities have not received the necessary attentions it deserved to reduce the carbon emission. A significant amount of energy could be saved by adopting proper urban planning with high density and promoting energy demand management.

#### *Low energy access in cities of developing countries*

The current level of energy generation in developing countries is far below the amount required for countries' economic growth, wealth creation and improvement of the people's living conditions; it is impossible for these countries to achieve ~~create~~ sustainable cities with the current energy supply. Power shortages and rationing are too common and contribute to the high cost of doing business in developing countries. Despite the shortages of modern energy, African citizens pay the highest energy tariff of the world; the majority of urban dwellers are considered energy poor, as they spend between 10 per cent to 30 per cent of their income on energy services.

#### *Wood energy*

Wood is one of the dominant renewable energy sources in the UNECE region where some of the most efficient bioenergy systems have been developed. This region achieved 98 per cent access to clean fuels and technology for cooking in 2014, up from 95 per cent in 2000, but 23.3 million people in remote rural regions still relied on inefficient solid fuel systems for cooking in 2014, often using locally gathered firewood. The fuel typically is burnt in a controlled combustion wood stove or a traditional high mass combined space heater and/or cooking oven. Inefficient stoves allow users to generate heat from low or no-cost local resources.

### How to fill the gap to achieve SDG 7 for sustainable cities development

The sectors discussed below require major interventions in the form of policy reforms, investments, capacity-building, and scaling up.

#### *Low-energy access in cities in developing countries*

Between 20 per cent and 40 per cent of urban dwellers in developing countries do not have reliable access to electricity. Policymakers should make more efforts to increase investments in energy access, particularly for the urban poor who live in informal settlements. Access to electricity should be improved. Partnerships are needed among the key players, including the government, the private sector and civil society organizations.

#### *Energy generation in cities: cities are becoming prosumers*

The New Urban Agenda adopted during Habitat III Conference in Quito in 2016, commits countries to the generation and use of renewable and affordable energy in urban areas. Cities become energy "prosumers" when they produce part of the energy that they consume. Urban areas are endowed with renewable energy sources such as wind, solar and other resources, as well as municipal wastes, which could be used to generate additional energy. Putting all these potential resources into use could reduce cities' carbon footprints.

Investment in clean energy offers cities the possibility to directly control on-site power generation, as opposed to the traditional centralized power grid controlled by a parastatal or the central government. Significant progress has been made in the adoption of feed-in tariffs and grid connection regulations allowing citizens and private entities to generate and sell clean energy to central or local energy grids, although their adoption remains slow in developing countries.

#### *Cities and national governments are adopting responsive energy efficient policies and practices, and municipal energy strategies*

Cities are adopting more energy efficient policies and practices in the transport, buildings, industry, and commercial sectors. The number of energy efficient building codes adopted by countries, and by-law at city level, has increased in the last five years. Numerous countries have included energy-efficiency interventions in their NDCs, with attention to cities.

Local governments need strong support to encourage, enable, measure and regulate sustainable energy, as well as inform decisions on deployment options, including adaptation to, and anticipation of, new technologies and changing energy requirements.

Cities and local governments, as managers of local infrastructures, can develop solutions that integrate energy and end uses such as buildings, industry, transport, waste, or sanitation, maximizing efficiencies, stimulating innovation in energy generation technologies, and reducing consumption. Although several local and national governments are committed to increasing the share of their sustainable public procurement to reduce environmental and carbon footprints, and to foster market growth, very little is happening on the ground. Procurement manuals and procedures

should be updated to include sustainability principles.

#### *District energy systems in cities*

District energy system in cities is a new concept of an energy generation and distribution system that focuses on energy efficiency and renewable energy.

Distributed electricity generation will become a key feature of new and existing cities, complementing sustainable utility-scale power plants, which are often outside cities. Cogeneration and district energy networks also provide the flexibility and storage to integrate an increasing share of renewables into the energy mix, while simultaneously improving energy efficiency through demand aggregation, increased scale of production sources and use of waste heat.

#### *Planned urban form*

Proper design and planning of urban forms, infrastructure and buildings, according to local environment and climates, could reduce significantly the demand for more energy and other resources for their operations. Energy and resource efficiency have not been applied consistently in major urban sectors such as industry, transport, buildings and infrastructure. Some cities are already integrating sustainable energy considerations in their urban neighbourhood designs, planning and management through use of performance metrics for energy production and consumption in zoning and land-use planning, permitting, infrastructure, buildings and transport decisions.

#### *Energy and buildings: the green building council expansion*

As buildings consume more energy than any other sectors, the adoption of green building concepts is gradually taking shape in most urban areas. Green building councils are being created to promote the adoption of sustainable building design practices. There are different types of green building rating systems that promote environmentally friendly building design associated with responsible consumption of resources (water, energy, material and land) and reduction of waste. Massive deployment and integration of green building principles could be made through building permits where all new buildings are required to adopt minimum energy performance standards. This will not only reduce energy waste in the built environment but can also allow buildings to generate additional energy through their rooftops.

#### *Smart energy grid and “smart” sustainable cities*

Smart grids are enabling major energy efficiency and resilience gains. Using ICTs, the grid is able to manage energy demand and use the most efficient energy source on the system.

Smart energy grids also allow for the deployment of electric transport systems, which are starting to contribute to the reduction

of the carbon footprint of the urban transport sector, particularly when the electric power used is from renewables.

#### *Cities and industrial development*

Urbanization and industrialization are two interlinked processes, with energy as a common denominator. In fact, the availability of energy drives both urbanization and industrialization. These are transformative processes for job creation, economic growth, and wealth creation.

#### *Availability of financial resources to stimulate the uptake of energy access to sustainable cities development*

The Paris Agreement on climate change calls for all countries to allocate sufficient resources to invest in a low carbon economy, including a sustainable energy sector. Although some countries have allocated resources for green energy generation, access to these financial resources remains a big challenge. However, there are Green Investment Banks with qualified expertise and Kenya has a newly created Green Bond programme aimed at developing a domestic green bond market focusing on climate and infrastructure targets. The Cities Climate Finance Leadership Alliance (CCFLA) is a group of leading organizations that are mobilizing investments into low-carbon and climate-resilient infrastructure in cities and urban areas internationally.

#### **Interlinkages with other SDGs**

Energy is a cross-cutting driver of all the 17 SDGs. From a social point of view, lack of access to energy is one of the biggest constraints to the main scope of Agenda 2030 on eradication of extreme poverty (SDG 1), including for the urban poor estimated at 1 billion people globally.

Energy access contributes to improving the quality of life, since it supports better health-care services and a greater life expectancy (SDG 3) and the possibility of having access to quality education (SDG 4). The use of electricity allows replacement or facilitation of time-consuming activities in informal settlements and in peri-urban areas, especially for women and children (SDG 5), allowing them to develop their human and social potential and empowering their roles within their households and society. In addition, modern energy provides access to electricity and gas, and the use of less-polluting systems for cooking and heating (SDG 2), and it is the driver of industrialization (SDG 9), telecommunication services (SDG 9), creation of jobs (SDG 8), good production and consumption (SDG 12). It is critical for the supply of safe and drinking water (SDG 6), which is badly needed in cities in developing countries, as well as for the development of inclusive human settlements (SDG 11). In relation to the economic dimension, energy allows the creation of jobs (SDG 8). Energy efficiency and increasing the share of renewable energy in the energy mix is crucial to mitigate the risks of climate

change (SDG 13) and limit the use of unsustainable firewood, which remain the major cooking fuel in informal settlements, reducing deforestation and soil degradation (SDG 15).

## Policy Implications/Recommendations

With cities being major consumers of energy and contributors to GHG emissions from inefficient systems that lead to energy wastage, the built environment in urban area offers greater opportunities for the achievement of SDG 7, SDG 11 and SDG 13. This can be achieved through planning and designing for greener and more compact cities, green buildings, adoption of energy efficiency, clean energy generation, reduction of waste and promotion of responsive consumption practices.

However, there is a need for committed leadership to drive the energy transition in cities. Capacity-building and tools development are needed for practitioners, such as architects, engineers and other experts, on sustainable building design. Training institutions should initiate or strengthen training courses on a sustainable built environment.

Urban planners should design cities, towns and neighbourhoods with minimum wastage of resources and maximum use of locally available renewable energy resources.

Investors should be engaged to finance efficient buildings and appliances through green mortgages; this will help remove financial barriers. Above all, the following key actions should be addressed:

### *Sharing information and technical expertise*

Public awareness is crucial to stimulate consumer demand for sustainable products and to promote behavioural change. All urban energy projects and programmes should promote non-technological measures supporting behaviour shifts, such as knowledge-sharing and public information campaigns. This will complement the different initiatives being carried out at the community level to engage the public and educate people to understand issues related to climate change and energy transition.

### *Closer cooperation among energy stakeholders, and partnerships*

Achieving sustainability in cities requires that all stakeholders work in closer cooperation and avoid working in isolation. Main stakeholders, including power utilities, national and subnational governments, academia, the private sector and civic society organizations should work more closely to ensure that sustainable energy goals be achieved.

### *Energy efficient building codes*

Considering that fossil fuel-related energy will still be leading the energy sector in the coming years, national and local governments should enact mandatory minimum energy performance standards, and ratings and labels for energy efficiency in buildings, equipment,

and appliances, especially lighting, heating and air-conditioning units, to reduce energy consumption and GHG emissions. Similarly, energy efficiency measures in buildings should consider efficiency in energy supply, and target the reduction of fossil fuel primary energy such as through the promotion of building integrated renewables, nearly net zero operating emission performance as proposed by the Global Alliance for Building and Construction (GABC), in the Roadmap for transition towards low - GHG and resilient buildings.

### *Switch energy sources in the transport sector.*

Some developed countries like Norway and Germany have set targets for cleaner transport systems by 2025 and 2030. Electric vehicles can now be seen in the streets of developing countries. This is a good trend that needs to be encouraged. Priority should be given to the switch to non-fossil fuel-based transport, such as renewable energy based public transport and electric vehicles, as well as increased use of other forms of eco-mobility and non-motorized transport reducing the use of single cars.

### *Compact and densify cities through proper integrated urban planning measures.*

Decarbonizing cities requires low-carbon urban-planning measures. This includes the allocation of adequate, sufficient and equitable areas for the built and open spaces. The built spaces should not exceed 50 per cent and the remaining 50 per cent should be allocated to streets, gardens and other open spaces. Sustainable cities should adopt adequate density and compact patterns with an average of 150 people per hectare. Connectivity is also equally important as it links different city spaces together. Mixed land use, combining economic and residential activities and basic services, avoids the need for transport and promotes a social mix of classes by integrating affordable housing as well. “*Compact, resource efficient cities could see cuts of 36-54 per cent in GHG emissions, and in metals, land, energy and water use.*” Weight of the Cities

Key Performance Indicators for Smart Sustainable Cities, such as those developed by UNECE and the International Telecommunication Union (ITU) with 14 other United Nations system organizations, will enable cities to measure their progress over time, compare their performance to other cities and through analysis and sharing allow for the dissemination of best practices and set standards for progress in meeting the SDGs at the city level.

### *Capacity-building*

Long-lasting development requires that the actors and beneficiaries are fully involved in clean energy generation. Any meaningful programme on sustainable energy should include technology transfer and capacity-building components. Capacity-building in producing energy in cities is vital, considering that this sector has been for so long dominated by utility companies and other

large energy providers based on centralized power generation and distribution systems.

#### *Gender dimension*

Contributions and concerns of women and men regarding energy in cities need to be addressed, given that their needs, expectations and aspirations could be different. The gender dimensions of sustainable energy in cities should be incorporated into the design, planning and implementation of projects. In reporting on such projects or programmes, gender-disaggregated data on access to energy and finance for energy, as well as employment in the energy sector, should clearly show how men and women benefitted from the intervention. Women and children living in informal settlements or peri-urban areas are among the chief victims of indoor air pollution from cooking on traditional stoves, so decision-making about promoting cleaner cooking programmes in urban areas should include women.

#### *Involvement of urban youth in green technologies for sustainable development*

Young people under 30 years old constitute over 60 per cent of the African population; most of them are disenfranchised and live in urban areas without formal jobs. Empowering them to participate in activities focusing on resource efficiency and renewable energy is key to the achievement of sustainable city development. In the past few years, several training initiatives to empower youth through training on green technologies have revealed that these disenfranchised sectors of the society could increase energy access through local production and assembly of solar street lights and solar lanterns.

Engage stakeholders to promote energy efficiency and responsible consumption.

Policies in regard to land management, particularly in remote areas where traditional biomass is often the only accessible heating option, might need to be revisited to allow the legal harvesting of biomass and encourage its regrowth. Formal adoption of sustainability criteria is needed for the management of renewable feedstocks and efficient energy conversion of wood pellets. Integration of sustainable land management and efficiency is possible through cooperation among multiple stakeholders.

Improvements in energy efficiency are possible through establishment of incremental targets. This is illustrated by improvements in energy conversion rates and reductions in particulate matter emissions from high-efficiency residential wood-energy systems.

Wood can be a traditional or a modern type of energy; the key is in the “system” used to turn that biomass into energy. A high-efficiency combined heat and power (CHP) is a modern system that can use biomass; likewise high-efficiency stoves.

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